INTERNATIONAL PACIFIC HALIBUT COMMISSION

IPHC Annual Meeting (AM094) – A Collection of Published Meeting Documents

22-26 January 2018, Portland, OR

DISTRIBUTION: NONE
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INTERNATIONAL PACIFIC HALIBUT COMMISSION

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DRAFT: AGENDA & SCHEDULE FOR THE 94th SESSION OF THE IPHC ANNUAL MEETING (AM094)

Date: 22–26 January 2018
Location: Portland, Oregon, U.S.A.
Venue: Hilton Portland & Executive Tower
Time: 22nd: 09:00-17:30; 23-26: 09:00-17:00 daily
Chairperson: Dr. James Balsiger (United States of America)
Vice-Chairperson: Mr. Paul Ryall (Canada)

Notes:

- *All sessions are open to observers and the general public, unless the Commission specifically decides otherwise.*
- *All open sessions will be webcast. Webcast sessions will also take audience comments and questions as directed by the Chairperson of the Commission.*

PROVISIONAL: AGENDA FOR THE 94th SESSION OF THE IPHC ANNUAL MEETING (AM094)

1. OPENING OF THE SESSION

2. ADOPTION OF THE AGENDA AND ARRANGEMENTS FOR THE SESSION

3. UPDATE ON ACTIONS ARISING FROM THE 93rd ANNUAL MEETING and the 93rd INTERIM MEETING

4. REPORT OF THE IPHC SECRETARIAT (2017)

5. FISHERY STATISTICS (2017)

6. STOCK STATUS OF PACIFIC HALIBUT (2017) & HARVEST DECISION TABLE (2018)

- 6.1 Fishery Independent Setline Survey (FISS) design and implementation in 2017, including current and future expansions
- 6.2 Space-time modelling of survey data (WPUE; survey expansion results, etc.)
- 6.3 Data overview and Stock assessment (2017), and draft harvest decision table (2018)
- 6.4 Pacific halibut catch tables (2018)

7. MANAGEMENT STRATEGY EVALUATION

- 7.1 IPHC Management Strategy Evaluation: update
- 7.2 Report of the 10th IPHC Management Strategy Advisory Board (MSAB10)
- 7.3 Review of fishery goals and objectives: Commission directive

8. REGULATORY PROPOSALS FOR 2018
- 8.1 IPHC Secretariat regulatory proposals
- 8.2 Contracting Party (agency) regulatory proposals
- 8.3 Other Stakeholder regulatory proposals
- 8.4 Stakeholder statements

9. CONTRACTING PARTY (AGENCY) REPORTS
- 9.1 Regulatory Area 2A (US west coast)
- 9.2 Regulatory Area 2B (British Columbia)
- 9.3 Regulatory Areas 2C/3/4 (Alaska)

10. IPHC RESEARCH AND 5-YEAR RESEARCH PROGRAM
- 10.1 IPHC Research Advisory Board – Update
- 10.2 Report of the 11th Session of the IPHC Scientific Review Board (SRB11)
- 10.3 IPHC 5-year Biological & Ecosystem Science research program: update
- 10.4 Evaluation of the IPHC's 32" minimum size limit

11. IPHC PERFORMANCE REVIEW
- 11.1 Update on progress regarding the implementation of the 1st IPHC Performance Review recommendations
- 11.2 2nd IPHC Performance Review: Update
  - Discussion of Legal Review of the IPHC Convention

12. FINANCE AND ADMINISTRATION
- 12.1 Financial Statement for FY2017
- 12.2 Annual independent auditor's report (2016 and 2017)
- 12.3 Handling of the annual budget carryover
- 12.4 Budget estimates for FY2018 and FY2019 for approval, and tentatively for FY2020
- 12.5 IPHC Financial Regulations (2018): Draft

13. REPORT OF THE 88th SESSION OF THE IPHC CONFERENCE BOARD (CB088)

14. REPORT OF THE 23rd SESSION OF THE IPHC PROCESSOR ADVISORY BOARD (PAB023)

15. OTHER BUSINESS
- 15.1 IPHC meetings calendar (2018-20)
- 15.2 News release
- 15.3 Election of a Chairperson and Vice-Chairperson

16. REVIEW OF THE DRAFT AND ADOPTION OF THE REPORT OF THE 94th SESSION OF THE IPHC ANNUAL MEETING (AM094)

DRAFT: SCHEDULE FOR THE 94th SESSION OF THE IPHC ANNUAL MEETING (AM094)

(including the schedule for the 94th Session of the IPHC Finance and Administration Committee (FAC094))

Monday, 22 January 2018		
Time	**Agenda item**	**Lead (support)**
94th Session of the IPHC Finance and Administration Committee (FAC094)		
09:00-10:30	94th Session of the IPHC Finance and Administration Committee (FAC094) (*in Captain Gray I & II Room*) 1) Financial Statement for FY2017 2) Annual independent auditor's reports (2016 & 2017) 3) Handling of the annual budget carryover 4) Proposed budget for FY2018 and FY2019 for approval, and tentatively for FY2020 5) IPHC Financial Regulations (2018): Draft	Chairperson & M. Larsen
10:30-11:00	Break	
11:00-12:30	94th Session of the IPHC Finance and Administration Committee (FAC094) (*in Captain Gray I & II Room*)	Chairperson
12:30-13:30	Lunch	
94th Session of the IPHC Annual Meeting (AM094)		
13:30-13:45	1. Opening of the Session *(in Grand Ballroom I Room)*	Chairperson
13:45-14:00	2. Adoption of the agenda and arrangements for the Session ➢ ***IPHC-2018-AM094-01****: Agenda & Schedule for the 94th Session of the IPHC Annual Meeting (AM094)* ➢ ***IPHC-2018-AM094-02****: List of Documents for the 94th Session of the IPHC Annual Meeting (AM094)*	Chairperson & Executive Director
14:00-14:10	3. Update on actions arising from the 93rd Annual Meeting and the 93rd Interim Meeting	D. Wilson

	➢ ***IPHC-2018-AM094-03**: Update on actions arising from the 93rd Annual Meeting, and the 93rd Interim Meeting* ➢ ***IPHC-2017-IM093-R**: Report of the 93rd Session of the IPHC Interim Meeting (IM093)*	
14:10-14:40	4. Report of the IPHC Secretariat (2017) ➢ ***IPHC-2017-AM094-04**: Report of the IPHC Secretariat (2017)*	D. Wilson (K. Jernigan, E. Soderlund)
14:40-15:00	5. Fishery statistics (2017) ➢ ***IPHC-2017-AM094-05**: Fishery statistics (2017)*	J. Goen (L. Erikson)
15:00-15:10	6 Stock status of Pacific halibut (2017) and harvest decision table (2018) 6.1 Fishery Independent Setline Survey (FISS) design and implementation in 2017, including current and future expansions ➢ ***IPHC-2018-AM094-06:** Fishery Independent Setline Survey (FISS) design and implementation in 2017, including current and future expansions*	T. Geernaert (J. Goen)
15:10-15:30	6.1 Space-time modelling of IPHC fishery-independent setline survey data ➢ ***IPHC-2018-AM094-07:** Space-time modelling of IPHC fishery-independent setline survey data.*	R. Webster
15:30-15:45	Break	
15:45-17:00	6.2 Data overview and Stock assessment (2017), and draft harvest decision table (2018) ➢ ***IPHC-2018-AM094-08:** Summary of the data, stock assessment, and harvest decision table for Pacific halibut (Hippoglossus stenolepis) at the end of 2017* ➢ ***IPHC-2018-AM094-09:** Overview of data sources for the Pacific halibut stock assessment, harvest strategy policy, and related analyses* ➢ ***IPHC-2018-AM094-10:** Assessment of the Pacific halibut* (*Hippoglossus stenolepis*) *stock at the end of 2017* 6.3 Updated Pacific halibut catch tables (2018) ➢ ***IPHC-2018-AM094-11:** Pacific halibut catch tables*	I. Stewart I. Stewart
17:00-17:30	*Public comment and questions (Agenda Items 5 & 6)*	Chairperson
Tuesday, 23 January 2018		
09:00-10:00	7. Management strategy evaluation *(in Grand Ballroom I Room)* 7.1 IPHC Management Strategy Evaluation update ➢ ***IPHC-2018-AM094-12:** IPHC Management Strategy Evaluation (MSE): update*	A. Hicks

	7.2 Reports of the IPHC Management Strategy Advisory Board (MSAB) ➢ ***IPHC-2017-MSAB09-R:*** *Report of the 9th Session of the IPHC Management Strategy Advisory Board (MSAB09)* ➢ ***IPHC-2017-MSAB10-R:*** *Report of the 10th Session of the IPHC Management Strategy Advisory Board (MSAB10)* 7.3 Review of fishery goals and objectives: Commission directive	A. Keizer Chairperson
10:00-10:30	*Public comment and questions (Agenda Item 7)*	Chairperson
10:30-10:45	Break	
10:45-12:30	8. Regulatory proposals for 2018 *(in Grand Ballroom I Room)* 8.1 IPHC Secretariat regulatory proposals 8.2 Contracting Party (agency) regulatory proposals 8.3 Other Stakeholder regulatory proposals 8.4 Stakeholder statements	 S. Keith Agencies (G. Merrill) Stakeholders (S. Keith) S. Keith
12:30-13:30	Lunch	
13:30-15:30	9. Agency reports *(in Captain Gray I & II Room)* 9.1 Regulatory Area 2A (US west coast)	Various agencies
15:30-15:45	Break	
15:45-16:30	9.2 Regulatory Area 2B (British Columbia)	Various agencies
16:30-17:00	*Public comment and questions (Agenda Items 8, 9.1-9.2)*	
Wednesday, 24 January 2018		
09:00-10:30	9. Agency reports: *(in Captain Gray I & II Room)* 9.3 Regulatory Areas 2C/3/4 (Alaska)	Various agencies
10:30-10:45	Break	
10:45-12:00	9. Agency reports: *(in Captain Gray I & II Room)* 9.3 Regulatory Areas 2C/3/4 (Alaska)	Various agencies
12:00-12:30	*Public comment and questions (Agenda Item 9.3)*	Chairperson
12:30-13:30	Lunch	
13:30-15:00	10. IPHC Research and 5-year research program *(in Captain Gray I & II Room)* 10.1 IPHC Research Advisory Board – Update 10.2 Report of the 11th Session of the IPHC Scientific Review Board (SRB11)	D. Wilson S. Cox

	➢ ***IPHC-2017-SRB11-R:*** *Report of the 11th Session of the IPHC Scientific Review Board (SRB11)* 10.3 IPHC 5-year Biological & Ecosystem Science research program: update ➢ ***IPHC-2018-AM094-13:*** *IPHC 5-year Biological and Ecosystem Science research program: update* 10.4 Evaluation of the IPHC's 32" minimum size limit ➢ ***IPHC-2018-AM094-14:*** *Evaluation of the IPHC's 32" minimum size limit*	J. Planas I. Stewart
15:00-15:30	*Public comment and questions (Agenda Item 10)*	Chairperson
15:30-15:45	Break	
15:45-17:00	12. Finance and administration: *(in Captain Gray I & II Room)* 12.1 Financial Statement for FY2017 ➢ ***IPHC-2018-AM094-17:*** *Financial Statement for FY2017* 12.2 Annual independent auditor's report (2017) ➢ ***IPHC-2018-AM094-18:*** *Independent auditor's reports (2016 & 2017)* 12.3 Handling of the annual budget carryover ➢ ***IPHC-2018-AM094-19:*** *Handling of the annual budget carryover* 12.4 Proposed budget for FY2018 and FY2019 (for approval), and tentatively for FY2020 ➢ ***IPHC-2018-AM094-20:*** *Budget estimates for FY2018 and 2019 (for approval) and tentatively for 2020* 12.5 IPHC Financial Regulations (2018): Draft ➢ ***IPHC-2018-AM094-21:*** *Amendment of the IPHC Financial Regulations (2014)*	M. Larsen
Thursday, 25 January 2018		
09:00-09:30	13. Report of the 88th Session of the IPHC Conference Board (CB088) *(in Grand Ballroom I Room)* ➢ ***IPHC-2018-CB088-R****: Report of the 88th Session of the IPHC Conference Board (CB088)*	CB Chairperson
09:30-10:00	14. Report of the 23rd Session of the IPHC Processor Advisory Board (PAB023) ➢ ***IPHC-2017-PAB023-R****: Report of the 23rd Session of the IPHC Processor Advisory Board (PAB023)*	PAB Chairperson
10:00-10:30	*Public comment and questions (Agenda Items 13 & 14)*	Chairperson
10:30-10:45	Break	

10:45-12:30	Commission Discussion	Chairperson
12:30-13:30	Lunch	
13:30-14:30	11. IPHC Performance Review 11.1 Update on progress regarding the implementation of the 1st IPHC Performance Review recommendations ➢ ***IPHC-2018-AM094-15:*** *Update on progress regarding the implementation of the 1st IPHC Performance Review recommendations* 11.2 2nd IPHC Performance Review: Update • Discussion of Legal Review of the IPHC Convention ➢ ***IPHC-2018-AM094-16:*** *2nd IPHC Performance Review: Update*	S. Keith D. Wilson
15:30-15:45	Break	
15:45-17:00	8. Revisit Regulatory proposals for 2018: for decision *(in Grand Ballroom I Room)*	D. Wilson (S. Keith)
Friday, 26 January 2018		
09:00-10:30	Catch limits for 2018: *(in Pavilion Ballroom West)* • Other actions as necessary	Chairperson
10:30-11:00	Break	
11:00-11:30	Revist final catch tables based on adopted catch limits for 2018	Executive Director
11:30-12:30	15. Other business 15.1 IPHC meetings calendar (2018-20) ➢ ***IPHC-2018-AM094-22:*** *IPHC meetings calendar (2018-20)* 15.2 News release 15.3 Election of a Chairperson and Vice-Chairperson	S. Keith S. Keith Chairperson
12:30-13:30	Lunch	
13:30-17:00	16. Review of the draft and adoption of the Report of the 94th Session of the IPHC Annual Meeting (AM094) (*in Broadway I/II Room*)	Chairperson Executive Director

INTERNATIONAL PACIFIC HALIBUT COMMISSION

IPHC-2018-AM094-02

Late updated: 19 January 2018

DRAFT: LIST OF DOCUMENTS FOR THE 94th SESSION OF THE IPHC ANNUAL MEETING (AM094)

Meeting documents	Title	Availability
IPHC-2018-AM094-01	DRAFT: Agenda & Schedule for the 94th Session of the IPHC Annual Meeting (AM094)	✓ 24 Oct 2017 ✓ 17 Jan 2018
IPHC-2018-AM094-02	DRAFT: List of Documents for the 94th Session of the IPHC Annual Meeting (AM094)	✓ 24 Oct 2017 ✓ 17 Jan 2018
IPHC-2018-AM094-03	Update on actions arising from the 93rd Annual Meeting (AM093), and the 93rd Interim Meeting (IM093) (IPHC Secretariat)	✓ 20 Dec 2017
IPHC-2018-AM094-04	Report of the IPHC Secretariat (2017) (IPHC Secretariat)	✓ 21 Dec 2017
IPHC-2018-AM094-05	Fishery statistics (2017) (J. Goen & L. Erikson)	✓ 20 Dec 2017
IPHC-2018-AM094-06	Fishery Independent Setline Survey (FISS) design and implementation in 2017, including current and future expansions (J. Goen, T. Geernaert, E. Henry, E. Soderlund, A.M. Ranta, T.M. Kong, & J. Forsberg)	✓ 20 Dec 2017
IPHC-2018-AM094-07	Space-time modelling of IPHC fishery-independent setline survey data (R. Webster)	✓ 19 Dec 2017
IPHC-2018-AM094-08	Summary of the data, stock assessment, and harvest decision table for Pacific halibut (*Hippoglossus stenolepis*) at the end of 2017 (I. Stewart, A. Hicks, R. Webster & D. Wilson)	✓ 19 Dec 2017
IPHC-2018-AM094-09	Overview of data sources for the Pacific halibut stock assessment, harvest strategy policy, and related analyses (I. Stewart & R. Webster)	✓ 21 Dec 2017
IPHC-2018-AM094-10	Assessment of the Pacific halibut (*Hippoglossus stenolepis*) stock at the end of 2017 (I. Stewart & A. Hicks)	✓ 21 Dec 2017
IPHC-2018-AM094-11 Rev_1	Final Pacific halibut catch tables for 2018 (I. Stewart)	✓ 01 Dec 2017 ✓ 10 Jan 2018
IPHC-2018-AM094-12	IPHC Management Strategy Evaluation (MSE): update (A. Hicks & I. Stewart)	✓ 02 Dec 2017
IPHC-2018-AM094-13	IPHC 5-year Biological and Ecosystem Science research program: update (J. Planas)	✓ 06 Dec 2017
IPHC-2018-AM094-14	Evaluation of the IPHC's 32" minimum size limit (I. Stewart & A. Hicks)	✓ 01 Dec 2017

IPHC-2018-AM094-15	Update on progress regarding the implementation of the 1st IPHC Performance Review recommendations (S. Keith & D. Wilson)	✓ 01 Dec 2017
IPHC-2018-AM094-16	2nd IPHC Performance Review: Update (D. Wilson)	✓ 01 Dec 2017
IPHC-2018-AM094-17	Financial Statement for FY2017 (M. Larsen)	✓ 04 Jan 2018
IPHC-2018-AM094-18	Independent auditor's reports (FY2016 & FY2017) (M. Larsen)	✓ 19 Jan 2018
IPHC-2018-AM094-19	Handling of the annual budget carryover (M. Larsen & D. Wilson)	✓ 20 Dec 2017
IPHC-2018-AM094-20	Budget estimates for FY2018 and 2019 (for approval) and tentatively for 2020 (M. Larsen)	✓ 05 Jan 2018
IPHC-2018-AM094-21	Amendment of the IPHC Financial Regulations (2014) (M. Larsen, S. Keith & D. Wilson)	✓ 21 Dec 2017
IPHC-2018-AM094-22	IPHC meetings calendar (2018-20) (IPHC Secretariat)	✓ 12 Dec 2017
IPHC-2018-AM094-23	Implementation notes: 2018 Regulatory proposals (IPHC Secretariat)	✓ 23 Dec 2017
Contracting Party (by agency) reports		
IPHC-2018-AM094-AR01	Pacific Fishery Management Council (PFMC) update	✓ 12 Dec 2017
IPHC-2018-AM094-AR02	NMFS Report: Report on the 2017 Pacific halibut fisheries in Area 2a	✓ 22 Dec 2017
IPHC-2018-AM094-AR03	U.S. Coast Guard enforcement Report (IPHC Areas 2A, 2C, 3A, 3B, 4A, 4B, 4C, 4D and 4E) to the International Pacific Halibut Commission (11th, 13th and 17th Districts)	✓ 28 Dec 2017
IPHC-2018-AM094-AR04	NOAA-NMFS Office of Law Enforcement (OLE) West coast enforcement division report to the International Pacific Halibut Commission	✓ 02 Jan 2018
IPHC-2018-AM094-AR05 Rev_1	Washington Department of Fish and Wildlife (WDFW): Summary of Washington Pacific Halibut Fisheries Management in 2017	✓ 21 Dec 2017 ✓ 27 Dec 2017
IPHC-2018-AM094-AR06 Rev_1	Oregon Department of Fish and Wildlife (ODFW): Report on the 2017 Oregon Recreational and Commercial Pacific Halibut Fisheries	✓ 22 Dec 2017 ✓ 04 Jan 2018
IPHC-2018-AM094-AR07	Oregon State Police Halibut Enforcement Summary	✓ 11 Dec 2017
IPHC-2018-AM094-AR08	California Department of Fish and Wildlife (CDFW): Report to the International Pacific Halibut Commission on 2017 California Fisheries	✓ 22 Dec 2017

IPHC-2018-AM094-AR09	Fisheries and Oceans Canada 2017: IPHC Annual Report	✓ 20 Dec 2017
IPHC-2018-AM094-AR10 Rev_1	2017 Canadian Recreational Fishery Halibut Catch Report	✓ 20 Dec 2017 ✓ 11 Jan 2018
IPHC-2018-AM094-AR11	Canadian report to the International Pacific Halibut Commission on 2017 halibut fishery enforcement activities	✓ 20 Dec 2017
IPHC-2018-AM094-AR12	North Pacific Fishery Management Council (NPFMC): Annual management letter	✓ 21 Dec 2017
IPHC-2018-AM094-AR13	Annual Report to the International Pacific Halibut Commission from the Alaska Region, National Marine Fisheries Service	✓ 08 Jan 2018
IPHC-2018-AM094-AR14	Alaska Department of Fish and Game (ADFG) Recreation Report	✓ 20 Oct 2017
IPHC-2018-AM094-AR15	Alaska Department of Fish and Game (ADFG) Subsistence Report	✓ 20 Dec 2017
IPHC-2018-AM094-AR16	NOAA Fisheries Office of Law Enforcement (OLE): Alaska enforcement division report to the International Pacific Halibut Commission	✓ 09 Jan 2018
IPHC-2018-AM094-AR17	Alaska State Troopers Department of Public Safety Division of Alaska Wildlife Troopers Report to the International Pacific Halibut Commission	Withdrawn
Regulatory proposals for 2018		
IPHC Secretariat regulatory proposals for 2018		
IPHC-2018-AM094-PropA1	IPHC Closed Area (Sect. 10) (IPHC Secretariat)	✓ 19 Dec 2017
IPHC-2018-AM094-PropA2	Fishing Periods (Sect. 8) (IPHC Secretariat)	✓ 01 Dec 2017
IPHC-2018-AM094-PropA3	Vessel Monitoring System requirement for IPHC Regulatory Area 4 clearances (Sect. 15) (IPHC Secretariat)	✓ 01 Dec 2017
IPHC-2018-AM094-PropA4	IPHC Fishery Regulations: minor amendments (IPHC Secretariat)	✓ 01 Dec 2017
IPHC-2018-AM094-PropA5	Discussion paper: Frozen-at-sea exemption for head-on requirement (Sect. 13) (IPHC Secretariat)	✓ 01 Dec 2017
Contracting Party (by agency) regulatory proposals for 2018		
IPHC-2018-AM094-PropB1 Rev_1	Leasing IFG to CDQ groups in IPHC Regulatory Area 4 (U.S.A. - NOAA-Fisheries)	✓ 23 Dec 2017
IPHC-2018-AM094-PropB2	Clarify sport fishing regulations in Regulatory Areas 2C and 3A (U.S.A. - NOAA-Fisheries)	✓ 01 Dec 2017

IPHC-2018-AM094-PropB3	Clarify head-on requirement in Alaska Commercial Fisheries (U.S.A. - NOAA-Fisheries)	✓ 01 Dec 2017
Other Stakeholder regulatory proposals for 2018		
IPHC-2018-AM094-PropC1	Catch limit proposals (Sect. 11) (Various)	✓ 1 Dec 2017
IPHC-2018-AM094-PropC2	Preserving catch on private live-aboard vessels (A. Cooper)	✓ 16 Aug 2017
IPHC-2018-AM094-PropC3	For unguided sport fishing (P. Phillips)	✓ 14 Sept 2017
IPHC-2018-AM094-PropC4	Sport Fishing for Halibut - Cleaning Regulations (S. Riehemann)	✓ 22 Sept 2017
IPHC-2018-AM094-PropC5	Elimination of skin-on regulation (J. Shirk)	✓ 16 Oct 2017
IPHC-2018-AM094-PropC6	Live-aboard processing exemption (D. Robertson)	✓ 17 Oct 2017
IPHC-2018-AM094-PropC7	Eliminate the requirement for a CHP (S. Riehemann)	✓ 20 Oct 2017
IPHC-2018-AM094-PropC8	Allow shellfish pots on board (ALFA)	✓ 23 Oct 2017
IPHC-2018-AM094-PropC9	Processing halibut greater than four filets (M. Cowart)	✓ 24 Oct 2017
IPHC-2018-AM094-PropC10	Halibut length measurement method (R. Yamada)	✓ 26 Oct 2017
IPHC-2018-AM094-PropC11	Long term storage aboard pleasure vessels (L. Thompson)	✓ 26 Oct 2017
IPHC-2018-AM094-PropC12	Long term storage on cruising vessels (W. Cornell)	✓ 26 Oct 2017
IPHC-2018-AM094-PropC13	Halibut in Bering Sea pots (J. Kauffman)	✓ 27 Oct 2017
IPHC-2018-AM094-PropC14	Status Quo Harvest Measures for Guided Anglers in Area 3A (R. Yamada)	✓ 27 Oct 2017
IPHC-2018-AM094-PropC15	Trawler Halibut Bycatch Tender boat program (J. Kearns)	✓ 22 Dec 2017
IPHC-2018-AM094-PropC16	Reduce daily bag limit for all anglers in Area 2C and 3A in times of low abundance (M. Grove)	✓ 23 Dec 2017
IPHC-2018-AM094-PropC17	Recreational sportsfishing only allocation (J. Kearns)	✓ 22 Dec 2017
Reports from IPHC subsidiary bodies (2017/18)		
IPHC-2017-SRB10-R	Report of the 10th Session of the IPHC Scientific Review Board (SRB10)	✓ 4 July 2017
IPHC-2017-SRB11-R	Report of the 11th Session of the IPHC Scientific Review Board (SRB11)	✓ 29 Sept 2017
IPHC-2017-MSAB09-R	Report of the 9th Session of the IPHC Management Strategy Advisory Board (MSAB09)	✓ 22 May 2017

IPHC-2017-MSAB10-R	Report of the 10th Session of the IPHC Management Strategy Advisory Board (MSAB10)	✓ 27 Oct 2017
IPHC-2018-CB088-R	Report of the 88th Session of the IPHC Conference Board (CB088)	Expected: 24 Jan
IPHC-2018-PAB023-R	Report of the 23rd Session of the IPHC Processor Advisory Board (PAB023)	Expected: 24 Jan
IPHC-2017-IM093-R	Report of the 93rd Session of the IPHC Interim Meeting (IM093)	✓ 2 Dec 2017
Information papers		
IPHC-2018-AM094-INF01	Understanding the IPHC harvest decision table (2018) (I. Stewart)	✓ 1 Dec 2017
IPHC-2018-AM094-INF02	IPHC Regulatory Area 2A Directed commercial Pacific halibut fishery management overview and fishing period options (2- and 5-days) (IPHC Secretariat)	✓ 19 Dec 2017
IPHC-2018-AM094-INF03	Bycatch data summary (IPHC Secretariat)	✓ 21 Dec 2017
IPHC-2018-AM094-INF04	Stakeholder statements on regulatory proposals for 2018 (IPHC Secretariat)	✓ 28 Dec 2017
IPHC-2018-AM094-INF05	The Magnuson-Stevens Act: Continuing our nation's legacy of strong, science-based fisheries management (ALFA)	✓ 08 Jan 2018
IPHC-2018-AM094-INF06	2017 2A Treaty Tribal Halibut Season Summary (Anon)	✓ 17 Jan 2018
Other supporting documents		
IPHC-2017-RARA27-R	Report of Assessment and Research Activities: 2017 (IPHC Secretariat)	✓ 20 Dec 2017

Update on actions arising from the 93rd Annual Meeting (AM093) and 93rd Interim Meeting (IM093)

PREPARED BY: IPHC SECRETARIAT (20 DECEMBER 2017)

PURPOSE

To provide the Commission with an opportunity to consider the progress made during the inter-sessional period, in relation to the recommendations and requests of the 93rd Session of the IPHC Annual Meeting (AM093), and 93rd Interim Meeting (IM093) in 2017.

BACKGROUND

At the 93rd Session of the IPHC Annual Meeting (AM093), and 93rd Session of the IPHC Interim Meeting, Contracting Parties agreed on a series of actions to be taken by Commissioners, Subsidiary Bodies and the IPHC Secretariat on a range of topics as detailed in Appendix A.

DISCUSSION

Noting that best practice governance requires the prompt delivery of core tasks assigned by the Commission, at each subsequent session of the Commission and its subsidiary bodies, attempts will be made to ensure that any recommendations and requests for action are carefully constructed so that each contains the following elements:

1) a specific action to be undertaken (deliverable);
2) clear responsibility for the action to be undertaken (i.e. a specific Contracting Party, the IPHC Secretariat, a subsidiary body of the Commission or the Commission itself);
3) a desired time frame for delivery of the action (i.e. by the next session of an subsidiary body, or other date).

This involves numbering and tracking all action items (see Appendix A) from the Commission in 2017, as well as including clear progress updates and document reference numbers.

RECOMMENDATION/S

That the Commission:

1) **NOTE** paper IPHC-2018-AM094-03 which provided the Commission with an opportunity to consider the progress made during the inter-sessional period, in relation to the recommendations and requests of the 93rd Session of the IPHC Annual Meeting (AM093) and 93rd Session of the IPHC Interim Meeting (IM093) in 2017.
2) **AGREE** to consider and revise as necessary, the actions, and for these to be combined with any new actions arising from the AM094.

APPENDICES

Appendix I: Update on actions arising from the 93rd Annual Meeting (AM093) and 93rd Interim Meeting (IM093)

APPENDIX A

Update on actions arising from the 93rd Annual Meeting (AM093) and 93rd Interim Meeting (IM093)

Action No.	Description	Update
93rd Annual Meeting (January 2017): RECOMMENDATIONS		
AM093–Rec.01 (para. 6)	***Update on actions arising from the 92nd Annual Meeting, IPHC Work Meeting and the 92nd Interim Meeting*** **NOTING** the importance of the North Pacific Fishery Management Council (NPFMC) working cooperatively with the IPHC on Pacific halibut management, the Commission **RECOMMENDED** that the existing ad-hoc meetings between the NPFMC and the IPHC be formalised into a standing body that meets regularly to provide direction to the development of a coordinated relationship between both parties. Such a body should consist of IPHC Commissioners (from both the USA and Canada) and the NPFMC leadership.	Completed: A one-day joint Session of IPHC Commissioners and NPFMC Councilors was held on 7 June 2017. The session was held as part of the Council process. The majority of Councilors were supportive of an annual joint Session, held in conjunction with one of the bodies meetings to reduce travel obligations. However, it was not agreed to make this a formal standing body. At the 2017 Work Meeting and IM093, the Commission agreed to continue close collaboration with the NPFMC regarding future joint sessions.
AM093–Rec.02 (para. 17)	***Survey expansion through 2019*** The Commission recalled its previous **RECOMMENDATION** that the IPHC Secretariat develop an information paper associated with the survey expansion, which details the likely implications of periodic survey expansion on the stock assessment and apportionment, taking into consideration potential population variability of Pacific halibut in expansion areas which are infrequently surveyed. The paper shall be submitted for initial consideration at the Commission's Work Meeting in September 2017.	Completed: Presented to the IM093 (IPHC-2017-IM093-07). For the latest update see the AM094 paper: IPHC-2018-AM094-07 Space-time modelling of IPHC fishery-independent setline survey data (R. Webster)
AM093–Rec.03 (para. 19)	The Commission **RECOMMENDED** that the IPHC Secretariat develop a proposal detailing an ad-hoc expansion of the IPHC fishery-independent setline survey for 2017, which would involve a denser survey grid off the north coast of Washington, USA. The proposal shall be provided to the Commission as soon as possible following the close of the 93rd Annual Meeting for its review, endorsement, and potential implementation. The intention of the ad-hoc expansion is to verify the current estimates of stock distribution within Regulatory Area 2A.	Completed: 17 February 2017: IPHC-2017-AM093-06 ADD_1 06 March 2017: IPHC-2017-AM093-06 ADD_2 **NOTING** the above, the Commission **ENDORSED** the revised IPHC fishery-independent setline survey for Regulatory Area 2A in 2017, as described in this paper (IPHC-2017-AM093-06 ADD_1). The 2017 survey has now been completed accordingly.

Action No.	Description	Update
AM093–Rec.04 (para. 29)	***Draft Pacific halibut apportionment and catch tables (2017)*** **NOTING** that the IPHC Secretariat and the IPHC Scientific Review Board (SRB) have demonstrated that Ebio is outdated and inconsistent with current assessment results, and that numerous elements of the current harvest policy are reliant on Ebio, and that the Commission has agreed that the current harvest policy is considered to be outdated (IPHC–2016–IM092–R, items 21, 22), the Commission **RECOMMENDED** that reference to all elements of the current harvest policy reliant on Ebio, as well as the use of the Blue line, be eliminated subsequent to the close of the 93rd Session of the Commission. The "*status quo* SPR" ($F_{46\%}$) may serve as an interim "hand rail" that allows all participants to gauge this and future years' catch limit discussions in comparison to previous years.	Completed: Reference to all elements of the current harvest policy reliant on Ebio, as well as the use of the Blue line, has been eliminated. The "*status quo* SPR" ($F_{46\%}$) is being used as an interim "hand rail".
AM093–Rec.05 (para. 30)	**NOTING** that the Commission has indicated its interest in clearer accounting for all mortality, and that Canada has put forward catch limit allocation principles proposing that catch limits include all sources of mortality for each regulatory area, the Commission **RECOMMENDED** that the presentation of harvest advice be changed to be based on the TCEY, which includes all O26 commercial, sport, personal use/subsistence, bycatch and wastage removals, for the 2018 Annual Meeting cycle, as a step towards more comprehensive and responsible management of the resource that will result in the negotiation of Regulatory Area-specific catch limits based on TCEYs.	Completed: The presentation of harvest advice has been changed to be based on the TCEY, which includes all O26 commercial, sport, personal use/subsistence, bycatch and wastage removals, for the 2018 Annual Meeting cycle.
AM093–Rec.06 (para. 38)	***IPHC Management Strategy Evaluation*** **NOTING** that the term "apportionment" has connotations broader than stock distribution that are not reflective of its meaning in the IPHC context, the Commission **RECOMMENDED** that it be replaced with the terms "stock distribution" or "stock distribution model(ing)".	Completed: The IPHC now uses "stock distribution" or "stock distribution model(ing)" accordingly.
AM093–Rec.07 (para. 39)	The Commission **RECOMMENDED** that the IPHC Management Strategy Evaluation (MSE) process be accelerated so that more of the elements contained within the current Program of Work are delivered at the 94th Annual Meeting of the Commission in 2018. The IPHC Secretariat is directed to mobilise carryover funds from "core operations" to ensure the accelerated delivery schedule.	In progress: MSAB meetings have been increased in length and content to handle an accelerated timeline. MSAB09: Extended from 2 to 3 days (9-11 May 2017). MSAB10: Extended from 2 to 3.5 days (23-26 October 2017). **Delivery schedule acceleration**: Fishing metrics have been evaluated and stock distribution procedures have been discussed. 3 proposed staff position hires to assist in expediting the MSE work throughout 2018, as follows: 1) Programmer (short-term contract) 2) MSE Expert (short-term contract)

Action No.	Description	Update
		3) MSE Researcher (FTE-2-yrs)
AM093–Rec.08 (para. 73)	***IPHC Pacific halibut fishery regulations 2017*** The Commission **RECOMMENDED** that the IPHC Secretariat prepare the draft IPHC Pacific halibut fishery regulations for 2017, based on the decisions of the AM093, for review and final approval by the Commission, prior to submission to the Contracting Parties for implementation.	Completed: The IPHC fishery regulations were published prior to the commencement of the directed fishery both the IPHC and both governments.
AM093–Rec.09 (para. 110)	***Exempted Fishing Permit (EFP) updates*** **NOTING** that the Commission had previously requested the IPHC Secretariat to examine bycatch reduction by the Amendment 80 sector versus other sectors in the Bering Sea, by regulatory area (see AM92.10), which was yet to be undertaken, the Commission **RECOMMENDED** that the IPHC Secretariat undertake a detailed examination of changes in bycatch levels among all gears/sectors, and for results to be presented to the Commission at its 93rd Interim Meeting (in November 2017).	Completed: Initial results of the work were incorporated within paper IPHC-2017-IM093-05 Rev_1 - Fishery statistics (2017): Draft
AM093–Rec.10 (para. 128)	***Report of the 18th Session of the IPHC Research Advisory Board (RAB18): Best practices handling guidelines*** The Commission recalled its **RECOMMENDATION** from the 92nd Interim Meeting, that the IPHC Secretariat undertake a project to develop '*Best practice handling guidelines'* for each of the primary gear types which catch Pacific halibut, both directed and non-directed.	In progress: The IPHC is currently conducting a research project evaluating handling practices associated with physiological condition and survival of discarded Pacific halibut in the longline fishery that will produce, as deliverables, best practice handling guidelines for the reduction or control of discard mortality rates by late 2019.
AM093–Rec.11 (para. 142)	***Proposed budget for FY2017, 2018 and tentatively for 2019*** The Commission **RECOMMENDED** two supplementary budget items at the Annual Meeting, whose expenses would be drawn from the IPHC carryover, and not the regular budget. a) Area 2A fishery-independent setline survey ad-hoc expansion (densification) of the Washington region. The IPHC Secretariat shall provide a proposal to the Commission for inter-sessional decision, which details the scientific, logistical and budget implications. b) Management Strategy Evaluation (MSE) supplemental support – The IPHC Secretariat shall provide a proposal to the Commission for inter-sessional decision, detailing any additional resources that could be used to expedite, enhance and supplement the MSE Program of Work.	Completed: a) Budget estimate: US$9,348. Approved by the Commission b) Budget estimate: Moved to 2018. See response to AM093–Rec.07 detailed above.
AM093–Rec.12 (para. 144)	**NOTING** that in the current IPHC annual budgeting process, the budget is approved several months after the fiscal year has begun, the Commission **RECOMMENDED** that the IPHC Secretariat propose modifications to the IPHC Financial Regulations (2014) to address this issue, for consideration at the 94th Annual Meeting of the Commission in 2018.	Completed: See paper IPHC-2018-AM094-21 Draft: IPHC Financial Regulations (2018)

Action No.	Description	Update
AM093–Rec.13 (para. 153)	***IPHC Performance Review: Planning for the 2nd IPHC Performance Review*** The Commission **RECOMMENDED** that the IPHC Secretariat finalise the draft performance review terms of reference and criteria to conduct the review, and implement the 2nd Performance Review throughout 2017, for presentation to the Commission at its 94th Annual Meeting in 2018.	In progress: See paper IPHC-2018-AM094-16 2nd IPHC Performance Review: Update A call for Expressions of Interest for a legal review of the Convention was published, closed and a candidate selected. Report delivered. First Panel meeting to be held in March/April 2018.
93rd Annual Meeting (January 2017): REQUESTS		
AM093–Req.01 (para. 18)	***Survey expansion through 2019*** **NOTING** the potential positive implications of periodic survey expansion on the stock assessment model and apportionment arising from the survey, and that the IPHC Secretariat will be developing an information paper associated with the survey expansion (see IPHC–2016–IM092–R, item 38), and that there are implications of survey expansion in Regulatory Area 2B for species of conservation concern and protected areas, and that Canada would like to better understand the value of the additional survey information, the Commission **REQUESTED** that the IPHC Secretariat work with domestic agencies and interests to explore options to the proposed survey expansion to minimise impacts on species of conservation concern and area closures before proceeding with planning any survey expansion in 2B.	In progress: IPHC requested for 2017 to fish standard setline survey stations that are inside protected areas (Marine Protected Areas (MPAs) and Rockfish Conservation Areas (RCAs)) in Regulatory Area 2B, but did not receive permission. Sixteen standard survey stations were affected (11 moved or dropped for MPAs, 5 moved for RCAs). The Secretariat is working with DFO staff to identify protected areas for the 2018 survey, which is expected to fish an expanded number of stations and when additional protected areas are also expected to be added. IPHC has held several meetings with DFO over 2017 (Mar, May, Aug, Sep, Nov, Dec) in preparation for the 2018 setline survey expansion and to explore options to minimize impacts to protected species and areas. Because 2018 will include an expansion in Regulatory Area 2B, IPHC will submit a request to DFO to conduct our fishery independent setline survey well in advance of the expected start date.
AM093–Req.02 (para. 40)	***IPHC Management Strategy Evaluation*** The Commission **REQUESTED** that the IPHC Secretariat initiate a process to develop alternative, biologically based stock distribution strategies for consideration by the Commission and its subsidiary bodies. This should also be incorporated into the MSE Program of Work.	In progress: See paper IPHC-2018-AM094-12 IPHC Management Strategy Evaluation: update
AM093–Req.03 (para. 51)	***Regulatory proposals for 2017*** ***IPHC Closed Area - removal*** **NOTING** the detailed information gathered and presented to the Commission in support of the removal of the IPHC Closed Area (PropB), as detailed in paper IPHC-2017-AM093-INF03 on the following topics:	Completed: See paper: IPHC-2018-AM094-PropA1 IPHC Closed Area (Sect. 10) (IPHC Secretariat)

<table>
<tr><th>Action No.</th><th>Description</th><th>Update</th></tr>
<tr><td></td><td>Past considerations
History of boundaries
Bycatch
Nursery grounds
Other nearby closed areas
Impacts of allowing directed Pacific halibut fishing
the Commission REQUESTED further information be provided on whether the area is a nursery ground for Pacific halibut, by examining juvenile abundance from data sources including but not limited to observer programs and the NMFS trawl surveys, and comparing this information with the impact of the directed fishery operating in nearby areas, as well as the non-directed fisheries currently operating within the Closed Area.</td><td></td></tr>
<tr><td>AM093–Req.04 (para. 89)</td><td>Fisheries and Oceans Canada (DFO) 2016: Annual report
NOTING that the proposed change to the IPHC Pacific halibut fishery regulations was made in Session, rather than in accordance with the IPHC rules relating to proposal submission, the Commission REQUESTED that the IPHC Secretariat work with DFO Staff in an attempt to implement electronic logbooks for Pacific halibut fisheries in Area 2B in 2017, including but not limited to:
a) Any necessary updates to IPHC Regulations such as Section 16, Paragraphs (5) through (7) on Canadian logs to reflect both electronic and paper logbooks;
b) Coordination with the IPHC Secretariat on the data fields captured in the electronic logbook to ensure inclusion of the information listed in IPHC Regulations 16(6) noted below and any other necessary fields as mutually agreed;
i. the name of the vessel and the DFO vessel registration number;
ii. the date(s) upon which the fishing gear is set and retrieved;
iii. the latitude and longitude coordinates for each set;
iv. the number of skates deployed or retrieved, and number of skates lost; and
v. the total weight or number of halibut retained for each set.
c) Coordination with the IPHC Secretariat on the logistics of data delivery to IPHC, including the timing of and security of data delivery to IPHC and the access to electronic logbooks by IPHC port samplers at the time of landing.
d) Should this not be possible in 2017, a Regulatory Proposal would be submitted by Canada for consideration at the 94th Session of the Annual meeting in 2018, in accordance with the IPHC Rules of Procedure.</td><td>Completed: IPHC Fishery Regulations (2017) contained the required amendments.</td></tr>
</table>

Action No.	Description	Update
AM093–Req.05 (para. 99)	***North Pacific Fisheries Management Council (NPFMC)*** The Commission **REQUESTED** that the NMFS provide a report of juvenile Pacific halibut catch rates in the commercial fisheries versus scientific trawl surveys. The IPHC Secretariat shall facilitate this request for presentation at the 93rd Interim Meeting in November 2017.	Completed: See AM094 document: IPHC-2018-AM094-AR02
AM093–Req.06 (para. 123)	***Reports of the IPHC Scientific Review Board (SRB)*** The Commission **REQUESTED** that, in response to the SRB recommendation that the Ebio calculation be phased out in favour of alternatives, the SRB recommend specific alternatives that the IPHC Secretariat can explore.	In progress: See above AM093–Rec.04 (para. 29). The SRB is working to develop options for consideration. See IPHC-2017-SRB11-R Report of the 11th Session of the IPHC Scientific Review Board (SRB11)
93rd Interim Meeting (November 2017): RECOMMENDATIONS		
IM093–Rec.01 (para. 6)	***Report of the IPHC Secretariat (2017)*** The Commission **RECOMMENDED** that the IPHC Secretariat develop a working paper for consideration at the 94th Annual Meeting, containing the following: a) A detailed description of how the Regulatory Area 2A commercial fishery (derby) is managed, including roles and responsibilities of agencies, the PFMC and the IPHC; and b) An update to the analysis of various fishing periods and fishing period limits provided to the PFMC in September 2017, including the addition of 2- and 5-day fishing periods.	Completed: See AM094 document: IPHC-2018-AM094-INF02
IM093–Rec.02 (para. 38)	***Review of fishery goals and objectives: Commission directive*** **NOTING** the goals and objectives related to distributing the TCEY presented during the meeting by the U.S.A. (Table 3), the Commission **RECOMMENDED** that they be considered at the 94th Annual Meeting in January 2018 after soliciting input from stakeholders.	In progress: IPHC Circular 2017-22 communicated to stakeholders on 18 December 2017. The Co-Chairpersons of the MSAB will present a summary at the AM094.
93rd Interim Meeting (November 2017): REQUESTS		
IM093–Rec.01 (para. 8)	***Fishery statistics (2017)*** **NOTING** Appendix I of paper IPHC-2017-IM093-05 Rev_1 was provided the evening prior to the Interim Meeting, and detailed information available on bycatch levels among all gears/sectors, as requested by the Commission at its 93rd Annual Meeting (AM093-Rec.09), the Commission **REQUESTED** that the IPHC Secretariat facilitate consideration of the information inter-sessionally, so that the Commission may provide further guidance on the type of information it requires, for consideration at the 94th Annual Meeting in January 2018.	Completed: IPHC Circular 2017-21 communicated to the Commission on 05 December 2017. Feedback was received that similar data would be desirable from the Canadian fleets. See AM094 document: IPHC-2018-AM094-INF03 for an expanded summary of the information currently assembled to meet this request.

Action No.	Description	Update
IM093–Req.02 (para. 17)	***Space-time modelling of survey data (WPUE; survey expansion results, etc.)*** The Commission **REQUESTED** that the IPHC Secretariat examine alternative ways of computing bottom area that account for bathymetry, noting that the current method involves estimating the surface area of the ocean.	In progress: Consideration of this request has commenced and will be address in 2018.
IM093–Req.03 (para. 28)	***Data overview and preliminary stock assessment (2017), and draft harvest decision table (2017)*** The Commission **REQUESTED** that the IPHC Secretariat provide columns in the decision table, three-year graphical projections, and catch tables for SPR values of 42%, 44%, 48%, and 50% in addition to the 46% SPR that was presented in documents IPHC-2017-IM093-08 and IPHC-2017-IM093-09.	Completed: See AM094 document: IPHC-2018-AM094-08
IM093–Req.04 (para. 29)	**NOTING** questions arising regarding the specific fisheries contributing to projected bycatch reductions from 2010 to 2017, the Commission **REQUESTED** that the IPHC Secretariat work with NMFS staff to facilitate a report for consideration at the 94th Annual Meeting in January 2018.	In progress: See Agency report IPHC-2018-AM094-AR13
IM093–Req.05 (para. 36)	***Report of the 10th Session of the IPHC Management Strategy Advisory Board (MSAB10)*** The Commission **REQUESTED** that the MSAB look at SPR values consistent with recent estimated SPR values from the assessment model and lower. This would mean expanding the lower range of SPR values to below 40%.	In progress: This request has been forwarded to the MSAB process in 2018.
IM093–Req.06 (para. 39)	***Review of fishery goals and objectives: Commission directive*** The Commission **REQUESTED** the IPHC Secretariat to consolidate the objectives related to TCEY distribution (Table 3) with the current goals, objectives and performance metrics provided as Appendix IV of the MSAB10 Report, for presentation at the 94th Annual Meeting in January 2018.	In progress: IPHC Circular 2017-22 communicated to stakeholders on 18 December 2017. The intention is to consolidate these for presentation at the AM094.
IM093–Req.07 (para. 61)	***Contracting Party (Agency) updates*** The Commission **REQUESTED** that the IPHC Secretariat develop a standard template for agency reports to the Commission, in order to improve their structure and consistency, as well as to allow the agencies to prepare the appropriate information at the appropriate level of detail for the Commission's consideration.	Pending: Currently slated for development in early 2018.

INTERNATIONAL PACIFIC HALIBUT COMMISSION

IPHC-2018-AM094-04

Report of the IPHC Secretariat (2017)

PREPARED BY: IPHC SECRETARIAT (21 DECEMBER 2017)

PURPOSE

To provide the Commission with an update on the activities of the IPHC Secretariat in 2017.

STAFFING CHANGES DURING 2017

FT Departures	Type	Hire Date	Departure Date	Position Title	Status
Melissa Knapp	Full time regular	1 June 2001	15 January 2017	Administrative Coordinator	Retired
Kelly McElligott	Full time regular	17 January 2017	27 December 2017	Data transcriber	Departed
FT Arrivals	**Type**	**Hire Date**	**Departure Date**		
Kelly Chapman	Full time regular	1 January 2017	-	Front office assistant	Active
Kelly McElligott	Full time regular	17 January 2017	-	Data transcriber	Active
Temporary positons					
Collin Winkowski	Temporary full time	20 March 2017	30 September 2017	Survey assistant	Contract ended
Niall O'Brien	Temporary full time	16 May 2017	14 August 2017	Intern	3 month Contract ended

MEETINGS OF THE COMMISSION AND SUBSIDIARY BODIES DURING 2017

	2017			
Meeting	**No.**	**Original Date**	**Changes**	**Location**
Annual Meeting (AM)	**93rd**	**23-27 Jan**	**-**	**Victoria, Canada**
Conference Board (CB)	87th	24-25 Jan	-	Victoria, Canada
Processor Advisory Board (PAB)	22nd	24-25 Jan	-	Victoria, Canada
Finance and Administration Committee (FAC)	--	23, 26 Jan, during AM	-	Victoria, Canada
Scientific Review Board (SRB)	10th	20-21 June	3d; 14-16 June	Seattle, USA
	11th	26-28 Sept	-	Seattle, USA
Management Strategy Advisory Board (MSAB)	9th	9-11 May	-	Seattle, USA
	10th	25-26 Oct	4d; 23-26 Oct	Seattle, USA
Scholarship Committee (SC)	(no meeting in 2017)			
Work Meeting (WM)	--	20-21 Sept	-	Bellingham, USA
Research Advisory Board (RAB)	19th	15 Nov	28 Feb 2018	Seattle, USA
Interim Meeting (IM)	**93rd**	**28-29 Nov**	**-**	**Seattle, USA**

IPHC FISHERY REGULATIONS (2017)

In 2017, the Commission adopted **four (4)** fishery regulations in accordance with Article III of the Convention, as follows:

1) ***IPHC Pacific halibut fishery regulations, Section 13. Size Limits***

   IPHC-2017-AM093-R, para. 48: *The Commission **ADOPTED** a proposal aimed at eliminating a recently identified bias in Pacific halibut removal estimates (net weight), by requiring all commercial Pacific halibut to be landed and weighed with their heads attached for data reporting purposes and to be subject to the 32-inch minimum size limit (IPHC-2017-AM093-PropA), which supersedes Section 13 of the IPHC Pacific halibut fishery regulations. An exemption was agreed upon whereby vessels that freeze Pacific halibut at sea may possess and land their frozen fish with the head removed subject to the 24-inch minimum size limit if possessed or landed with the head removed (Appendix VI).*

2) ***IPHC Pacific halibut fishery regulations, Section 18. Fishing Multiple Regulatory Areas***

   IPHC-2017-AM093-R, para. 54: *The Commission **ADOPTED** a proposal aimed at harmonising IPHC and NMFS regulations regarding fishing in multiple regulatory areas in Alaska (Appendix VII), which supersedes Section 18 of the IPHC Pacific halibut fishery regulations.*

3) ***2017 Catch limits***

   IPHC-2017-AM093-R, para. 71: *The Commission **ADOPTED** catch limits for 2017 as provided at Appendix VIII.*

4) ***Fishing periods***

   IPHC-2017-AM093-R, para. 72: *The Commission **ADOPTED** fishing periods for 2017 as provided at Appendix IX, thereby superseding Section 8 of the IPHC halibut fishery regulations.*

INTERACTIONS WITH CONTRACTING PARTIES

CANADA

a) Identification of concerns with the current process of estimating Pacific halibut biological distribution

The IPHC Secretariat continues to hear concern from Canadian representatives regarding the IPHC's current understanding of Pacific halibut biological distribution. Commentary indicates that the current methodology is underrepresenting the amount of the coastwide Pacific halibut stock that is within Canadian waters. Reports of large Pacific halibut and high catch rates are thought to further support this claim. The IPHC is expanding the fisheries-independent setline survey (FISS) in Canadian waters in the summer of 2018. We are confident that this expansion will increase our collective knowledge of Pacific halibut biological distribution, as it will cover a greater range (deeper and shallower depths) than the current setline survey design. The setline survey expansion comes at a challenging time as DFO is managing fishery impact restrictions in areas where the setline survey is proposed. The IPHC Secretariat is working closely with DFO staff to alleviate the impact of these fishery restrictions on the current IPHC fisheries-independent setline survey stations and the stations necessary for the expansion.

UNITED STATES OF AMERICA

North Pacific Fisheries Management Council (NPFMC)

a) **Joint meetings**

A one-day Joint Session of IPHC Commissioners and NPFMC Council Members was held on 7 June 2017. The session was held as part of the Council process. The majority of Council Members were supportive of an periodic Joint Session, held in conjunction with one of the bodies' meetings to reduce travel obligations. However, it was not agreed to make this a formal standing body.

b) **Abundance-Based Management of Pacific halibut bycatch**

The Council's Abundance-Based Management Working Group (ABMWG) developed a discussion paper describing indices and potential alternatives for abundance-based management (ABM) of Pacific halibut in the Bering Sea. The discussion paper was presented to the NPFMC in April of 2017. The Council felt that there was not enough information to develop specific alternatives for the ABM working group to analyze, and they put forward a motion providing guidance for further developments to be provided at the October 2017 NPFMC meeting.

Further clarification was received at the June NPFMC meeting after a summary of the ABM progress and an outline of the discussion paper for October was presented at the Joint IPHC/NPFMC meeting in Juneau, AK and to the Council. This motion provided further direction to the ABMWG who jointly developed the ABM discussion paper with Council staff for the October NPFMC meeting in Anchorage, AK. The Commission provided a comment letter for the October meeting based on the Commissioners' discussion at the Work Meeting.

At the October meeting, the NPFMC reviewed the discussion paper and concurred with the ABMWG and Scientific and Statistical Committee (SSC) recommendations to move forward with two indices: the estimates of Pacific halibut biomass from the National Marine Fisheries Service (NMFS) Eastern Bering Sea annual shelf trawl survey, and from the annual IPHC fishery-independent setline survey in IPHC Regulatory Areas 4A/B/C/D/E. The NPFMC provided further direction on explicit elements and options to consider while developing control rules, including the shape of the control rule, a range of starting points for Prohibited Species Catch (PSC/bycatch) limits (2,118 mt to 3,867 mt), and the maximum and minimum bycatch (a.k.a. PSC) limits under consideration.

c) **Discard Mortality Rates of Pacific halibut bycatch**

The NPFMC's discard mortality rate (DMR) working group presented an update to the Groundfish Plan Teams in September 2017 on DMR calculations for use in 2018. This update summarised the DMRs estimated from data collected during the 2016 fisheries in Alaska and compared those results with DMRs applied for use in management during 2017. In addition, several minor issues with the method for calculating the 2017 DMRs for fisheries with low sampling rates or atypical fishing behaviour were reconciled. The Groundfish Plan Team recommended adopting these updates with no further changes, and the Council adopted the DMRs for 2018 and 2019.

Pacific Fisheries Management Council (PFMC)

a) Regulatory Area 2A Catch Sharing Plans / IPHC data

The IPHC Secretariat collaborated with NMFS and State agencies to conduct in-season management of the various fisheries identified in the IPHC Regulatory Area 2A Catch Sharing Plan. Date and possession restrictions were adjusted in season among the various fisheries to meet identified fishery needs while attaining and remaining within the applicable catch limit. Estimates for 2017 will be presented during the IPHC's Annual Meeting Agenda Item 5 on fishery statistics (see paper IPHC-2018-AM094-05).

b) Commercial and Recreational Derby fisheries

The IPHC Secretariat submitted a letter to the PFMC recommending that the PFMC consider a move away from derby-style management for the directed commercial Pacific halibut fishery in IPHC's Regulatory Area 2A (Agenda Item G.1.a, Supplemental IPHC Letter 2, June 2017). The IPHC Secretariat noted concerns over safety and discards, as well as limitations on fishers and processor flexibility. At the PFMC's June 2017 meeting, the PFMC reviewed the IPHC's letter and heard further input from the PFMC's Groundfish Advisory Subpanel (GAP) regarding possible alternatives to the commercial derby fishery (Agenda Item G.1.b, Supplemental GAP Report, June 2017). In response, the PFMC requested, and the IPHC Secretariat provided, examples of vessel fishing period limits for 1-week, 20-day, or 30-day seasons. The IPHC Secretariat noted these options mitigate, but do not fully address the concerns identified in the original IPHC letter and welcomes other suggestions or recommendations to improve the management of the directed commercial Pacific halibut fishery in IPHC Regulatory Area 2A. The options provided by the IPHC Secretariat were reviewed at the September PFMC meeting. Although no changes to the non-tribal directed Pacific halibut fishery were proposed, the PFMC asked the States and the IPHC to continue investigating options that would move the fishery away from a derby-style fishery. The Council reviewed the analysis and alternatives again in November 2017, with a view toward continuing the discussion during 2018 for possible changes in 2019. No changes were recommended for the 2018 fishery.

IPHC COMMUNICATIONS AND OUTREACH

Report of Assessment and Research Activities (RARA)

The annual IPHC Report of Assessment and Research Activities (RARA) is intended to supply progress reports on current projects and monitoring that are underway at the International Pacific

Halibut Commission (IPHC). In past years, this document included fishery information, monitoring activities, stock assessment, and research reports about the previous year's activities. Many of the reports that have been routinely included in the past (e.g. the suite of stock assessment documents) are now provided as detailed papers for the Annual Meeting and as such, are listed and linked here with unique document numbers, e.g. IPHC-2018-AM094-01. This allows us to update our documents in real time as data become available ensuring that Commissioners and stakeholders have access to the most recent information possible for the decision-making process at the Annual Meeting. Continuing to be included in their entirety, are summaries of an expanded research effort that has taken place in the past year, as well as pieces of supporting information for the annual meeting documents now on the IPHC website. Over the coming year, much of the remaining RARA material will be integrated into the new IPHC Science and Research pages of the website, to be updated in near real-time, thus eliminating the need for future compendiums of this nature.

Annual Report

The 2016 Annual Report is available for download from the IPHC website at the following link: http://iphc.int/library/documents/category/annual-reports.

Previously, the IPHC Annual Report was published late in the following year, or even early in the subsequent year (13-14 months after the end of the year being reported on). Unfortunately, this decreased the utility of the report for user groups and led to confusion about the state of the fishery and resource, as well as the current decisions of the Commission.

In 2017, we undertook an accelerated production timeline for the IPHC 2016 Annual Report, which the IPHC Secretariat staff produced some six months ahead of schedule. It is our intention to further accelerate the 2017 Annual Report production process, thereby ensuring users of the report receive the summary information as close to the relevant year as possible. Your continued feedback on the content, format and presentation of the Annual Report is welcome.

Website http://iphc.int/

Over the last six years the IPHC has undertaken two major website improvement projects that have been focused on technology refreshes, social media integration, and the creation of subsidiary body web pages.

The new website, launched on 15 December 2017 (http://iphc.int/), is the culmination of a year long project by IPHC Secretariat staff which commenced on 15 September 2016, when the IPHC Secretariat chartered a website improvement team with members from the Seattle-based staff. The team's focus was on improving the distribution of public domain information. In November 2016, support for the team's efforts were enhanced by ensuring funding was available to hire a professional website designer.

In February 2017, the IPHC Secretariat entered into a partnership with Efelle Creative to redesign our website. Immediately after entering into the partnership with Efelle Creative, the team worked on the new website design for five months. In addition to the new design, the Seattle-based staff went through a full review of website content prior to publishing on our new website.

Our new website has five categories of content which include 'The Commission, Science and Research, Fisheries, Data, Meetings, and Documents'. The Meetings section of our website contains all the information about the Commission and its subsidiary body meetings including meeting documents, agenda, schedule, and registration links. Additionally, IPHC publications, meeting documents, and reports can be found and downloaded from the Documents section of the website.

The Seattle-based staff will continue to develop different ways to publish data and statistics for our stakeholders. This is evident through our interactive maps and our online fishery-independent setline survey data query. Areas we are still developing will be indicated on the website as such.

RECOMMENDATION/S

That the Commission:

1) **NOTE** paper IPHC-2018-AM094-04 which provides the Commission with an update on additional activities of the IPHC Secretariat in 2017, not detailed in other papers before the Commission.

APPENDICES

Nil

Fishery statistics (2017)

PREPARED BY: IPHC SECRETARIAT (J.GOEN & L. ERIKSON; 23 DECEMBER 2017)

PURPOSE

To provide an overview of the key fishery statistics from fisheries catching Pacific halibut during 2017, including the status of landings compared to catch limits adopted by the Commission.

BACKGROUND

The International Pacific Halibut Commission (IPHC) estimates all Pacific halibut (*Hippoglossus stenolepis*) removals taken in the IPHC Convention Area and uses this information in its yearly stock assessment (see IPHC-2018-AM094-09) and other analyses. The data are compiled by the IPHC Secretariat and include data from Federal and State agencies of each Contracting Party. All 2017 data are in net weight (head-off, dressed, ice and slime deducted) and are considered preliminary at this time.

This paper includes Pacific halibut removals for:

- Commercial fisheries, including landings and discard mortality
- Recreational fisheries, including landings and discard mortality
- Subsistence fisheries
- Bycatch in other fisheries

Figure 1 shows the distribution of Pacific halibut removals (mortality) by these fishery sources in 2017. Table 1 provides estimates of total removals against catch limits by IPHC Regulatory Area (Figure 2).

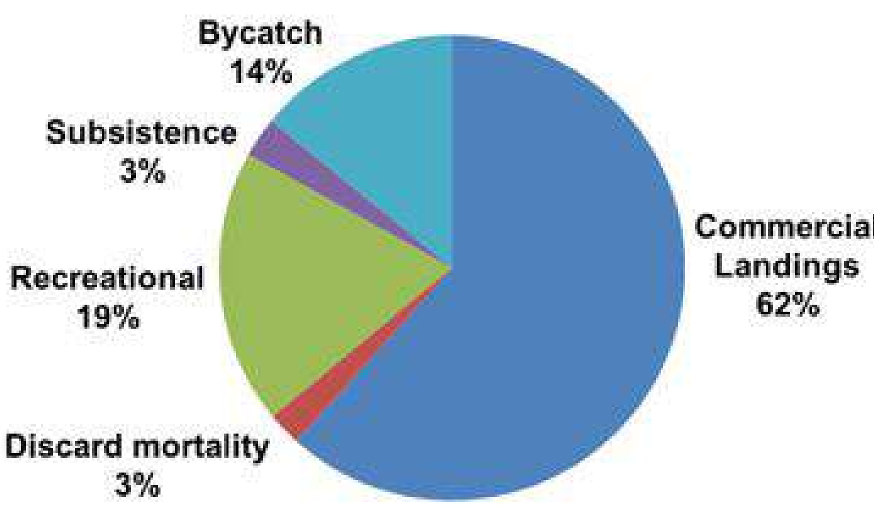

Figure 1. Distribution of Pacific halibut mortality by source in 2017.

Table 1. 2017 estimates of total removals (thousands of pounds, net weight), including catch limits and landings of Pacific halibut by IPHC Regulatory Area. Preliminary as of 9 November 2017. Shaded cells included in catch totals which are tracked against the catch limit. Totals have been rounded. Totals have also been provided in metric tons.

	IPHC Regulatory Area							
Removals	**2A**	**2B**	**2C**	**3A**	**3B**	**4**	**Total (,000 lb)**	**Total (t)**
Commercial landings [1]	737	6,193	4,108[13]	7,587	3,022	3,938	25,585	11,605.16
Commercial discard mortality [2]	19	175	87	347	234	126	988	448.15
Recreational landings [3]	515	1,172	2,294	3,904	8	15	7,908	3,587.01
Recreational landings from commercial leasing [4]	-	4	41	7	-	-	52	23.59
Recreational discard mortality [5]	4	42	59	52	-	-	157	71.21
Bycatch mortality [6]	111	251	17	1,390	885	3,342	5,996	2,719.74
Subsistence [7]	30	405	436	222	14	61	1,168	529.80
IPHC Research landings [8]	16	65	124	198	72	96	571	259.00
Total Removals	***1,432***	***8,307***	***7,166***	***13,707***	***4,235***	***7,578***	***42,425***	***19,243.66***
2017 Catch Limits [9]	1,330[10]	7,450[11]	5,250[12]	10,000[12]	3,140	4,230	31,400	14,242.80
2017 Catch Sharing Plan Total	1,286[10]	7,411[11]	6,589[12]	11,897[12]	3,030	3,953	34,166	15,497.44

[1] Commercial landings are of Pacific halibut that are 32" or greater (O32) in length from directed halibut fisheries using longline gear or in some cases pot gear. Commercial landings are reported on landing receipts and converted from head-on, gutted weight to net weight.

[2] Includes estimate of discard mortality from IPHC research.

[3] Recreational landings are of Pacific halibut that may be subject to a size limit and may vary by Regulatory Area (as described in domestic regulations). Data collection methods vary by Regulatory Area and are collated by IPHC from domestic and state agencies.

[4] Fish landed against transfers from commercial quota fisheries (XRQ in Area 2B, GAF in Areas 2C and 3A).

[5] Regulatory Area 2A based on previous 5-year average. Regulatory Area 2B is the value reported by DFO and differs from the value used in the 2017 stock assessment (53,161 lb). The stock assessment value is based on the method developed by the IPHC, which applies the rate of discarding from the Regulatory Area 2C charter fishery applied to 2B catch.

[6] Bycatch mortality is from fisheries targeting other fish and shellfish that inadvertently catch Pacific halibut. The bycatch mortality estimates are of Pacific halibut that are caught and released at sea but subsequently die.

[7] Includes 2016 Alaskan subsistence harvest estimates (tribal and rural SHARC holders). Area 4 includes 7,380 pounds of U32 Pacific halibut retained in the 2017 Regulatory Area 4DE Community Development Quota fishery.

[8] IPHC Research landings include landings from the fishery-independent setline survey and other research projects.

[9] Does not include pounds from the underage/overage programs in Area 2B or Alaska or pounds from the Annette Island Reserve fishery in Area 2C.

[10] Catch limit and landings reported include commercial, recreational, and treaty subsistence landings.

[11] Catch limit and landings reported include commercial and recreational (including commercial leasing) landings and recreational discard mortality.

[12] Catch limit and landings reported include commercial and recreational guided/charter (including commercial leasing) landings and discard mortality for all commercial and guided recreational. Unguided recreational landings and discard mortality are not included.

[13] Regulatory Area 2C commercial landings includes 64,363 pounds taken in the Metlakatla fishery within the Annette Islands Reserve.

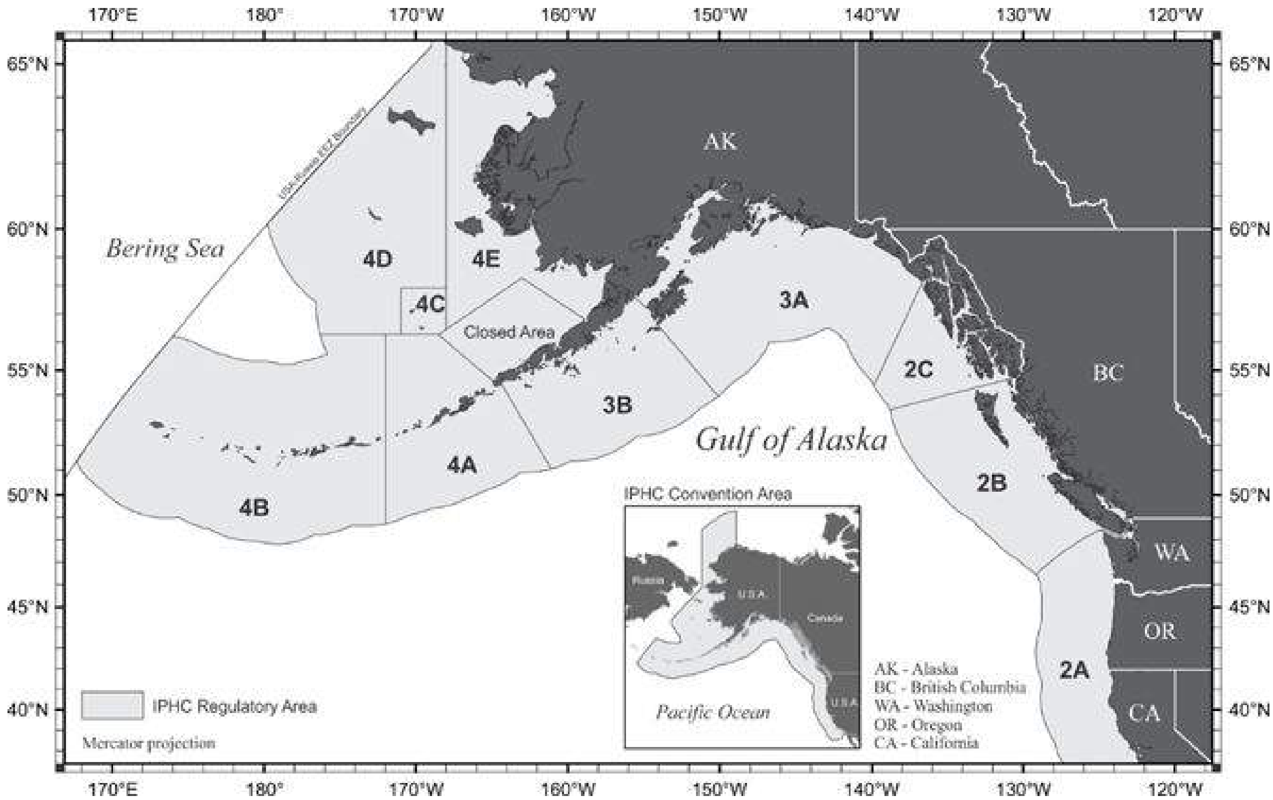

Figure 2. Map of the IPHC Convention Area and IPHC Regulatory Areas.

DEFINITIONS

Commercial fisheries: include commercial landings and discard mortality (formerly called "wastage" in IPHC reports). Commercial discard mortality continues to include estimates of sub-legal Pacific halibut (under 32 inches (81.3 cm), also called U32), fish that die on lost or abandoned fishing gear, and fish discarded for regulatory reasons.

Recreational fisheries (formerly called sport): include recreational landings (including landings from commercial leasing) and discard mortality.

Subsistence fisheries (formerly called personal use/subsistence): are non-commercial, customary, and traditional use of Pacific halibut for direct personal, family, or community consumption or sharing as food, or customary trade. Subsistence fisheries include:

i) ceremonial and subsistence (C&S) removals in the Regulatory Area 2A treaty Indian fishery,
ii) the sanctioned First Nations Food, Social, and Ceremonial (FSC) fishery conducted in British Columbia,
iii) federal subsistence fishery in Alaska that uses Alaska Subsistence Halibut Registration Certificate (SHARC), and
iv) U32 Pacific halibut retained in Regulatory Areas 4D and 4E by the CDQ fishery for personal use.

Bycatch: incidentally caught fish by fisheries targeting other species and that cannot legally be retained. Bycatch mortality, or bycatch removals, refers only to those fish that subsequently die due to capture.

COMMERCIAL FISHERIES

The IPHC's commercial fisheries span from northern California through to northern and western Alaska in USA and Canada waters of the northeastern Pacific Ocean. The IPHC sets annual limits for the catch of Pacific halibut in each IPHC Regulatory Area. Participants in these commercial fisheries use longline and pot gear to catch Pacific halibut for sale. The commercial Pacific halibut fisheries in IPHC Regulatory Area 2A consisted of the directed commercial fishery with fishing period limits, the incidental Pacific halibut catch during the salmon troll and limited-entry sablefish fisheries, and the treaty Indian fisheries. Farther north, the commercial fisheries consisted of the Individual Vessel Quota (IVQ) fishery in IPHC Regulatory Area 2B, the Individual Fishing Quota (IFQ) system in Alaska, the Community Development Quota (CDQ) fisheries in IPHC Regulatory Areas 4B and 4CDE, and the Metlakatla fishery in Southeast Alaska. All 2017 landing and discard mortality data presented in this document are preliminary.

Commercial Fishing Periods

The Canadian IVQ fishery in IPHC Regulatory Area 2B and the US IFQ and CDQ fisheries in IPHC Regulatory Areas 2C, 3A, 3B, 4A, 4B, 4C, 4D, and 4E commenced at 12 noon local time on 11 March and closed at 12 noon local time on 7 November 2017 (Table 2). The IPHC Regulatory Area 2A commercial fisheries, including the treaty Indian commercial fisheries, occurred during the same calendar period (11 March to 7 November 2017). For IPHC Regulatory Area 2A, seven potential 10-hour fishing periods for the non-treaty directed commercial fishery were adopted: 28 June, 12 July, 26 July, 2 August, 16 August, 30 August, and 13 September 2017. All fishing periods began at 0800 and ended at 1800 local time, were further restricted by fishing period limits, and closed for the remainder of the year after the third opening on 26 July when the IPHC Regulatory Area 2A directed commercial fishery allocation was estimated to have been reached.

Table 2. Fishing periods for commercial Pacific halibut fisheries by IPHC Regulatory Area, 2008-17.

Regulatory Area	Year									
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
2A Treaty Indian	8 Mar-3 Jun (88) 17 Mar-15 Apr	21 Mar- 15 Jul (117) 21 Mar-9 May	6 Mar–20 Mar (14) 6 Mar-8 Apr	20-22 Mar (2) 1-2 May (19 h) 12-19 Mar 24-28 Mar (13)	24-26 Mar (2) 1 May (13 hrs) 17-19 Mar (55 hrs)	23-25 Mar (48 hrs) 2-4 Apr, 15-16 Apr, 8 May, 6 Jun, 13 Jul 20 Jul 3 Aug	11-13 Mar (48 hrs) 20-21Mar, 8May 8 May	16-18 Mar (48 hrs) 1-2 Apr	19-21 Mar,20-21 Mar, 21-23 Mar 1-2 Apr 1-2,11-12 May, 18 May-15 Aug, 25 Jul-2 Aug, 12 Sep-7 Nov	20 Mar, 15-16 Apr 1-2 May 19-20 May, 22-23 May 18-19 Jun 21-22 Jul
2A Commercial Directed	11 Jun (10 hrs) 25 Jun (10 hrs) 9 Jul (10 hrs) 23 Jul (10 hrs)	24 Jun (10 hrs) 8 Jul (10 hrs)	30 Jun (10 hrs)	29 Jun (10 hrs) 13 Jul (10 hrs)	27 Jun (10 hrs) 11 Jul (10 hrs)	26 Jun (10 hrs) 10 Jul (10 hrs)	25 Jun (10 hrs) 9 Jul (10 hrs)	24 Jun (10 hrs) 8 Jul (10 hrs)	22 Jun (10 hrs) 6 Jul (10 hrs) 20 Jul (10 hrs)	28 Jun (10 hrs) 12 Jul (10 hrs) 26 Jul (10 hrs)
2A Commercial Incidental	Salmon 1 May–15 Nov (199) Sablefish 1 May– 31 Oct (184)	Salmon 1 May–15 Nov (199) Sablefish 1 May– 31 Oct (184)	Salmon 1 May– 16 Jun (45) Sablefish No fishery	Salmon 1 May–28May (28) 29 Jul-31 Oct (94) Sablefish No fishery	Salmon 1 May – 3 Jul (64) Sablefish 1 May– 31 Oct (184)	Salmon 1 May–10 Aug (101) Sablefish 1 May– 31 Oct (184)	Salmon 1 Apr–11 Sep (163) Sablefish 1 Apr– 31 Oct (213)	Salmon 1 Apr–21 Aug (142) Sablefish 1 Apr– 31 Aug (152)	Salmon 1 Apr – 31 Oct (213) Sablefish 1 Apr – 31 Oct (213)	Salmon 1 Apr–3 Aug (124) Sablefish 1 Apr– 31 Oct (213)
2B	8 Mar–15 Nov (253)	21 Mar–15 Nov (240)	6 Mar–15 Nov (255)	12 Mar–18 Nov (252)	17 Mar–7 Nov (236)	23 Mar–7 Nov (230)	8 Mar–7 Nov (244)	14 Mar–7 Nov (238)	19 Mar–7 Nov (233)	11 Mar–7 Nov (241)
Alaska (2C, 3A, 3B, 4A, 4B, 4CDE)	8 Mar–15 Nov (253)	21 Mar–15 Nov (240)	6 Mar–15 Nov (255)	12 Mar–18 Nov (252)	17 Mar–7 Nov (236)	23 Mar–7 Nov (230)	8 Mar–7 Nov (244)	14 Mar–7 Nov (238)	19 Mar–7 Nov (233)	11 Mar–7 Nov (241)

Commercial Landings

Commercial landings (including IPHC research landings) and catch limits by IPHC Regulatory Area for the 2017 fishing season are shown in Table 3. Commercial catch limit, as referred to here, is the IPHC commercial catch limit set by the Commissioners at the Annual Meeting. The adjusted commercial catch limit represents the IPHC catch limit with adjustments from the underage and overage programs from the previous year's quota share programs, and in IPHC Regulatory Area 2B, it also includes relinquishment of quota and quota leasing programs among sectors and the Use of Fish allocation. Historical landings and catch limits from 2008 through 2017 are shown in Table 4.

The 2017 commercial fishery landings were spread over nine months of the year (Table 5). On a month-to-month comparison, August took the lead as the busiest month for total poundage (15%) landed from IPHC Regulatory Area 2B. On a month-to-month comparison, August was the busiest month for total poundage (17%) from Alaska.

Table 3. 2017 Pacific halibut commercial fishing periods, number of fishing days, catch limits, and landings (including research) (thousands of pounds, net weight) by IPHC Regulatory Area (preliminary, as of 9 November 2017).

Regulatory Area 2A	Fishing Period	Catch Limit	Length of Opening	Commercial Landings	Research Landings	Total Landings
Treaty Indian	Unrestricted:					
	20 Mar		11 hrs			
	15-16 Apr		39 hrs	264		
	Restricted:					
	1-2 May		35 hrs	41.6		
	Late Fishery:					
	19-20 May (WA coast)		34 hrs	126.9		
	22-23 May (PS)		34 hrs			
	18-19 Jun		34 hrs			
	21-22 Jul		34 hrs			
Total		435.9		432.5		432.5
Incidental in Salmon Fishery	1 Apr – 3 Aug	39.8	124 days	38.6		38.6
Incidental in Sablefish Fishery	1 Apr – 31 Oct	70	214 days	35.9		35.9
Directed[1]	28 Jun		10 hours	83		
	12 Jul		10 hours	77.5		
	26 Jul		10 hours	69.5		
Directed Total		225.6		230		230
2A Total		771.3		737	16	753
Regulatory Area	**Fishing Period**	**Catch Limit**	**Adjusted Catch Limit[2]**	**Commercial Landings[3]**	**Research Landings**	**Total Landings[4]**
2B	11 Mar – 7 Nov	6,272	6,364	6,193[4]	65	6,258
2C	11 Mar – 7 Nov	4,212	4,244	4,108[5]	124	4,232
3A	11 Mar – 7 Nov	7,739	7,788	7,587	198	7,785
3B	11 Mar – 7 Nov	3,140	3,151	3,022	72	3,094
4A	11 Mar – 7 Nov	1,390	1,402	1,270	28	1,298
4B	11 Mar – 7 Nov	1,140	1,165	1,048	44	1,092
4C	11 Mar – 7 Nov	752	754		9	
4D	11 Mar – 7 Nov	752	764	1,620[6,7]	15	1,644
4E	11 Mar – 7 Nov	196	196			
Alaska Total		19,321	19,464	18,655	490	19,145
Grand Total		**26,364[8]**	NA[8]	**25,585[8]**	**571[8]**	**26,156[8]**

[1] Fishing period limits by vessel class.
[2] Includes adjustments from the underage/overage programs, and in Regulatory Area 2B, quota held by DFO (Canada) for First Nations through relinquishment processes, and the Use of Fish allocation.
[3] Includes pounds from 7 November 2017 Prior Notice of Landings in Alaska and hail-ins from Fishery Operations System in Canada.
[4] Includes the pounds that were landed by Native communal commercial licenses (FL licenses).
[5] Includes the pounds taken in the Metlakatla fishery within the Annette Islands Reserve.
[6] Regulatory Area 4C IFQ and CDQ could be fished in Regulatory Area 4D by NMFS and IPHC Fishery Regulations.
[7] Regulatory Area 4D CDQ could be fished in Regulatory Area 4E by NMFS and IPHC Fishery Regulations.
[8] Includes IPHC Regulatory Area 2A catch limit and landings.

Table 4. Commercial landings, discard mortality, catch limits and percent of catch limit attained of Pacific halibut (in thousands of pounds, net weight) by IPHC Regulatory Area, 2008-17.

Regulatory Area	Commercial Landings									
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
2A	675	485	407	524	556	526	510	551	642	737
2B	7,683	6,538	6,607	6,612	5,874	5,951	5,776	5,884	6,046	6,193
2C[1]	6,145	4,866	4,390	2,363	2,575	2,912	3,275	3,602	3,877	4,108
3A	24,166	21,399	20,186	14,379	11,735	10,852	7,383	7,722	7,308	7,587
3B	10,617	10,616	9,958	7,218	4,932	4,009	2,816	2,574	2,609	3,022
4A	2,973	2,464	2,265	2,316	1,543	1,207	833	1,336	1,346	1,270
4B	1,723	1,534	1,785	2,022	1,715	1,224	1,091	1,080	1,084	1,048
4CDE	3,852	3,279	3,288	3,413	2,328	1,759	1,243	1,173	1,463	1,620
Total	57,834	51,181	48,886	38,847	31,258	28,440	22,927	23,922	24,375	25,585
Regulatory Area	Commercial Discard Mortality									
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
2A	44	52	27	25	25	25	21	31	37	19
2B	454	354	302	283	220	211	250	238	229	175
2C[1]	295	304	261	83	95	110	119	121	123	87
3A	1,004	1,175	1,450	930	593	519	443	521	378	347
3B	676	796	903	770	526	404	326	215	232	234
4A	149	157	138	144	95	70	35	79	54	67
4B	25	18	37	43	38	35	56	36	60	31
4CDE	111	90	95	191	75	56	52	52	65	28
Total	2,758	2,946	3,213	2,469	1,667	1,430	1,302	1,293	1,178	988
Regulatory Area	Commercial Total Removals									
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
2A	719	537	434	549	581	551	531	582	679	756
2B	8,137	6,892	6,909	6,895	6,094	6,162	6,026	6,122	6,275	6,368
2C[1]	6,440	5,170	4,651	2,446	2,670	3,022	3,394	3,723	4,000	4,195
3A	25,170	22,574	21,636	15,309	12,328	11,371	7,826	8,243	7,686	7,934
3B	11,293	11,412	10,861	7,988	5,458	4,413	3,142	2,789	2,841	3,256
4A	3,122	2,621	2,403	2,460	1,638	1,277	868	1,415	1,400	1,337
4B	1,748	1,552	1,822	2,065	1,753	1,259	1,147	1,116	1,144	1,079
4CDE	3,963	3,369	3,383	3,604	2,403	1,815	1,295	1,225	1,528	1,648
Total	60,592	54,127	52,099	41,316	32,925	29,870	24,229	25,215	25,553	26,573
Regulatory Area	Commercial Catch Limits									
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
2A	718.4	511.2	420	480.7	546.6	539.7	519.6	511.5	642.3	771.3
2B[2]	7,918	6,712	6,599	6,702	5,953	5,958	5,793	5,974	6,199	6,272
2C[2]	6,210	5,020	4,400	2,330	2,624	2,970	3,319	3,679	3,924	4,212
3A[2]	24,220	21,700	19,990	14,360	11,918	11,030	7,318	7,790	7,336	7,739
3B[2]	10,900	10,900	9,900	7,510	5,070	4,290	2,840	2,650	2,710	3,140
4A[2]	3,100	2,550	2,330	2,410	1,567	1,330	850	1,390	1,390	1,390
4B[2]	1,860	1,870	2,160	2,180	1,869	1,450	1,140	1,140	1,140	1,140
4CDE[2]	3,890	3,460	3,580	3,720	2,464	1,930	1,284	1,285	1,660	1,720
Total	58,816	52,723	49,379	39,693	32,012	29,498	23,064	24,420	25,001	26,364
Regulatory Area	Commercial Limits – Percent Attained									
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
2A	94	95	97	109	102	97	98	108	100	96
2B	97	97	100	99	99	100	100	98	98	99
2C[1]	104	103	106	105	102	102	102	101	102	100
3A	104	104	108	107	103	103	107	106	105	103
3B	104	105	110	106	108	103	111	105	105	104
4A	101	103	103	102	105	96	102	102	101	96
4B	94	83	84	95	94	87	101	98	100	95
Total	102	97	94	97	98	94	101	95	92	96

[1] In Area 2C, includes the Metlakatla fishery landed catch.
[2] Additional carryover from the underage/overage plans is not included.

Table 5. The total pounds (thousands, net weight, preliminary) of 2017 commercial landings (not including research landings) of Pacific halibut for Alaska and British Columbia by IPHC Regulatory Area and month.

Regulatory Area	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Total
2B[1]	686	562	751	746	835	929	638	727	319	6,193
2C[2,3]	644	854	710	531	237	448	383	278	23	4,108
3A[2]	540	1,285	1,509	1,058	542	932	877	776	68	7,587
3B[2]	58	265	481	347	345	559	662	242	61	3,022
4A[2]		26[4]	136	186	162	276	237	198	48	1,270
4B[2]	-	60	97	248	184	250	107	102[5]		1,048
4CDE[2]			54	203	372	615	268	107[5]		1,620
Alaska Total	1,242	2,490	2,988	2,574	1,842	3,081	2,534	1,703	201	18,655
Grand Total	1,928	3,052	3,739	3,320	2,677	4,010	3,173	2,430	519	24,848

[1] Based on landings from DFO Fishery Operations System (FOS).
[2] Based on landings from NMFS Restricted Access Management (RAM) Division.
[3] Weights include landings from the Metlakatla Indian Community.
[4] Weight combined with the previous months for confidentiality purposes.
[5] Weight combined with the following month for confidentiality purposes.

Regulatory Area 2A (Washington, Oregon, California)

The 2017 IPHC Regulatory Area 2A fisheries and respective catch limits are listed in Table 3. The total IPHC Regulatory Area 2A catch (not including IPHC research) of 737,000 pounds (334 t) was within 1% of the catch limit. The total directed commercial landings of 230,000 pounds (104 t) were 2% over the catch limit of 225,591 pounds (102 t) after three 10-hour openers. The fishing period limits by vessel size class for each opener in 2017 are listed in Table 6. At the start of the season on 1 April, the allowable incidental landing ratio of Pacific halibut during the salmon troll fishery was one Pacific halibut per three Chinook (*Oncorhynchus tshawytscha*), plus an “extra” Pacific halibut per landing, and a vessel trip limit of 20 fish. The landing restrictions were changed to one Pacific halibut per four Chinook, plus an “extra” Pacific halibut per landing, and a vessel trip limit of 10 fish, effective 1 July 2017. The incidental Pacific halibut retention closed on 3 August, with total landings of 39,000 pounds (18 t) which was 3% under the catch limit (39,810 pounds (18 t)). Incidental Pacific halibut retention during the limited-entry sablefish fishery remained open from 1 April to noon on 31 October. The allowable landing ratio was 140 pounds (0.06 t) (net weight) of Pacific halibut to 1,000 pounds (0.45 t) (net weight) of sablefish, and up to two additional Pacific halibut in excess of the ratio limit. The total landings of 36,000 pounds (14 t) were 49% under the catch limit (70,000 pounds (32 t)).

In IPHC Regulatory Area 2A, north of Point Chehalis, the treaty Indian tribes manage the commercial landings by allocating 75% to an open access fishery and 25% to a restricted fishery with daily and vessel limits. There were two unrestricted, open access fisheries on 20 March and from 15 – 16 April and one restricted fishery, including a vessel per day limit of 500 pounds (0.23 t) for the 1-2 May opening. The 2017 tribal commercial season closed to all parties on 7 November, following the late fisheries, with total landings of 432,500 pounds (196 t), 1% under the catch limit (435,900 pounds (198 t)).

Table 6. The fishing periods and limits (pounds, dressed, head-on with ice/slime) by vessel class used in the 2017 directed commercial fishery in IPHC Regulatory Area 2A.

Vessel Class		Fishing Period & Limits		
Letter	**Feet**	**28 June**	**12 July**	**26 July**
A	≤25	860	860	670
B	26-30	1,075	1,075	835
C	31-35	1,715	1,715	1,335
D	36-40	4,735	4,735	3,680
E	41-45	5,090	5,090	3,960
F	46-50	6,095	6,095	4,740
G	51-55	6,800	6,800	5,290
H	56+	10,225	10,225	7,955

Regulatory Area 2B (British Columbia)

Under the IVQ fishery in British Columbia, Canada, the number of active Pacific halibut licences (L licences), and First Nations communal commercial licences (FL licences) was 160 in 2017. In addition, Pacific halibut can be landed as incidental catch in other licensed groundfish fisheries. Therefore, Pacific halibut was landed from a total of 231 active licences in 2017, with 71 of these licences from other fisheries. The 2017 commercial landings of 6,193,000 pounds (2,809 t) were 1% under the catch limit (6,272,000 pounds (2,845 t)) (Table 3).

Commercial trips from IPHC Regulatory Area 2B were delivered into 16 different ports in 2017. The ports of Port Hardy (including Coal Harbour and Port McNeill) and Prince Rupert/Port Edward were the major landing locations, receiving 92% of the commercial landings. Port Hardy received 38% while Prince Rupert received 54% (2,359,000 and 3,343,000 pounds (1,070 and 1,516 t), respectively) of the commercial landings. All of the IVQ landings were landed in IPHC Regulatory Area 2B. The 2017 landings of live Pacific halibut from IPHC Regulatory Area 2B was legally allowed by Fisheries and Oceans Canada (DFO) and resulted in a total landed weight of 202 pounds. Only Canadian vessels landed frozen, head-off Pacific halibut in 2017, and only in Canadian ports: 56 landings (70,272 net lbs; ~31.9 t) reported frozen-at-sea head-off product from 28 vessels.

Regulatory Areas 2C, 3, and 4 (Alaska)

In Alaska, USA, the National Marine Fisheries Service (NMFS) Restricted Access Management (RAM) allocated Pacific halibut quota share (QS) to recipients by IPHC Regulatory Area. Quota share transfers were permitted with restrictions on the amount of QS a person could hold and the amount that could be fished per vessel. In 2017, RAM reported that 3,076 persons held QS.

The total 2017 landings from the IFQ/CDQ Pacific halibut fishery for the waters off Alaska were 18,655,000 pounds (8,462 t), less than 3% under the catch limit (Table 3). By IPHC Regulatory Area, the landings were under the catch limit by 2% for Areas 2C and 3A, 4% for Area 3B, 9% for Area 4A, and 8% for Area 4B. The total combined IPHC Regulatory Area 4CDE commercial landings of 1,620,000 pounds (735 t) were 5% under the combined Area 4CDE catch limit (1,700,000 pounds (771 t)). The North Pacific Fishery Management Council's Catch Sharing Plan allowed IPHC Regulatory Area 4D CDQ to be harvested in IPHC Regulatory Areas 4D or 4E and Area 4C IFQ and CDQ to be fished in Areas 4C or 4D.

Kodiak received approximately 18% (3,258,000 pounds (919 t)) of the commercial landings of Alaskan catch making it the port that received the greatest number of pounds in 2017. Seward received the second and Homer the third largest landing volume at 12% (2,096,000 pounds, 951 t) and 11% (2,027,000 pounds, 919 t) of the Alaskan commercial landings, respectively. In Southeast Alaska, the three largest landing volumes were received in Petersburg (1,515,000 pounds (687 t)), Sitka (1,436,000 pounds (651 t)), and Juneau (1,003,000 pounds (455 t)), in that order, and their combined landings represented 22% of the commercial Alaskan landings. The Alaskan QS catch that was landed outside of Alaska was 3%.

The Metlakatla Indian Community (within IPHC Regulatory Area 2C) was authorized by the United States government to conduct a commercial Pacific halibut fishery within the Annette Islands Reserve. There were 13 two-day openings between 14 April and 8 October for total landings of 64,363 pounds (29 t) (Table 7). This was lower than the 2016 landings, and within the historical landing range that has varied over time from a low of 12,000 pounds (5 t) in 1998 to a high of 126,000 pounds (57 t) in 1996.

Table 7. Metlakatla community fishing periods, number of vessels, and preliminary Pacific halibut landings (net weight) in IPHC Regulatory Area 2C, 2017.

Fishing Period Dates	Number of Vessels	Catch (Pounds)
14 – 16 April	11	2,994
5 – 7 May	12	5,158
19 – 21 May	18	7,914
2 – 4 June	10	5,356
16 – 18 June	15	10,136
30 June – 2 July	8	5,076
14 – 16 July	11	5,778
28 – 30 July	10	4,227
11 – 13 August	10	4,682
25 – 27 August	6	3,118
8 – 10 September	13	6,703
22 – 24 September	7	2,125
6 – 8 October	3	1,096
13 Fishing Periods		64,363

Commercial Discard Mortality

Incidental mortality of Pacific halibut in the commercial Pacific halibut fishery is the mortality of all Pacific halibut that do not become part of the landed catch. This mortality, also called discard mortality, was previously termed wastage in many IPHC publications. The three main sources of discard mortality estimate include: 1) fish that are captured and discarded because they are below the legal size limit of 32 inches (81.3 cm), 2) fish that are estimated to die on lost or abandoned fishing gear, and 3) fish that are discarded for regulatory reasons (e.g., the vessels trip limit has been exceeded). The methods that are applied to produce each of these estimates differ due to the amount and quality of information available. Information on lost gear and regulatory discards is collected through logbook interviews and fishing logs received by mail. The ratio of U32 to O32 Pacific halibut (>32 inches in length) is determined from the IPHC fisheries-independent setline survey in most areas and by direct observation in the IPHC Regulatory Area 2B fishery. Different mortality rates are applied to each category: released Pacific halibut have a 16% mortality rate and Pacific halibut mortality from lost gear is 100%.

Pacific halibut discard mortality estimates from the commercial Pacific halibut fishery are summarized by IPHC Regulatory Area in Table 1 and over a series of years in Table 4. A more detailed description of commercial discard mortality, including methodology and longer term trends, is presented in Appendix I.

RECREATIONAL FISHERIES

The 2017 recreational removals of Pacific halibut, including discard mortality, was estimated at 8,127,000 pounds (3,686 t), an increase of the recreational harvest in 2016 by 751,000 pounds (341 t). Changes in harvests varied across areas; in some cases, in response to changes in size restrictions. Recreational catch limits and landings are detailed by IPHC Regulatory Area in Table 8, and summarized in Table 1.

Table 8. Recreational removals and limits of Pacific halibut (in thousands of pounds, net weight) by IPHC Regulatory Area, 2013-17.

Regulatory Area	Recreational Retained				
	2013	2014	2015	2016	2017
2A	501	476	445	504	515
2B – XRQ Leased	8	5	5	7	4
2B	814	913	981	1,021	1,172
2C – GAF Leased	-	54	28	39	41
2C – Charter Retained	762	783	768	789	882
2C – Noncharter Retained	1,361	1,171	1,327	1,246	1,412
2C	2,123	2,008	2,123	2,074	2,335
3A – GAF Leased	-	10	5	9	7
3A – Charter Retained	2,514	2,034	2,067	2,004	2,079
3A – Noncharter Retained	1,452	1,533	1,616	1,538	1,825
3A	3,966	3,577	3,688	3,551	3,911
3B	15	7	5	8	8
4A	9	9	7	15	15
4B and 4CDE	-	-	-	-	-
Total	7,428	6,926	7,216	7,125	7,908
Regulatory Area	Recreational Discard Mortality				
	2013	2014	2015	2016	2017
2A	4	4	4	4	4
2B	45	54	60	66	53
2C – Charter Discard Mortality	42	46	47	51	40
2C – Noncharter Discard Mortality	28	16	18	19	19
2C	70	62	65	70	59
3A – Charter Discard Mortality	49	43	36	29	22
3A – Noncharter Discard Mortality	30	26	37	27	30
3A	79	69	73	56	52
3B and 4	-	-	-	-	-
Total	198	189	202	196	168
Regulatory Area	Recreational Total Removals				
	2013	2014	2015	2016	2017
2A	505	480	449	508	518
2B	866	972	1,046	1,094	1,229
2C	2,193	2,070	2,188	2,144	2,394
3A	4,045	3,646	3,761	3,607	3,963
3B	15	7	5	8	8
4A	9	9	7	15	15
4B and 4CDE	-	-	-	-	-
Total	7,633	7,184	7,456	7,376	8,127
Regulatory Area	Recreational Limits				
	2013	2014	2015	2016	2017
2A	418	412	427	464	529
2B	1,080	1,057	1,064	1,101	1,118
2C	788	761	851	906	915
3A	2,734	1,782	1,890	1,814	1,890
3B and 4	-	-	-	-	-
Total	5,020	4,012	4,232	4,285	4,452
Regulatory Area	Recreational Limit Percent Attained				
	2013	2014	2015	2016	2017
2A	121	117	105	109	98
2B	80	92	98	99	110
2C	102	116	99	97	105
3A	94	117	112	113	112
3B and 4	-	-	-	-	-
Total	-	-	-	-	-

Recreational Landings

Regulatory Area 2A (Washington, Oregon, California)

The 2017 IPHC Regulatory Area 2A recreational allocation was 599,099 pounds (271.7 t) net weight and based on the Pacific Fishery Management Council's Catch Sharing Plan formula, which divides the overall fishery catch limit among all sectors. The recreational allocation was further subdivided to seven subareas, after 70,000 pounds (31.8 t) was allocated to the incidental Pacific halibut catch in the commercial sablefish fishery in Washington. This subdivision resulted in 230,868 pounds (104.7 t) being allocated to Washington subareas, 250,851 pounds (113.8 t) to Oregon subareas, and 12,799 pounds (5.8 t) shared in the Columbia River region. In addition, California received an allocation of 34,580 pounds (15.7 t). The IPHC Regulatory Area 2A recreational harvest totaled 514,781 pounds (233.5 t), 2% under the recreational allocation (Table 8).

Recreational fishery harvest seasons by subareas varied and were managed inseason with fisheries opening on 1 May. The Washington Inside Waters (i.e., Puget Sound) fishery closed after week 25 (18 June) along with the Washington North Coast fishery with one or two day openers each week. In the Washington South Coast subarea, the primary fishery closed after week 21 (21 May) with one or two day openers and re-opened 17 June for one day with no nearshore fishery. The Columbia River subarea fishery closed week 28 (25 May) after one to four day openings each week and reopened for a single day on 17 June. The Central Oregon subarea had fishery openings from May through October totaling 26 days in the all-depth fishery and 116 days in the <40-fathom fishery. The South of Humbug subarea closed after week 25 (on 15 June), reopened in August and again in September, and closed for the year on 10 September (85 days).

Regulatory Area 2B (British Columbia)

IPHC Regulatory Area 2B operated under a 133 cm (52.4 inch) maximum size limit, and one Pacific halibut had to be less than 83 cm (32.7 inch) when attaining the two fish possession limit with an annual limit of six per licence holder. The IPHC Regulatory Area 2B fishery closed on 6 September due to the allocation estimated to have been attained. Recreational fishing continued to be allowed after this closure in IPHC Regulatory Area 2B for any fish that was leased from commercial fishery quota shares for that area.

Canada and Alaska both have programs that allow recreational harvesters to land fish that is leased from commercial fishery quota share holders for the current season. In Canada, four thousand pounds (1.7 t) were leased from the commercial quota fishery and landed as recreational harvest.

Regulatory Areas 2C, 3, and 4 (Alaska)

A reverse slot limit allowing for the retention of Pacific halibut, if ≤ 44 inches (112 cm) or ≥ 80 inches (203 cm) (compared to ≤ 43 inches (109 cm) and ≥ 80 inches (203 cm) in 2016) in total length, was continued by the IPHC for the charter fishery in IPHC Regulatory Area 2C. In IPHC Regulatory Area 3A, charter anglers were allowed to retain two fish, but only one could exceed 28 inches in length, a four fish annual limit with a recording requirement, one trip per calendar day per charter permit, with no charter retention of Pacific halibut on Wednesdays throughout the season and 18 July, 25 July, and 1 August.

Similar to Canada, Alaska has programs that allow recreational harvesters to land fish that is leased from commercial fishery quota share holders for the current season. In IPHC Regulatory

Areas 2C and 3A, 41,000 pounds (18.6 t) and 7,000 pounds (3.2 t), respectively, were leased from the commercial quota fisheries in those areas and landed as recreational harvest.

Recreational Discard Mortality

Pacific halibut discarded for any reason suffer some degree of discard mortality, and impacts more of the stock with the increasing use of size restrictions, such as reverse slot limits. Current year estimates from contracting parties' agencies of recreational discard mortality have been received from Alaska, Oregon, and Canada, and are provided in Table 8.

SUBSISTENCE FISHERIES

Pacific halibut is taken throughout its range as subsistence harvest by several fisheries. Subsistence fisheries (formerly called personal use/subsistence) are non-commercial, customary, and traditional use of Pacific halibut for direct personal, family, or community consumption or sharing as food, or customary trade. The primary subsistence fisheries are the treaty Indian Ceremonial and Subsistence fishery in IPHC Regulatory Area 2A off northwest Washington State, the First Nations Food, Social, and Ceremonial (FSC) fishery in British Columbia, and the subsistence fishery by rural residents and federally-recognized native tribes in Alaska documented via Subsistence Halibut Registration Certificates (SHARC).

The coastwide subsistence estimate for 2017 is 1,169,000 pounds (530.2 t). Subsistence harvest by IPHC Regulatory Areas from 2008 through 2017 is available in Table 9.

Table 9. Subsistence Pacific halibut fisheries removals (thousands of pounds net weight) by IPHC Regulatory Area, 2008 - 2017.

Regulatory Area	Subsistence Fishery									
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017[2]
2A	29.0	30.4	25.3	24.8	32.0	28.5	31.8	33.9	29.6	29.6
2B	405	405	405	405	405	405	405	405	405	405
2C	458.4	457.0	424.8	387.0	396.0	396.0	428.2	428.2	436.5	436.5
3A	337.4	328.5	312.7	266.1	253.5	253.5	231.3	231.3	222.5	222.5
3B	42.2	25.5	23.0	22.0	16.0	16.0	18.3	18.3	14.2	14.2
4A	19.6	33.5	14.5	13.6	9.5	9.5	7.2	7.2	8.1	8.1
4B	4.7	1.2	0.5	0.5	1.7	1.7	0.4	0.4	0.3	0.3
4C	5.7	6.3	10.9	1.6	1.2	1.2	4.3	4.3	4.3	4.3
4D	3.1	0.6	1.2	0.6	0.7	0.7	0.6	0.6	0.0	0.0
4E	15.9	8.7	10.1	6.2	8.4	8.4	70.1	70.1	41.4	41.4
4D/4E[1] (CDQ U32)	21.8	10.3	9.5	16.9	20.2	10.0	5.5	4.7	5.5	7.4
Total	1,342.8	1,307.0	1,237.5	1,144.3	1,144.2	1,130.5	1,202.7	1,204.0	1,167.4	1,169.3

[1] 2012 Alaska estimates were carried over for the 2013 catch estimate, with the exception that 4D/4E subsistence harvest in the CDQ fishery were updated. Similarly, 2014 Alaska estimates were carried over for the 2015, and 2017 for 2016.

Estimated subsistence harvests by area

The coastwide subsistence harvest of Pacific halibut was estimated by the IPHC at more than 2,000,000 pounds (907.2 t) in 1991, then declined rapidly through 1995, and became relatively stable in recent years (2008-present). Harvest estimation methods were revised in 1998, and the resulting estimates were somewhat higher than previous years but remained fairly stable through 2002. The estimates of harvest took another jump in 2003 following the implementation of new subsistence fishery regulations in Alaska and a more comprehensive harvest estimation survey. Many of the changes seen in the harvest estimates from 2003 and prior were due primarily to changes in estimation methods and not necessarily actual changes in harvest levels. Methodology explained in the following sections has remained the same since 2003 and changes in estimates represent changes in harvest levels. For historical subsistence harvest levels since 1991, refer to the IPHC's Report of Assessment and Research Activities (RARA 2016, Chapter 2.4).

In the commercial Pacific halibut fisheries coastwide, the state and federal regulations require that take-home Pacific halibut caught during commercial fishing be recorded as part of the commercial catch on the landing records (i.e., State fish tickets or Canadian validation records). This is consistent across areas, including the quota share fisheries in Canada and Alaska, and as part of fishing period limits and Pacific halibut ratios in the incidental fisheries in IPHC Regulatory Area 2A. Therefore, personal use fish or take-home fish within the commercial fisheries are accounted for as commercial catch and are not included here.

Regulatory Area 2A (Washington, Oregon, California)

The Pacific Fishery Management Council's Catch Sharing Plan allocates the Pacific halibut catch limit to commercial, recreational, and treaty Indian users in Regulatory Area 2A. The treaty tribal catch limit is further sub-divided into commercial and ceremonial and subsistence (C&S) fisheries. The 2016 final estimate of C&S was 29,600 pounds (13.4 t) and this catch estimate became the 2017 C&S allocation. The estimate of the 2017 catch is not available so it is assumed the treaty tribal C&S allocation was fully harvested.

Regulatory Area 2B (British Columbia)

The source of Pacific halibut subsistence harvest in British Columbia is the First Nations FSC fishery. The IPHC receives some logbook and landing data for this harvest from the DFO but those data have not been adequate for the IPHC to make an independent estimate of the FSC fishery harvest. DFO estimated the First Nations FSC harvest to be 300,000 pounds (136.1 t) annually until 2006, and since 2007, the yearly estimate has been provided as 405,000 pounds (183.7 t).

Regulatory Areas 2C, 3, and 4 (Alaska)

The IPHC began estimating the Pacific halibut subsistence harvest in Alaska in 1991. The available estimates indicated that subsistence harvest in Alaska totaled 1,950,000 pounds (884.5 t) that year. The estimate for 1992 dropped in half, to one million pounds (453.6 t). Estimates were subsequently made for each IPHC Regulatory Area independently and annually for most areas.

Trumble (1999) developed a new methodology to estimate personal use (now called subsistence) using Pacific halibut catch information gathered by household interviews and postal surveys conducted by the Alaska Department of Fish and Game (ADFG). The surveys did not distinguish between recreational and subsistence harvests, so Trumble made assumptions regarding the relative amount of recreational and subsistence catch in native and non-native households. The resulting estimates were used for Alaska for 1998-2002, with the only annual change being the amount of U32 (i.e. < 32 in or 81.3 cm) poundage retained by the IPHC Regulatory Area 4E CDQ fishers.

In 2003, the subsistence Pacific halibut fishery off Alaska was formally recognized by the North Pacific Fishery Management Council, and implemented by IPHC and NMFS regulations. The fishery allows the customary and traditional use of Pacific halibut by rural residents and members of federally-recognized Alaska native tribes who can retain Pacific halibut for non-commercial use, food, or customary trade. The NMFS regulations define legal gear, number of hooks, and daily bag limits, and IPHC regulations set the fishing season. Prior to subsistence fishing, eligible persons registered with NMFS Restricted Access Management to obtain a SHARC. The Division of Subsistence at ADFG was contracted by NMFS to estimate the subsistence harvest in Alaska through a data collection program. Information has been provided for the years 2003-2012 (Fall and Koster 2014), 2014 (Fall and Lemons 2016), and draft 2016 (Fall and Koster 2017). Yearly reports are available at http://www.fakr.noaa.gov/ram/ subsistence/halibut.htm. Each year, the data collection program included an annual voluntary survey of fishers conducted by mail or phone, with some onsite visits. The 2012 estimate has been carried forward for the 2013 estimate and the 2014 estimate has been used for 2014 through 2015; a new 2016 estimate is used for 2016 through 2017. The 2014 estimates are about 10% higher than in 2012, and are noticeably higher in IPHC Regulatory Area 4E. To collect the 2014 harvest estimates, the ADFG staff conducted face to face interviews in two of the major subsistence harvesting communities within IPHC Regulatory Area 4E rather than relying on mailed returns. Face to face interviews likely resulted in more realistic harvest estimates than the mail survey alone, so it is likely that the IPHC Regulatory Area 4E harvest estimates between 2008 through 2013 were low.

In addition to the SHARC harvest, IPHC regulations allow Pacific halibut less than 32 inches or 81.3 cm in fork length (also called U32) to be retained in the IPHC Regulatory Area 4D and 4E commercial Pacific halibut CDQ fishery, under an exemption requested by the North Pacific Fishery Management Council, as long as the fish are not sold or bartered. The exemption originally applied only to CDQ fisheries in IPHC Regulatory Area 4E in 1998 but was expanded in 2002 to also include IPHC Regulatory Area 4D. The CDQ organizations are required to report to the IPHC the amounts retained during their commercial fishing operations. This harvest is not included in the SHARC program estimate so is reported separately. For more information on the history of U32 retained by CDQ organizations and methodology changes over the years, refer to the IPHC's Report of Assessment and Research Activities (RARA 2016, Chapter 2.5).

Reports for 2017 were received from three organizations: Bristol Bay Economic Development Corporation (BBEDC), Coastal Villages Regional Fund (CVRF), and Norton Sound Economic Development Corporation (NSEDC). The reports are summarized below, and the reported amounts of retained U32 Pacific halibut are shown in Table 10. A total of 7,400 pounds (3.4 t) of retained U32 Pacific halibut was reported by CDQ organizations, the highest amount since 2013. Generally, annual changes are a reflection of the amount of effort by the local small boat fleets and the availability of fish in their nearshore fisheries.

Table 10. Reported annual amount (pounds, net weight) of U32 (<32 inches in fork length) Pacific halibut retained by Community Development Quota harvesters fishing in IPHC Regulatory Areas 4D and 4E.

Organization	**U32 CDQ Landings**									
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
BBEDC	1,816	922	2,155	2,752	5,095	3,493	3,456	2,460	3,456	5,261
CVRF	12,926	4,277	3,924	9,909	10,424	5,250	963	0	0	0
NSEDC	6,924	6,060	3,438	4,206	4,668	1,290	1,114	2,206	2,001	2,119
Total	21,666	11,259	9,517	16,867	20,187	10,033	5,533	4,666	5,457	7,380

CDQ - Bristol Bay Economic Development Corporation

BBEDC requires their fishers to record the lengths of retained U32 Pacific halibut in a separate log, which are tabulated by BBEDC at the conclusion of the season. The lengths were converted to weights using the IPHC length/weight relationship and summed to estimate the total retained U32 weight. Pacific halibut were landed by BBEDC vessels primarily at Togiak, with a lesser amount landed in Dillingham and a minor amount landed in Naknek. BBEDC reported 22 harvesters landed 513 U32 Pacific halibut (5,261 pounds; 2.4 t).

CDQ - Coastal Villages Regional Fund

CVRF reported that no Pacific halibut were landed by their fishers or received by their facilities.

CDQ - Norton Sound Economic Development Corporation

NSEDC required their fishers to offload the U32 Pacific halibut for weighing. Ice was removed but the fish were not washed nor the heads removed. The U32 Pacific halibut were then returned to the harvester. NSEDC reported 247 U32 Pacific halibut weighing 2,119 pounds (1.0 t) were caught in the local CDQ fishery and landed at the Nome plant.

BYCATCH IN OTHER FISHERIES

Bycatch in other fisheries are incidentally caught fish by fisheries targeting other species and that cannot legally be retained. Bycatch mortality, or bycatch removals, refers only to those fish that subsequently die due to capture. The IPHC accounts for bycatch mortality in other fisheries by IPHC Regulatory Area and sector. Table 11 provides these estimates from 2008 through 2017. For historical bycatch mortality by IPHC Regulatory Area since 1990 and bycatch mortality trends by gear, refer to the IPHC's Report of Assessment and Research Activities (RARA 2016, Chapter 2.6). Additional background information on discard mortality rates and Alaska bycatch limits is available in Appendix II.

Estimates of the bycatch mortality of Pacific halibut in other (non-Pacific halibut) fisheries in 2017 totaled 5,996,000 pounds (2,720.0 t) net weight, representing a decrease of approximately 500 t from 2016 (Table 11). Bycatch increased in some areas and decreased in others from 2016 values. In IPHC Regulatory Area 2A, bycatch mortality rose 16%. Estimated bycatch in the IPHC Regulatory Area 2B bottom trawl fishery in 2016 decreased by 7%. Bycatch trends were varied among Alaskan areas, with bycatch in IPHC Regulatory Areas 3B, 4B, and 4CDE with the Closed Area being up, while bycatch mortality in IPHC Regulatory Areas 2C, 3A, and 4A was down.

Table 11. Bycatch mortality estimates of Pacific halibut (thousands of pounds, net weight) by year, IPHC Regulatory Area, and fishery, for 2008-17. Estimates for 2017 are preliminary.[1]

IPHC Reg Area and Gear	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
AREA 2A										
Groundfish Trawl	351	416	302							
IFQ Bottom Trawl				52	60	54	44	55	55	71
Other Groundfish Trawl				2	2	4	3	1	1	2
Groundfish Pot				1	1	0	0	1	1	0
Hook & Line	80	98	45	34	56	8	53	23	39	38
Shrimp Trawl	0	0	0	0	0	0	0	0	0	0
Total	431	513	347	90	119	66	99	80	96	111
AREA 2B										
Groundfish Bottom Trawl	143	213	181	232	189	225	245	326	271	251
Total	143	213	181	232	189	225	245	326	271	251
AREA 2C										
Crab Pot	19	7	18	10	21	13	1	1	1	1
Groundfish Trawl	0	0	0	0	0	0	0	0	0	0
Hook & Line (non-IFQ)	7	5	4	3	8	8	8	12	15	7
Hook & Line (IFQ)	3	3	3	3	12	13	9	7	13	10
Chatham Str. Sablefish	8	8	8	8	n/a	n/a	n/a	n/a	n/a	n/a
Clarence Str. Sablefish	25	25	25	25	n/a	n/a	n/a	n/a	n/a	n/a
Total	62	48	58	49	41	34	17	19	29	17
AREA 3A										
Scallop Dredge	3	9	14	12	10	12	24	24	24	24
Groundfish Trawl	2,381	2,141	2,030	2,232	1,422	1,336	1,680	1,792	1,493	1,190
Hook & Line (non-IFQ)	293	197	111	92	238	216	155	223	210	132
Hook & Line (IFQ)	119	119	119	119	25	31	16	33	26	33
Groundfish Pot	13	5	12	23	29	34	12	25	40	10
Pr Wm Sd Sablefish	10	10	10	10	n/a	n/a	n/a	n/a	n/a	n/a
Total	2,819	2,481	2,296	2,488	1,724	1,630	1,888	2,098	1,793	1,390
AREA 3B										
Crab Pot	0	0	0	0	0	0	0	0	0	0
Scallop Dredge	0	4	0	5	4	8	14	0	0	0
Groundfish Trawl	979	865	676	806	989	733	809	537	708	754
Hook & Line (non-IFQ)	190	256	269	172	105	88	115	96	124	99
Hook & Line (IFQ)	116	116	116	116	24	14	18	15	8	18
Groundfish Pot	18	7	36	21	20	44	18	10	31	13
Total	1,303	1,247	1,097	1,120	1,142	887	974	658	871	885

…cont'd

Table 11 (cont'd). Bycatch mortality estimates of Pacific halibut (thousands of pounds, net weight) by year, IPHC Regulatory Area, and fishery, for 2008-17. Estimates for 2017 are preliminary.[1]

IPHC Reg Area and Gear	2008	2009	2010	2011	2012	2013	2014	2015	2016	2016
AREA 4A										
Scallop Dredge	0	0	0	0	0	0	0	0	0	0
Crab Pot	7	5	22	14	12	27	0	0	0	0
Groundfish Trawl	1,021	1,315	800	789	1,314	606	615	483	466	288
Hook & Line (non-IFQ)	178	220	213	145	130	204	160	149	99	104
Hook & Line (IFQ)	15	15	15	15	5	4	3	3	2	2
Groundfish Pot	8	2	7	8	10	32	27	7	5	7
Total	1,229	1,557	1,058	971	1,472	873	805	642	572	400
AREA 4B										
Crab Pot	2	0	0	1	0	3	0	0	0	0
Groundfish Trawl	206	299	371	402	215	116	101	202	137	175
Hook & Line (non-IFQ)	114	119	65	32	27	6	24	20	5	18
Hook & Line (IFQ)	40	40	40	40	12	10	5	2	2	0
Groundfish Pot	2	1	1	1	1	5	2	0	0	2
Total	364	459	477	476	255	140	132	223	144	195
AREA 4CDE+CA										
Scallop Dredge	0	0	0	0	0	0	0	0	0	0
Crab Pot	54	33	63	49	29	29	0	37	37	37
Groundfish Trawl	3,469	3,160	3,429	2,496	3,458	4,110	4,205	3,003	2,895	2,427
Hook & Line (non-IFQ)	978	821	684	472	768	668	538	384	311	281
Hook & Line (IFQ)	5	5	5	5	1	151	11	0	0	0
Groundfish Pot	2	1	1	2	4	18	13	2	2	2
Total	4,508	4,021	4,182	3,024	4,260	4,977	4,767	3,425	3,245	2,747
AREA 4 Subtotal										
Scallop Dredge	0	1	0	0	0	0	0	0	0	0
Crab Pot	63	39	85	65	41	59	0	37	37	37
Groundfish Trawl	4,696	4,774	4,600	3,687	4,987	4,832	4,921	3,687	3,499	2,890
Hook & Line (non-IFQ)	1,270	1,160	962	649	925	878	722	552	415	403
Hook & Line (IFQ)	60	60	60	60	18	165	19	5	3	2
Groundfish Pot	12	4	9	11	15	55	42	8	7	10
Total	6,101	6,037	5,717	4,472	5,987	5,989	5,704	4,290	3,961	3,342
GRAND TOTAL	**10,859**	**10,539**	**9,695**	**8,450**	**9,202**	**8,832**	**8,927**	**7,470**	**7,021**	**5,996**

[1]Note that some totals may not sum precisely due to rounding.

Estimating Bycatch Mortality

Bycatch of Pacific halibut is estimated because not all fisheries have 100% monitoring and not all Pacific halibut that are discarded are assumed to die. Agencies estimate the amount of bycatch that will not survive, called discard mortality.

The IPHC relies upon information supplied by observer programs run by domestic agencies for bycatch estimates in most fisheries. Non-IPHC research survey information is used to generate estimates of bycatch in the few cases where fishery observations are unavailable. The NMFS operates observer programs off the U.S. West Coast and Alaska, which monitor the major groundfish fisheries. Data collected by those programs are used to estimate bycatch. Trawl fisheries off British Columbia (BC) are comprehensively monitored and bycatch information is provided to IPHC by DFO.

Off the U.S. West Coast, an individual quota (IQ) program was implemented in 2011 for the domestic groundfish trawl fisheries. The program is quite similar to the program for the BC trawl fishery, in that it contains an individual bycatch quota component for managing and reducing Pacific halibut bycatch mortality. Fishery monitoring is required at 100% coverage levels, so all vessels carry an observer to record the vessel's catch. Bycatch is reported to IPHC by NMFS (Jannot et al. 2017). Bycatch estimates for the shrimp trawl fishery have been provided by Oregon Department of Fish and Wildlife (ODFW) staff from examinations of Pacific halibut bycatch during gear experiments. Updated estimates were provided by ODFW in 2011.

The amount of information varies for fisheries conducted off BC. For the trawl fishery, bycatch is managed with an individual bycatch quota program implemented by DFO in 1996. Fishery observers sample the catch on each bottom trawler, collecting data to estimate bycatch and discard mortality. Bycatch in other fisheries, such as the shrimp trawl, sablefish pot, and rockfish hook-and-line fisheries, was largely unknown until the inception of the Integrated Fisheries Management Program in 2006. The program has requirements for full accounting and accountability of all bycatch, and includes 100% at-sea monitoring, either by human observers or electronic monitoring. Estimates of trawl bycatch were provided by DFO staff at the Pacific Biological Station, based on data collected by observers. Reporting of bycatch from the non-trawl programs is being developed with DFO staff and will be provided in future reports.

Estimates of bycatch off Alaska in federally managed fisheries were provided by the NMFS Alaska Region. Several fishery programs have a mandatory 100% monitoring requirement, including the CGOARP, the BSAI CDQ fisheries, the AFA pollock cooperatives, and the BSAI A80 fishery cooperatives. NMFS Alaska Fisheries Science Center's Annual Deployment Plan (ADP) provides the scientific guidelines which determine how vessels not involved in these full coverage programs are chosen for monitoring, including vessels in the directed Pacific halibut IFQ fishery. Additional details about the ADP can be found in NMFS (2016). The NMFS projections were provided in metric tons, round weight, and were converted to pounds net weight using net weight = round weight x 0.75 * 2,204.62.

Estimates of Pacific halibut bycatch in scallop dredge and crab fisheries are obtained from the ADFG, but not on an annual basis. The catch estimates are based on fishery data collected by on-board observers. The most recent estimates were summarized by Williams (2016) and current year estimates were simply rolled forward for 2017. Work is underway to develop an annual approach to updating these data.

Bycatch Mortality by Area

Regulatory Area 2A (Washington, Oregon, California)

Groundfish fisheries off Washington, Oregon, and California are managed by the NMFS, following advice and recommendations developed by the Pacific Fishery Management Council. The final estimate of bycatch mortality in IPHC Regulatory Area 2A was 111,000 pounds (50.3 t) (Table 11). As in prior years, the bottom trawl fishery and hook-and-line fishery for sablefish were responsible for the bulk of the bycatch mortality. Pacific halibut bycatch in the trawl IFQ fishery (also called trawl catch shares) in this area are capped at 100,000 pounds (45 t) (net weight) of O32 Pacific halibut. For 2017, the bycatch mortality for the trawl IFQ fishery was 71,000 pounds (32.2 t) of Pacific halibut.

Regulatory Area 2B (British Columbia)

In Canada, Pacific halibut bycatch in trawl fisheries are capped at 750,000 pounds net weight (453.6 t round weight) by DFO. Non-trawl bycatch is handled under an IFQ system within the directed Pacific halibut fishery cap.

For 2017, bycatch mortality in the BC bottom trawl fishery was estimated at 251,000 pounds (113.9 t) (Table 11). The reported bycatch mortality data were complete through September. Projections for the full calendar year 2017 were made by extrapolating to the full 12 months.

Regulatory Areas 2C, 3, and 4 (Alaska)

Groundfish fisheries in Alaska are managed by the NMFS, following advice and recommendations developed by the North Pacific Fishery Management Council. The North Pacific Fishery Management Council sets limits on the amount of Pacific halibut bycatch mortality which is allowed to occur annually in the groundfish fisheries, known as the Prohibited Species Catch (PSC) limits. These PSC limits are published in metric tons (t) (round weight) and are shown in Table 12, with their equivalent net weight (millions of pound). If a fishery's PSC limit is reached, the fishery is closed. Certain gear types, e.g., pots or jigs, are exempted from closures due to their low bycatch properties and to encourage their use. Bycatch mortality estimates for Alaskan areas in Table 11 were provided by NMFS; projections were made for the full year based on fishery data through 24 October 2017.

Table 12. Pacific halibut bycatch limits in the Alaska groundfish fishery 2008-17**.**

Geographical Area	**Sector**	**Bycatch Limits** (metric tons (t), round weight)									
		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Gulf of Alaska	Trawl	2,000	2,000	2,000	2,000	2,000	1,973	1,848	1,759	1,706	1,706
	Fixed Gears	300	300	300	300	300	300	279	270	266	266
Bering Sea/ Aleutian Islands	Trawl	3,675	3,625	3,625	3,575	3,525	3,525	3,525	3,525	2,805	2,805
	Fixed Gears	900	900	900	900	900	900	900	900	710	710
Geographical Area	**Sector**	**Bycatch Limits** (millions of pounds, net weight)									
		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Gulf of Alaska	Trawl	3.30	3.30	3.30	3.30	3.30	3.26	3.06	2.91	2.82	2.82
	Fixed Gears	0.50	0.50	0.50	0.50	0.50	0.50	0.46	0.45	0.44	0.44
Bering Sea/ Aleutian Islands	Trawl	6.10	6.00	6.00	5.90	5.80	5.80	5.80	5.80	4.64	4.64
	Fixed Gears	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.17	1.17

Regulatory Area 2C – Southeast Alaska

For the federal waters of IPHC Regulatory Area 2C, only bycatch by hook-and-line vessels fishing in the outside waters were reported by NMFS. These vessels are primarily targeting

Pacific cod and rockfish (*Sebastes* spp.) in open access fisheries, and sablefish in the IFQ fishery. In aggregate, these fisheries resulted in approximately 17,000 pounds (7.7 t) of bycatch mortality in 2017.

Fisheries occurring within state waters and resulting in Pacific halibut bycatch include pot fisheries for red and golden king crab, and tanner crab. Information is provided periodically by ADFG (last examined in Williams (2016)), and the estimate was again rolled forward for 2017.

Regulatory Area 3 – Eastern, Central and Western Gulf of Alaska

IPHC Regulatory Area 3 is comprised of Areas 3A and 3B. IPHC tracks bycatch for each IPHC Regulatory Area due to assessment and stock management needs, while groundfish fisheries operate throughout both areas. Trawl fisheries are responsible for the majority of the bycatch in these IPHC Regulatory Areas, with hook-and-line fisheries a distant second (Table 11) for a total of 2,275,000 pounds (1,031.9 t). State-managed crab and scallop fisheries are also known to take Pacific halibut as bycatch, but at low levels.

IPHC Regulatory Area 3 remains the area where bycatch mortality is estimated most poorly. Observer coverage for most fisheries is relatively low. Tendering, loopholes in trip cancelling, and safety considerations likely result in observed trips not being representative of all trips (observed and unobserved) in many regards (e.g. duration, species composition, etc.. This, plus low coverage, lead to increased uncertainty in these bycatch estimates and to potential for bias.

Regulatory Area 4 – Bering Sea and Aleutian Islands

Bycatch mortality for all IPHC Regulatory Areas within Area 4 was estimated at 3,342,000 pounds (1,515.9 t), with the groundfish trawl fishery being most of that at 2,890,000 pounds (1,310.9 t).

Hook-and-line fishery bycatch mortality was estimated at 405,000 pounds (183.7 t). Pacific cod is the major fishery in this IPHC Regulatory Area with Pacific halibut bycatch, which is conducted in the late winter/early spring and late summer. Almost all of the vessels are required to have 100% observer coverage because of the vessel's size and requirements of their fishery cooperative; very few small vessels fish Pacific cod in this IPHC Regulatory Area. Because of this high level of observer coverage, bycatch estimates for this and other IPHC Regulatory Area 4 fisheries are considered reliable.

Pots are used to fish for Pacific cod and sablefish and fish very selectively. Bycatch rates are quite low and survival is relatively high. Annual bycatch mortality estimates are typically low, usually less than 15,000 pounds (6.8 t).

Within the Bering Sea, bycatch mortality estimates have typically been the highest in IPHC Regulatory Area 4CDE (Table 11). This is due to the groundfish fisheries which operate in the area, i.e., those for flatfish. The bycatch mortality estimate in IPHC Regulatory Area 4CDE accounted for 82% of the total Bering Sea bycatch.

RECOMMENDATION/S

That the Commission:

1) **NOTE** paper IPHC-2018-AM094-04 which provides preliminary fishery statistics from fisheries catching Pacific halibut during 2017, including the status of removals compared to catch limits adopted by the Commission.

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APPENDICES

Appendix I: Discard mortality of Pacific halibut in the directed commercial halibut fishery

Appendix II: Additional background information on bycatch mortality of Pacific halibut in other fisheries

Appendix I:

Discard mortality of Pacific halibut
in the directed commercial halibut fishery

Overview

The removals of Pacific halibut (*Hippoglossus stenolepis*) accounted for in the International Pacific Halibut Commission (IPHC) stock assessment include commercial and recreational fisheries landings, discard mortality from the commercial Pacific halibut fisheries, discard mortality from the recreational Pacific halibut fisheries, subsistence removals, and discard mortality of Pacific halibut from other commercial fisheries (bycatch mortality). Commercial fishery discard mortality is 1) Pacific halibut that are smaller than the commercial minimum size of 32 inches (81.3 cm), known as U32s, that must be released by regulation and subsequently die, 2) fish of all sizes estimated to have been captured by fishing gear that were subsequently lost or abandoned during fishing operations, 3) fish that are discarded for regulatory reasons (e.g. the vessel's trip limit has been exceeded). Different mortality rates are applied to each category: released Pacific halibut have a 16% mortality rate and Pacific halibut mortality from lost gear is 100%. The methods applied to produce each of these estimates differ due to the amount and quality of the information available. The discard mortality of Pacific halibut 26 inches and longer (O26), including O32 Pacific halibut (>32 inches in length) and Pacific halibut between 26 and 32 inches (U32/026), is directly deducted to determine the fishery constant exploitation yield (FCEY); and the mortality of U26 Pacific halibut is accounted for in the removals in the stock assessment and in the exploitation rates in the harvest policy. The intent of the division of U26/O26 is to standardize the treatment of removals, given that recreational and subsistence fishery removals are directly deducted when setting catch limits.

Discard mortality of U32 Pacific halibut

In the directed commercial Pacific halibut fishery, direct observations by fisheries observers or electronic monitoring information are not available coastwide, so in most IPHC Regulatory Areas the weight of discarded U32 Pacific halibut must be estimated by indirect methods. In the IPHC Regulatory Area 2B fishery (since 2006), fishers are required to record in their logbooks the number of U32 Pacific halibut discarded, which is verified for accuracy via analysis of electronic monitoring video from fishing activities. Therefore, for the IPHC Regulatory Area 2B fishery, there exists a direct estimate of the total number of U32 Pacific halibut discarded. The percent of U32 fish (in numbers) in the IPHC setline surveys and the IPHC Regulatory Area 2B logbooks is shown in Figure 3. To convert this number for the IPHC Regulatory Area 2B logbooks into a weight, the average observed weight of U32 Pacific halibut in the Area 2B setline survey is used.

In all other cases, since the setline survey uses similar fishing gear, it has been used as a proxy for the expected encounter rates by IPHC Regulatory Area and year. Previous analyses recognized that some survey stations produce a much lower catch rate of O32 Pacific halibut than observed for the average commercial set (Gilroy and Clark 2008). Therefore, to make them more comparable, the setline survey stations are filtered to stations with a higher catch rate (by weight) of O32 Pacific halibut. Following the previous analyses, the top 33% was used for IPHC Regulatory Areas 3A-4CDE, and individually estimated percentages for IPHC Regulatory Areas 2A, 2B, and 2C (Figure 4). These percentages make the observed O32 Pacific halibut catch rates of filtered stations reasonably similar to those reported in commercial fishery logbooks. It is then inferred that the catch rate of U32 Pacific halibut would also be similar; however, this inference cannot be directly tested. Although the comparison is useful, there is considerable uncertainty with regard to the actual spatial and temporal patterns of the directed fishery, and direct estimates of U32 discards would be considerably better.

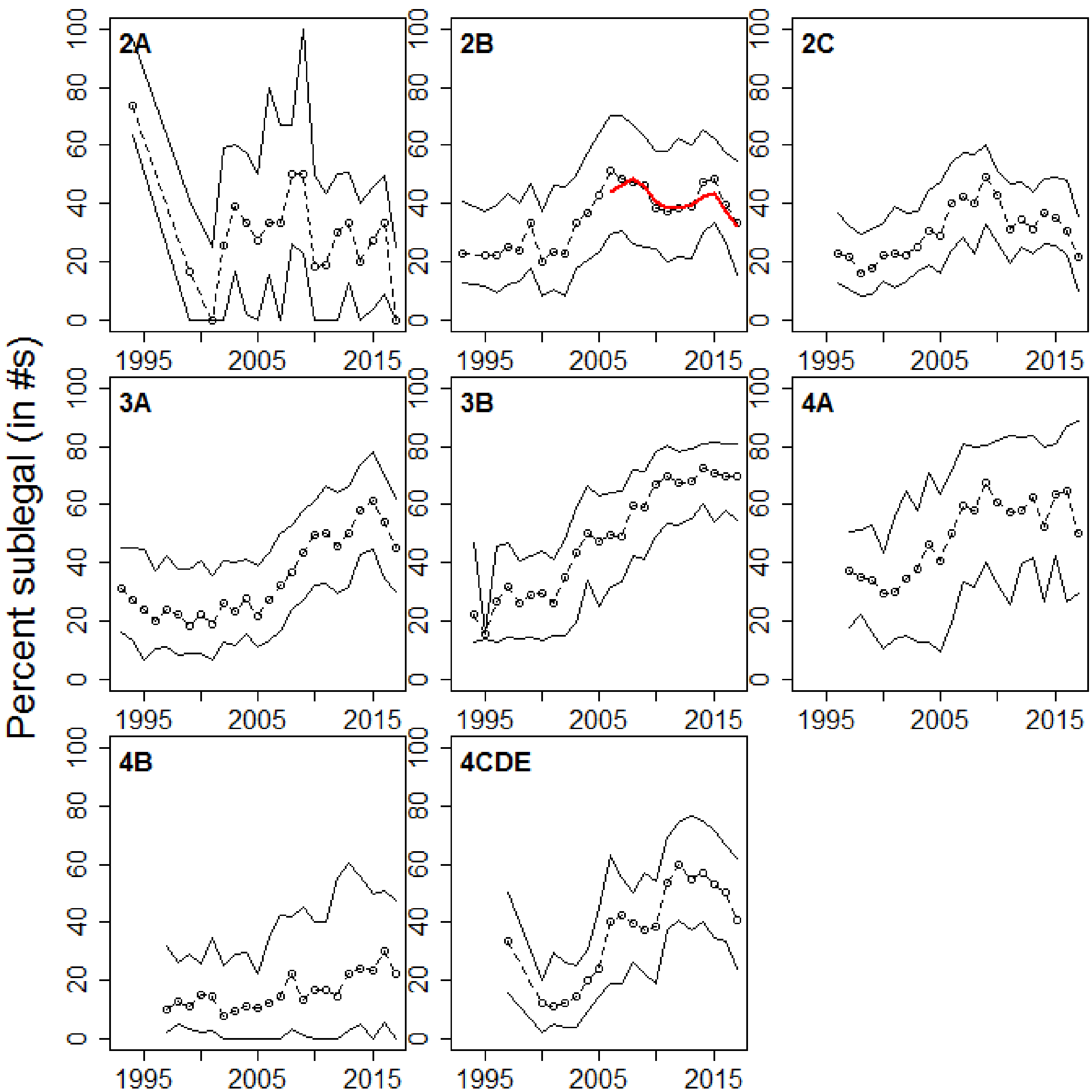

Figure 3. Setline survey percentage U32 by number, 1996-2017. Circles represent the median station observed each year in the setline survey and the lines indicate the 25th and 75th percentiles. The thick solid line in IPHC Regulatory Area 2B since 2006 represents the percent U32 reported in the logbooks.

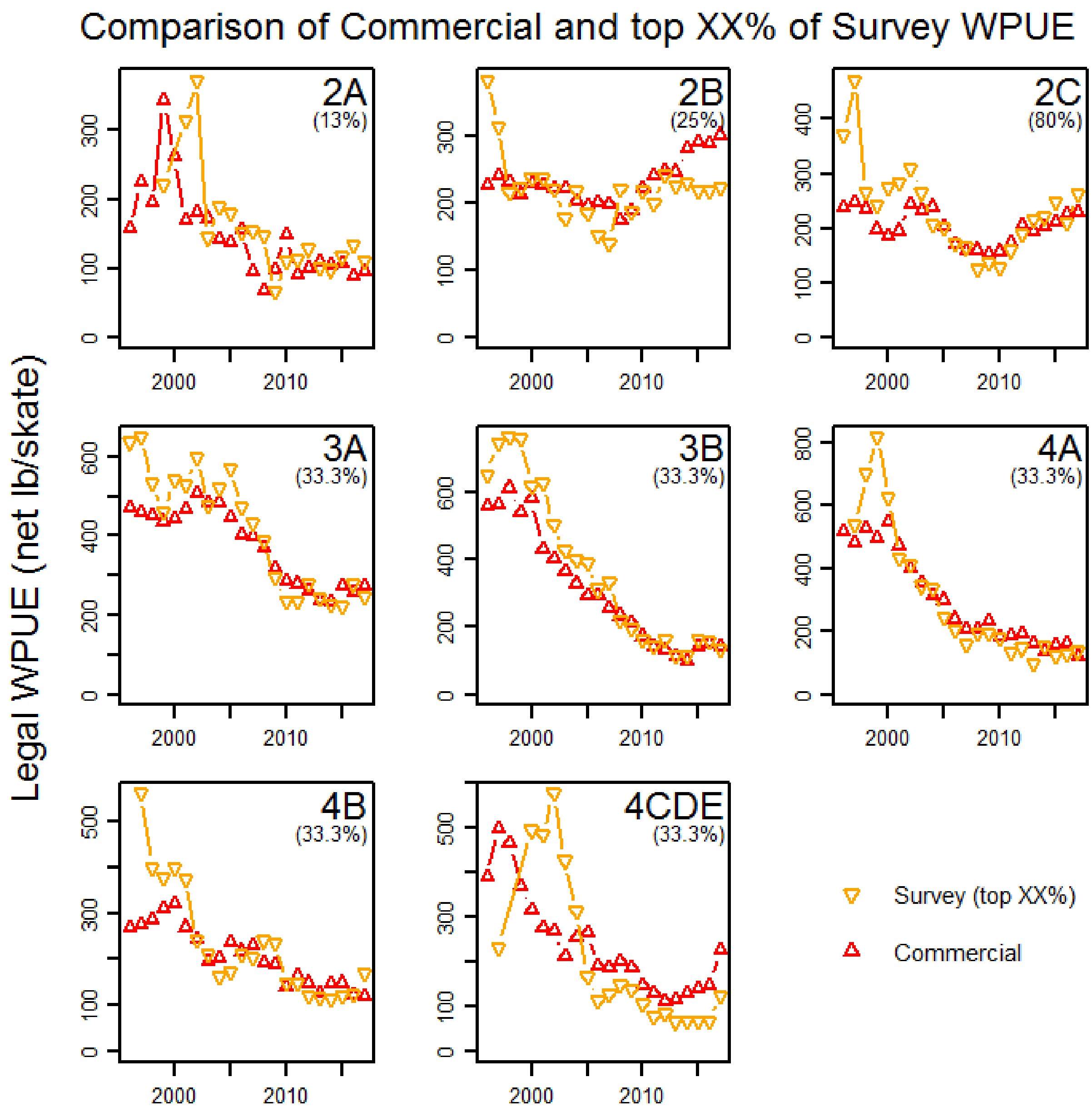

Figure 4. O32 WPUE for the commercial fishery versus setline survey filtered to the top XX%, 1997-2017.

A mortality rate of 16% was applied to all commercial fishery Pacific halibut discards since the beginning of individual quota fisheries (1991 in Canada, 1995 in Alaska). During the era of the derby fishery and for all years in IPHC Regulatory Area 2A, a 25% rate was applied (Gilroy 2007). The IPHC Regulatory Area 2A commercial catch numbers include the U32 estimates from the tribal and non-tribal commercial fisheries.

To estimate the pounds of U32 Pacific halibut captured in the commercial Pacific halibut fishery, the IPHC Regulatory Area specific U32:O32 ratio was multiplied by the estimated commercial catch in each regulatory area for each year. The resulting poundage was then multiplied by the discard mortality rate to obtain the estimated poundage of U32 Pacific halibut killed in the commercial fishery.

Discard mortality from lost or abandoned gear

Since the implementation of the quota share fisheries, lost gear is much less common. During the derby fishery of the 1980s and early 1990s in Alaska and B.C., extremely short fishing periods resulted in a competitive race to catch as many Pacific halibut as fast as possible, leading to a considerable quantity of longline gear being lost on the fishing grounds. Information on the amount of gear lost or abandoned by the Pacific halibut longline fishery was collected through logbook interviews or from fishing logs received via mail. Fishery-wide estimates were then extrapolated to total catch values using logbook catch and effort statistics.

Discard mortality for O32 Pacific halibut was calculated from the ratio of effective skates lost to effective skates hauled, multiplied by total landed catch. Effective skates are skates for which no data (skate length, hook spacing, number of hooks per skate) are missing and gear type meets the standardization criteria. The ratio was calculated using both fixed-hook and snap gear in all IPHC Regulatory Areas. The IPHC Regulatory Area 2A catch has always included the non-treaty directed commercial catch, treaty commercial catch, and, when open, incidental catch during the longline sablefish fishery. In addition, the quantity of U32 Pacific halibut captured by lost gear is also estimated using the method described above. All fish estimated to have been captured by lost gear are assumed to die. Discard mortality from lost gear was first calculated in 1985. The amount of gear lost varies by year and it is much lower since the inception of the quota share fisheries. In some instances, very few to no skates are reported lost, which was the case in IPHC Regulatory Areas 4C and 4E in 2016. The 2016 data are preliminary and it is expected that some gear was lost in those IPHC Regulatory Areas and when final log data are available the numbers will be updated. We will be reviewing the procedure for determining the mortality of Pacific halibut from the lost gear in the future.

Discard mortality for regulatory reasons

The directed commercial fisheries in IPHC Regulatory Area 2A are still managed using derby fishing seasons, in which the quantity of Pacific halibut for a vessel is limited by a fishing period limit. This results in catches that may exceed the vessel or trip limits, and therefore regulatory discards of O32 Pacific halibut, which are reported in the fishery logbooks. The ratio of discards to landings from the trips with logbook records available is used to estimate the O32 discards for all landings reported on fish tickets. In addition, the quantity of U32 Pacific halibut captured along with these discarded fish is estimated following the methods described above. The estimates for regulatory discards vary most likely due to the number of fishery openings, the number of vessels fishing, and the vessel trip limits. The IPHC Regulatory Area 2A incidental Pacific halibut retention fisheries during the salmon and sablefish fisheries are not included as they are accounted for under bycatch mortality estimates.

Discards from the quota share fisheries in Alaska and B.C. are not included at present; however, they are under review with the intent to include them in the future.

Total discard mortality in the commercial Pacific halibut fishery

Based on these methods, discard mortality in the commercial fishery for Pacific halibut is estimated to have been highest in the early 1980s, subsequently declined (particularly in IPHC Regulatory Area 3A in 1995 when the derby fishery was converted to a quota system), and then increased from 1995 to 2010 as the size-at-age of Pacific halibut declined and more fish at older ages remained below the minimum size limit. The estimates of discard mortality cannot be delineated within IPHC Regulatory Area 4 prior to 1981 (Table 1), but there is very little discard mortality estimated prior to that time. In addition, there is currently no direct accounting for whale depredation in this calculation.

Table 1. Discard mortality of Pacific halibut in the commercial halibut fishery since 1974 by IPHC Regulatory Area, in millions of pounds net weight.

	Regulatory Area											
Year	**2A[a]**	**2B**	**2C**	**3A**	**3B**	**4**	**4A**	**4B**	**4C**	**4D**	**4E**	**Total**
1974	0.002	0.081	0.042	0.061	0.013	0.002	NA	NA	NA	NA	NA	0.201
1975	0.004	0.143	0.048	0.091	0.021	0.002	NA	NA	NA	NA	NA	0.309
1976	0.002	0.164	0.044	0.107	0.025	0.002	NA	NA	NA	NA	NA	0.344
1977	0.002	0.135	0.026	0.093	0.032	0.004	NA	NA	NA	NA	NA	0.292
1978	0.001	0.113	0.036	0.115	0.014	0.004	NA	NA	NA	NA	NA	0.283
1979	0.001	0.119	0.039	0.130	0.004	0.004	NA	NA	NA	NA	NA	0.297
1980	0.000	0.136	0.029	0.132	0.003	0.002	NA	NA	NA	NA	NA	0.302
1981	0.002	0.152	0.036	0.147	0.006	NA	0.004	0.002	0.002	0.000	0.000	0.351
1982	0.002	0.163	0.033	0.124	0.067	NA	0.010	0.000	0.002	0.000	0.000	0.401
1983	0.003	0.192	0.064	0.117	0.114	NA	0.023	0.009	0.004	0.000	0.000	0.526
1984	0.005	0.363	0.065	0.162	0.104	NA	0.010	0.008	0.006	0.001	0.000	0.724
1985	0.011	0.542	0.344	1.213	0.398	NA	0.082	0.056	0.031	0.028	0.001	2.705
1986	0.016	0.695	0.606	2.374	0.591	NA	0.231	0.016	0.048	0.077	0.002	4.657
1987	0.014	0.686	0.543	2.105	0.513	NA	0.188	0.071	0.047	0.031	0.005	4.204
1988	0.007	0.557	0.384	2.158	0.267	NA	0.052	0.039	0.019	0.009	0.000	3.493
1989	0.020	0.443	0.352	2.102	0.366	NA	0.041	0.098	0.024	0.022	0.000	3.469
1990	0.038	0.437	0.508	1.693	0.414	NA	0.148	0.073	0.033	0.052	0.004	3.401
1991	0.008	0.238	0.520	1.666	0.711	NA	0.127	0.080	0.040	0.070	0.005	3.466
1992	0.020	0.220	0.436	1.230	0.388	NA	0.090	0.072	0.028	0.018	0.002	2.504
1993	0.033	0.320	0.411	0.854	0.248	NA	0.084	0.059	0.028	0.019	0.002	2.058
1994	0.010	0.271	0.442	1.477	0.134	NA	0.064	0.065	0.026	0.018	0.004	2.512
1995	0.008	0.228	0.156	0.420	0.058	NA	0.024	0.022	0.009	0.004	0.002	0.932
1996	0.010	0.211	0.175	0.535	0.083	NA	0.043	0.042	0.024	0.025	0.005	1.152
1997	0.013	0.291	0.185	0.529	0.246	NA	0.057	0.049	0.033	0.033	0.007	1.445
1998	0.019	0.329	0.229	0.676	0.289	NA	0.068	0.052	0.025	0.026	0.004	1.716
1999	0.018	0.321	0.232	0.546	0.322	NA	0.067	0.074	0.029	0.031	0.004	1.644
2000	0.024	0.190	0.197	0.475	0.384	NA	0.092	0.059	0.013	0.014	0.003	1.452
2001	0.024	0.245	0.229	0.456	0.481	NA	0.132	0.076	0.018	0.020	0.005	1.688
2002	0.022	0.204	0.174	0.646	0.515	NA	0.103	0.036	0.008	0.011	0.003	1.722
2003	0.043	0.344	0.201	0.676	0.646	NA	0.105	0.042	0.008	0.016	0.004	2.085
2004	0.016	0.311	0.367	0.758	0.716	NA	0.078	0.034	0.009	0.016	0.003	2.309
2005	0.039	0.335	0.344	0.724	0.572	NA	0.139	0.018	0.007	0.034	0.005	2.218
2006	0.050	0.605	0.443	0.741	0.476	NA	0.102	0.013	0.009	0.044	0.007	2.491
2007	0.040	0.529	0.381	0.966	0.454	NA	0.135	0.023	0.011	0.053	0.012	2.604
2008	0.044	0.454	0.295	1.004	0.676	NA	0.149	0.025	0.021	0.073	0.017	2.757
2009	0.052	0.354	0.304	1.175	0.796	NA	0.157	0.018	0.018	0.060	0.012	2.946
2010	0.027	0.302	0.261	1.450	0.903	NA	0.138	0.037	0.023	0.061	0.011	3.214
2011	0.025	0.283	0.083	0.930	0.770	NA	0.144	0.043	0.044	0.121	0.026	2.468
2012	0.025	0.220	0.095	0.593	0.526	NA	0.095	0.038	0.018	0.045	0.012	1.667
2013	0.025	0.211	0.110	0.519	0.404	NA	0.070	0.035	0.016	0.030	0.010	1.432
2014	0.021	0.250	0.119	0.443	0.326	NA	0.035	0.056	0.016	0.030	0.006	1.302
2015	0.031	0.238	0.121	0.521	0.215	NA	0.079	0.036	0.017	0.031	0.004	1.293
2016	0.037	0.229	0.123	0.378	0.232	NA	0.054	0.060	0.016	0.044	0.005	1.177
2017	0.019	0.175	0.087	0.347	0.234	NA	0.067	0.031	0.009	0.016	0.003	0.989

[a] Regulatory Area 2A includes O32 regulatory discards.

Additional data sources

We do not currently utilize the North Pacific Observer Program's (NPOP) growing data set on discards (reference the NPOP's annual report) in the directed Pacific halibut fishery due to the very low coverage rates, the lack of coverage on vessels less than 40 feet, and the lack of a conversion from numbers to weight for discarded Pacific halibut. However, it is anticipated that stratification by depth, gear, and other fishing characteristics could improve the representativeness of these data for estimating Pacific halibut discard in the future, and we plan to explore using these data in the near future.

Ongoing and future research on discard mortality rates may be helpful to refine the current rates used in this analysis. (Planas and IPHC Staff 2017).

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Appendix II:

Additional background information on
bycatch mortality of Pacific halibut in other fisheries

Pacific halibut bycatch limits

The North Pacific Fishery Management Council adopts Pacific halibut bycatch mortality limits for the Alaskan groundfish fisheries during its annual specification process in the fall of the preceding year. Currently, the limits are set by management area: the Gulf of Alaska (GOA) (Figure 1) and Bering Sea and Aleutian Islands (BSAI) (Figure 2). The limits, also called Prohibited Species Catch (PSC) limits, are fixed in regulation and can only be changed through a formal amendment, which can take up to a year. For both regions, regulations allow the North Pacific Fishery Management Council to apportion the trawl and fixed-gear limits into seasonal amounts and by fishery, to enable the groundfish fisheries to maximize their groundfish catch within the specified limits. A history of the Pacific halibut bycatch limits for both regions is in Table 12 of the main body of this paper (IPHC-2018-AM094-05).

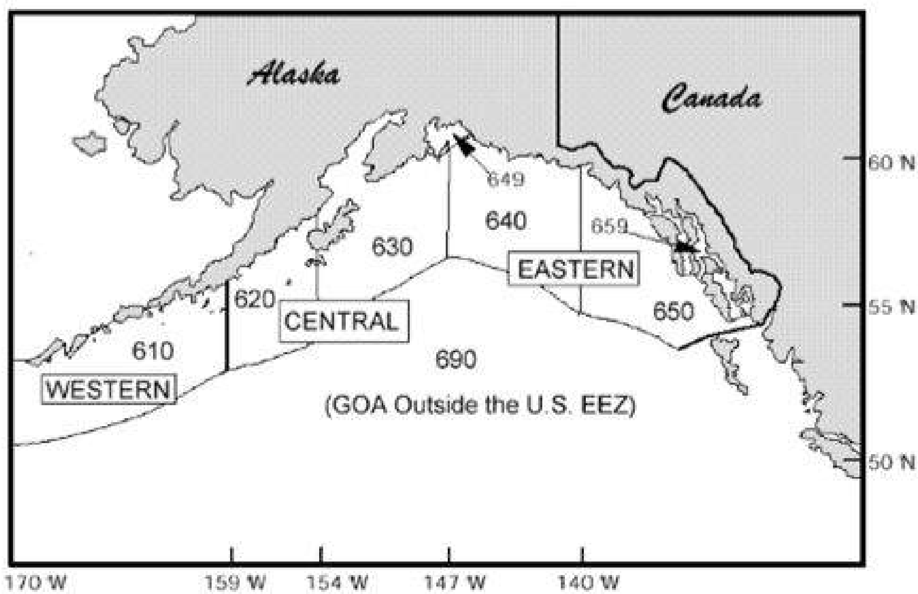

Figure 1. NMFS statistical and management areas for the Gulf of Alaska.

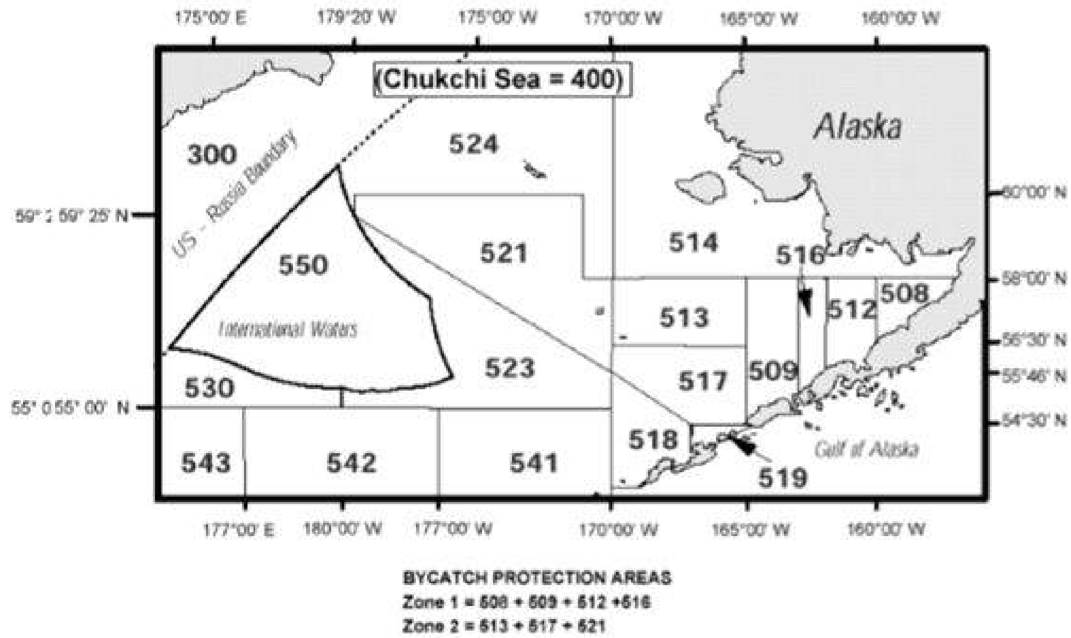

Figure 2. NMFS statistical and management areas for the Bering Sea/Aleutian Islands.

Gulf of Alaska

The final year of a phased three-year reduction in GOA bycatch limits occurred in 2016. The reduction for the trawl sector was implemented through a 7% reduction in 2014, an additional 5% in 2015 (to 12%), and finally 3% for 2016, thereby totaling 15% across three years. The reductions resulted in new trawl fishery limits of 1,848 t in 2014, 1,759 t in 2015, and 1,706 t in 2016 and beyond for all trawl vessels. For the hook-and-line fleet, the reduction varied by vessel type. The bycatch limit for the hook-and-line catcher/processor (CP) fleet was reduced 7%, which was implemented as one step in 2014. The hook-and-line catcher vessel (CV) bycatch limit was reduced by 15%, on the same 3-year reduction schedule as the trawl sector. The trawl limit was divided by season for shallow water and deep water fisheries, as has been the practice since 1991.

Bycatch management in the GOA fisheries was similar to previous years in that limits were assigned to specific sectors. The bycatch limit was set at 266 t round weight (0.44 million pounds net weight) for all fixed-gear fisheries and at 1,706 t round weight (282 million pounds net weight) for all trawl gear fisheries. The fixed-gear fisheries target primarily Pacific cod in the central and western GOA during the winter and rockfish in the eastern GOA in the spring. The fixed-gear limit is divided between the catcher vessel (CV) and catcher-processor (CP) sectors; the sector limits are further divided seasonally. All pot and jig gear fisheries, as well as the sablefish IFQ fishery, were exempted from the bycatch limits.

Several programs exist in the GOA for which the North Pacific Fishery Management Council has allocated specific Pacific halibut bycatch limits from the overall limit. The Central GOA Rockfish Program (CGOARP) isolates fishing for certain rockfish species from other fisheries within the fishery management system. Fishery cooperatives (“co-ops”) are formed under the program, and a portion of the overall rockfish quotas and Pacific halibut bycatch limit are specified for the program.

Another program for Pacific halibut bycatch management in the GOA applies to vessels that participate in the fishery co-ops in the BSAI. Briefly, the BSAI Plan Amendment 80 (A80) permits vessels to form fishery co-ops, which allows for a more efficient prosecution of their fisheries. Although A80 does not require vessels to join a co-op, all eligible A80 vessels belonged to one of the two co-ops.

The final apportionment of Pacific halibut bycatch in the GOA is a result of the 1998 American Fisheries Act (AFA). The AFA specified that certain trawl CP vessels fishing for pollock in the BSAI were prohibited from fishing for certain other groundfish species in the GOA. The AFA also specified limits on the amounts of other non-pollock groundfish species those vessels were allowed to catch; these limits are also termed sideboards.

Bering Sea/Aleutian Islands

The Pacific halibut bycatch mortality limits for the BSAI trawl and fixed-gear fisheries totaled 3,515 t round weight (5.8 million pounds net).

The BSAI fixed-gear fisheries were allocated a total bycatch limit of 710 t (1.17 million pounds net weight), with 7.5% reassigned to CDQ fisheries, leaving 657 t round weight (1.09 million pounds net weight). This was divided between the hook-and-line fishery for Pacific cod and all other fixed-gear fisheries. The Pacific cod fishery bycatch limit was further divided between CPs and CVs. All pot and jig fisheries were exempted from Pacific halibut mortality closures. The sablefish IFQ hook-and-line fishery was also exempted from the bycatch limit.

The trawl fishery bycatch mortality limit was 2,805 t round weight (4.64 million pounds net weight). By regulation, a fixed amount of 315 t round weight (0.52 million pounds net weight) is reallocated to CDQ fisheries (gear-nonspecific), leaving 2,490 t round weight (4.12 million pounds net weight) for all remaining trawl fisheries. A80 separated the trawl fleet into an A80 sector and a Limited Access sector. The latter group includes the pollock co-ops created by the AFA. Within the A80 fleet, the bycatch limit was assigned to the Alaska Seafood Cooperative and the Alaska Groundfish Cooperative.

In addition, the North Pacific Fishery Management Council created bycatch limit sideboards for the AFA vessels which apply to these vessels when they fish in non-AFA fisheries, i.e., any target species other than pollock.

Discard mortality rates and assumptions

Discard mortality rates (DMRs), used to determine the fraction of the estimated bycatch that dies, vary by fishery and IPHC Regulatory Area. Where observers are used for fishery monitoring, DMRs are calculated from data collected on the release viability or injury of Pacific halibut. For IPHC Regulatory Areas without observers, assumed DMRs are used, which are based on the similarity of fisheries to those in other areas where data are available. The mortality models used to calculate these rates have been presented by Clark et al. (1993) and Williams (1997).

Observer data are used to calculate DMRs in fisheries in three major IPHC Regulatory Areas. In IPHC Regulatory Areas 2A and 2B, observers deployed on the bottom trawl vessels examine each Pacific halibut to determine release viability. The bycatch mortality reported to IPHC incorporates these release viability observations. Data to determine DMRs for some fisheries are not available. Therefore, assumptions are made on likely DMRs based on similar fisheries with known DMRs. For the U.S. west coast, NMFS uses a DMR of 16% for the sablefish hook-and-line fishery, based on an analysis of observer data from the sablefish fishery off Alaska prior to the implementation of IFQ in 1995. The DMR for pot fisheries is assumed to be 18%. Bycatch mortality in the CP midwater fishery for Pacific hake is based on a 100% DMR.

NMFS manages the groundfish fisheries off Alaska according to a schedule of DMRs developed during the North Pacific Fishery Management Council NMannual specification process (based on recent years' realized fishery specific DMRs obtained from observer data).

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Fishery-independent setline survey (FISS) design and implementation in 2017, including current and future expansions

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PURPOSE

To provide an overview of the IPHC's fishery-independent setline survey (FISS) design and implementation in 2017, including current and future expansions.

BACKGROUND

The International Pacific Halibut Commission's (IPHC's) fishery-independent setline survey (FISS or setline survey) provides catch information and biological data on Pacific halibut (*Hippoglossus stenolepis)* that are collected independently of the commercial fishery. These data, which are collected using standardized methods, bait, and gear during the summer of each calendar year, provide an important comparison with data collected from the commercial fishery. The commercial fishery is variable in its gear composition and distribution of fishing effort over time, and presents a broad spatial and temporal sampling of the stock. Pacific halibut biological data collected on the setline survey (e.g. the size, age, and sex composition) are used to monitor changes in biomass, growth, and mortality in adult and sub-adult components of the Pacific halibut population. In addition, records of non-target species caught during setline survey operations provide insight into bait competition, rate of bait attacks, and serve as an index of abundance over time, making them valuable to the assessment, management, and avoidance of non-target species.

The IPHC has conducted fishery-independent setline surveys in selected areas during most years since 1963 (with a break from 1987 to 1992). Historical information regarding previous setline survey operations has been presented in IPHC Annual Reports and Survey Manuals; IPHC Report of Assessment and Research Activities documents 1993-2016; and IPHC Technical Reports 18 and 58. The majority of the current FISS station design and sampling protocols have been standardised since 1998.

FISHERY-INDEPENDENT SETLINE SURVEY (FISS) DESIGN AND PROCEDURES

In summary, the 2017 FISS chartered twelve commercial longline vessels (five Canadian and six U.S.) during a combined 74 trips and 780 charter days. All 1,499 setline survey stations planned for the 2017 setline survey season were either scouted or completed. Of these stations, 1,493 (99.6%) were considered successful for stock assessment analysis. A total of 13 special projects were facilitated and completed, and 12,922 otoliths were collected coastwide. Approximately 569,576 pounds (258 t) of Pacific halibut, 51,338 pounds (23 t) of Pacific cod, and 31,674 pounds (14 t) of rockfish were landed from the setline survey stations. Compared to the 2016 setline survey, weight-per-unit-effort increased in Regulatory Areas 2C, 4A, 4C, and 4D, with decreases in Areas 2A, 2B, 3A, 3B, and 4B. Descriptions of the FISS design and procedures follow.

Design

The IPHC's FISS design encompasses nearshore and offshore waters of the IPHC Convention Area (Figure 1a). The current setline survey station layout has been in place since 1998 (with some additions in 2006 (Bering Sea), and in 2011 (IPHC Regulatory Area 2A)).

The Regulatory Areas are divided into 32 regions, each requiring between 10 and 46 charter days to survey (Table 1). Setline survey stations were located at the intersections of a 10 nmi by 10 nmi square grid within the depth range occupied by Pacific halibut during summer months (20-275 fm [37-503 m] in most areas). Figure 1b depicts the FISS station positions, charter region divisions, and IPHC Regulatory Areas surveyed.

The current standard grid (SG) station layout has been in place since 1998, with the addition of stations around the Pribilof Islands and St. Matthew Island beginning in 2006 and twelve stations in the Washington/Oregon charter regions beginning in 2011. Thirteen extra stations (ES) in southeast Alaska and eight rockfish (*Sebastes spp*.) index (RI) stations in the Washington charter region (described in the Special Projects section of this document) are fished on a different layout than the FISS and are not included in the IPHC stock assessment dataset.

Six skates were set in Regulatory Area 2A and seven skates in Regulatory Area 4CDE. Regulatory Areas 2B, 2C, 4A and 4B had five skates of baited gear set at each setline survey station in all charter regions. Setline survey specifications for gear, setting schedule, and soak time have been consistent since 1998. Setline survey gear consists of fixed-hook, 1,800-foot (549 m) skates with 100 16/0 circle hooks baited with 0.25 to 0.33 pounds (0.11 to 0.15 kg) of chum salmon (*Oncorhynchus keta*) and spaced 18 feet (5.5 m) apart. Gangion length ranges from 24 to 48 inches (61 cm to 122 cm). Each vessel sets one to four stations daily beginning at or after 0500 AM, and soaks the gear at least five hours before hauling. Vessels avoided soaking the gear at night, when possible. Data from gear soaked longer than 24 hours were not used for stock assessment purposes.

Sets were considered ineffective for stock assessment if predetermined limits for lost gear, snarls, depredation, or displacement from station coordinates were exceeded. The fork lengths of all Pacific halibut captured at FISS stations were recorded to the nearest centimeter and all lengths stated hereafter will be fork lengths. Each length was converted to an estimated weight using a standard formula (Clark 1992), and these weights were then used to generate the weight per unit effort (WPUE) data. Average WPUE, expressed as net pounds per skate, was calculated by dividing the estimated catch in pounds (net weight) of Pacific halibut equal to or over 32 inches (81.3 cm; O32 Pacific halibut) in length by the number of skates hauled for each station, and averaging these values by area (statistical, charter, or regulatory).

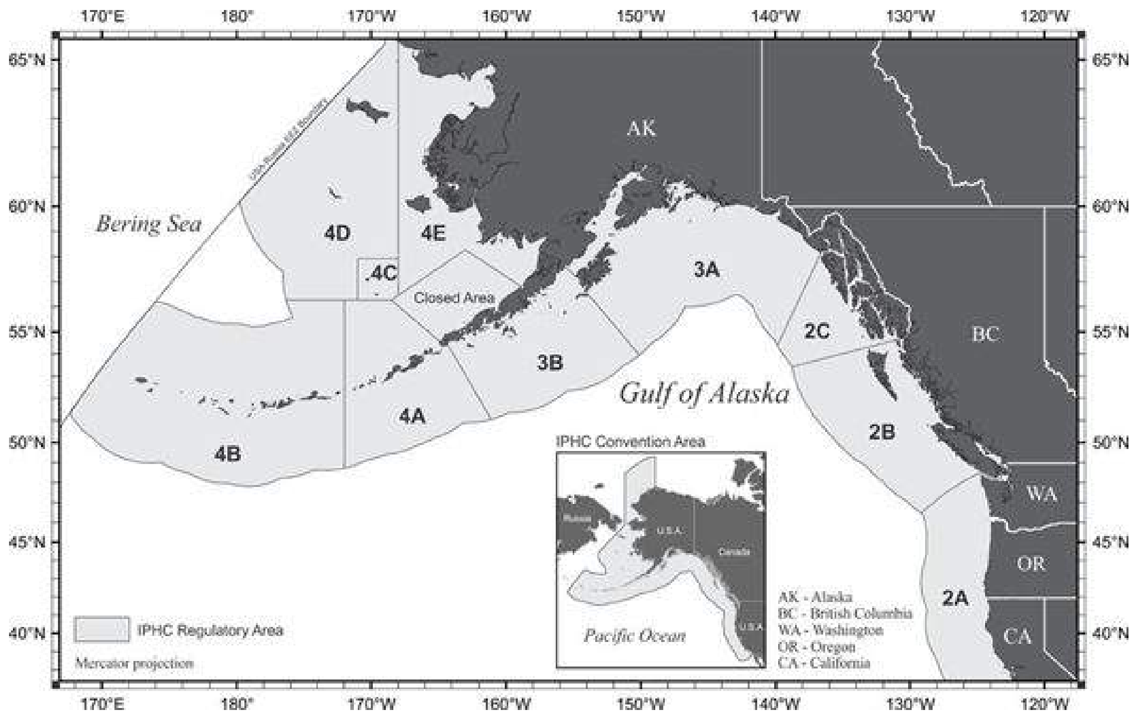

Figure 1a. Map of the IPHC Convention Area and IPHC Regulatory Areas.

Table 1. Effort and catch summary by FISS charter region and vessel for all 2017 setline survey stations.

Regulatory Area	Charter Region	Vessel	ADFG or VRN[1]	Charter Days[2]	Planned Stations	Effective Stations	Pacific halibut Sold[3] (lbs)	Avg. Price[4] USD	Chum (lbs)
2A	N. California	*Pacific Surveyor*	-	29	42	41	1,728	$8.01	4,767
2A	Oregon	*Pacific Surveyor*	-	34	60	60	9,915	$7.96	12,393
2A	Washington	*Pacific Surveyor*	-	40	96	96	3,452	$5.74	16,870
2A	Puget Sound	*Pacific Surveyor*	-	10	14	14	727	$4.75	2,700
2B	Charlotte	*Pender Isle*	27282	19	43	43	27,607	$8.54	6,896
2B	Goose Is.	*Vanisle*	21912	25	43	43	11,015	$8.02	8,600
2B	St. James	*Vanisle*	21912	20	39	39	19,513	$8.43	7,800
2B	Vancouver	*Vanisle*	21912	20	41	41	6,594	$7.77	8,200
2C	Ketchikan	*Star Wars II*	20492	22	41	41	42,502	$7.55	6,200
2C	Ommaney	*Pender Isle*	27282	18	40	40	47,493	$6.62	5,850
2C	Sitka	*Pender Isle*	27282	19	42	41	33,712	$6.44	7,150
3A	Albatross	*Clyde*	55803	23	45	45	27,290	$6.45	9,006
3A	Fairweather	*Star Wars II*	20492	20	49	49	22,319	$6.30	8,659
3A	Gore Pt.	*Bold Pursuit*	20875	16	45	45	14,931	$6.46	7,100
3A	Portlock	*Saint Nicholas*	45399	28	46	46	30,735	$6.48	7,100
3A	PWS	*Bold Pursuit*	20875	19	45	45	28,695	$6.07	6,008
3A	Seward	*Bold Pursuit*	20875	24	48	48	22,534	$6.41	7,470
3A	Shelikof	*Saint Nicholas*	45399	46	45	44	14,537	$6.39	6,900
3A	Yakutat	*Star Wars II*	20492	23	51	51	36,860	$6.36	9,441
3B	Chignik	*Allstar*	55922	25	45	44	16,413	$6.14	6,958
3B	Sanak	*Free to Wander*	29155	26	48	48	12,187	$5.90	4,600
3B	Semidi	*Predator*	33133	28	47	47	14,730	$6.19	8,700
3B	Shumagin	*Allstar*	55922	20	44	44	17,444	$6.11	4,067
3B	Trinity	*Clyde*	55803	19	47	47	10,988	$6.18	8,194
4A, Closed	4A Edge	*Free to Wander*	29155	24	57	57	11,074	$5.65	8,272
4A. 4C	Unalaska	*Free to Wander*	29155	26	66	66	20,395	$5.56	11,012
4D, 4C	4D Edge	*Kema Sue*	41033	34	68	68	19,952	$5.09	13,900
4B	Andreanof	*Norcoaster*	38173	32	54	53	28,251	$5.51	10,295
4B	Amchitka	*Norcoaster*	38173	38	49	49	10,725	$5.06	9,358
4B	S. Bower's Ridge	*Norcoaster*	38173	12	25	25	2,557	$4.96	4,757
4B	N. Bower's Ridge	*Kema Sue*	41033	13	25	25	553	$5.30	3,652
4B	Near Islands	*Kema Sue*	41033	28	49	48	2,148	$5.06	3,800
Total		**12 Vessels**		**780**	**1499**	**1493**	**569,576**	**$6.36**	**246,675**

[1] ADFG or VRN stands for Alaska Department of Fish and Game or Vessel Registration Number.
[2] Days are estimated because some vessels fished two charter regions in one day.
[3] Net weight (head-off, dressed, washed). Poundage may not sum to correct total because of rounding errors introduced by splitting the catch out to region.
[4] Gross prices

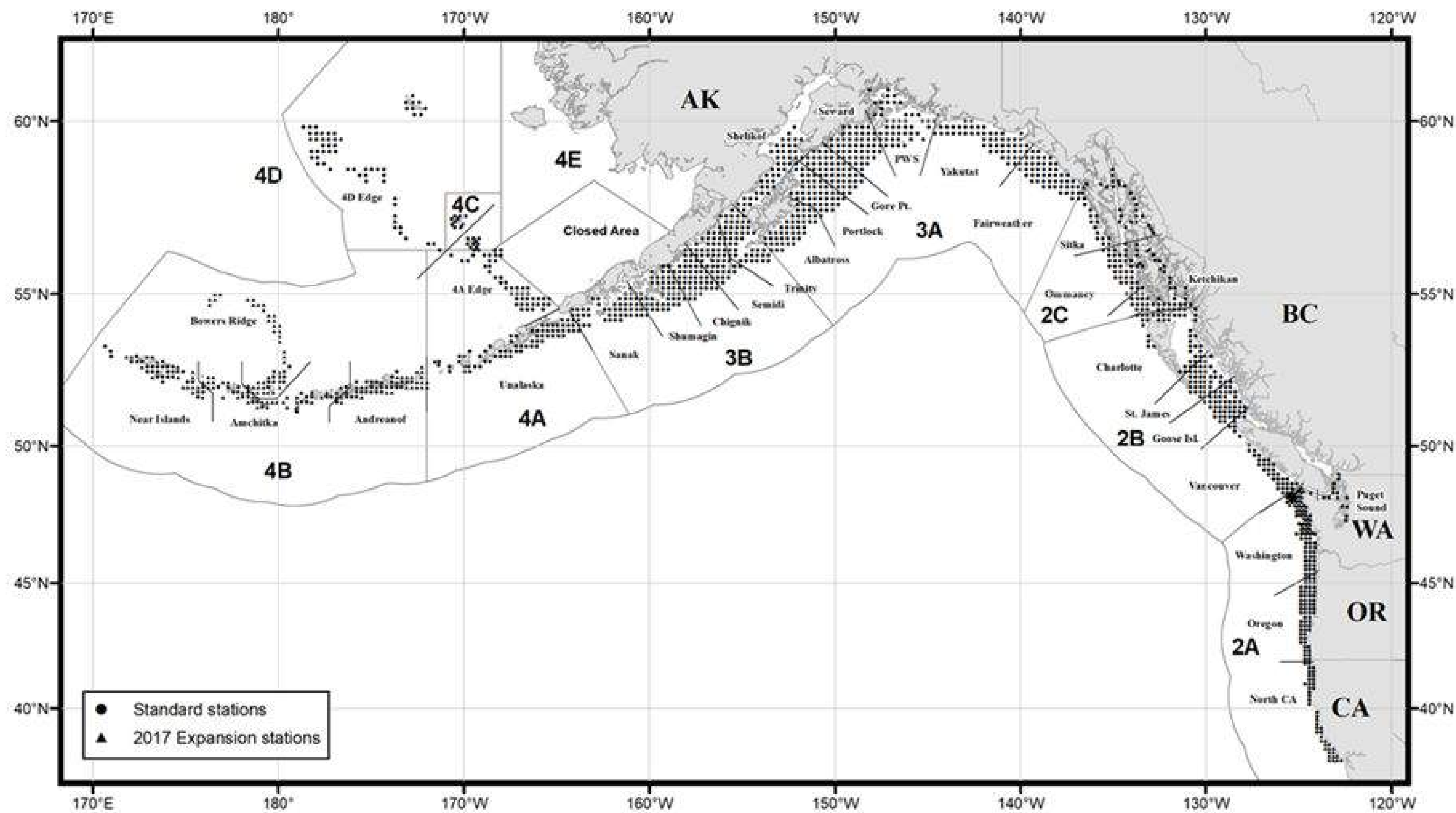

Figure 1b. 2017 IPHC fishery-independent setline survey station positions, charter region divisions, and IPHC Regulatory Areas.

Vessel Operations

Fishing vessels are chosen through a competitive bid process each year where up to 3 regions per vessel are awarded and 10-15 vessels are chosen. In 2017, twelve commercial longline vessels (five Canadian and six U.S.), were chartered by the IPHC for our fishery-independent setline survey operations. During a combined 74 trips and 780 charter days, these vessels fished 32 charter regions, covering habitat from northern California on to the island of Attu in the Aleutian Islands, and north along and including the Bering Sea continental shelf (Table 1).

FISHERY-INDEPENDENT SETLINE SURVEY (FISS) EXPANSION STATIONS

Since 2014, the IPHC has been sampling expansion setline survey stations in one or two IPHC Regulatory Areas each year (Figure 2). Commercial fishery data and other sources have shown the presence of Pacific halibut down to depths of 732 m (400 fm) and in waters shallower than 37 m (20 fm). Further, most IPHC Regulatory Areas have substantial gaps in station coverage within the standard 37-503 m depth range. The incomplete coverage of Pacific halibut habitat by the setline survey could potentially lead to biased estimates of the weight per unit effort (WPUE) and numbers per unit effort (NPUE) when used in the density indices for stock assessment modelling and for stock distribution estimation. For this reason, the IPHC has been undertaking a sequence of expansions since 2014 (following a 2011 pilot), with setline survey stations added to the standard grid to cover habitat not previously sampled.

In 2017, 145 stations were added to Regulatory Area 4B, which included depths as shallow as 50 fathoms (91 m) and as deep as 400 fathoms (732 m). Regulatory Area 2A was fished with the same expansion as in 2014 including an additional 17 stations in the Northern California charter region, an additional densified grid of 26 stations in the Washington charter region, and repeating the 14 stations into Puget Sound. All 1,499 setline survey stations planned for the 2017 setline survey season were either scouted or completed. Of these stations, 1,493 (99.6%) were considered successful for stock assessment analysis.

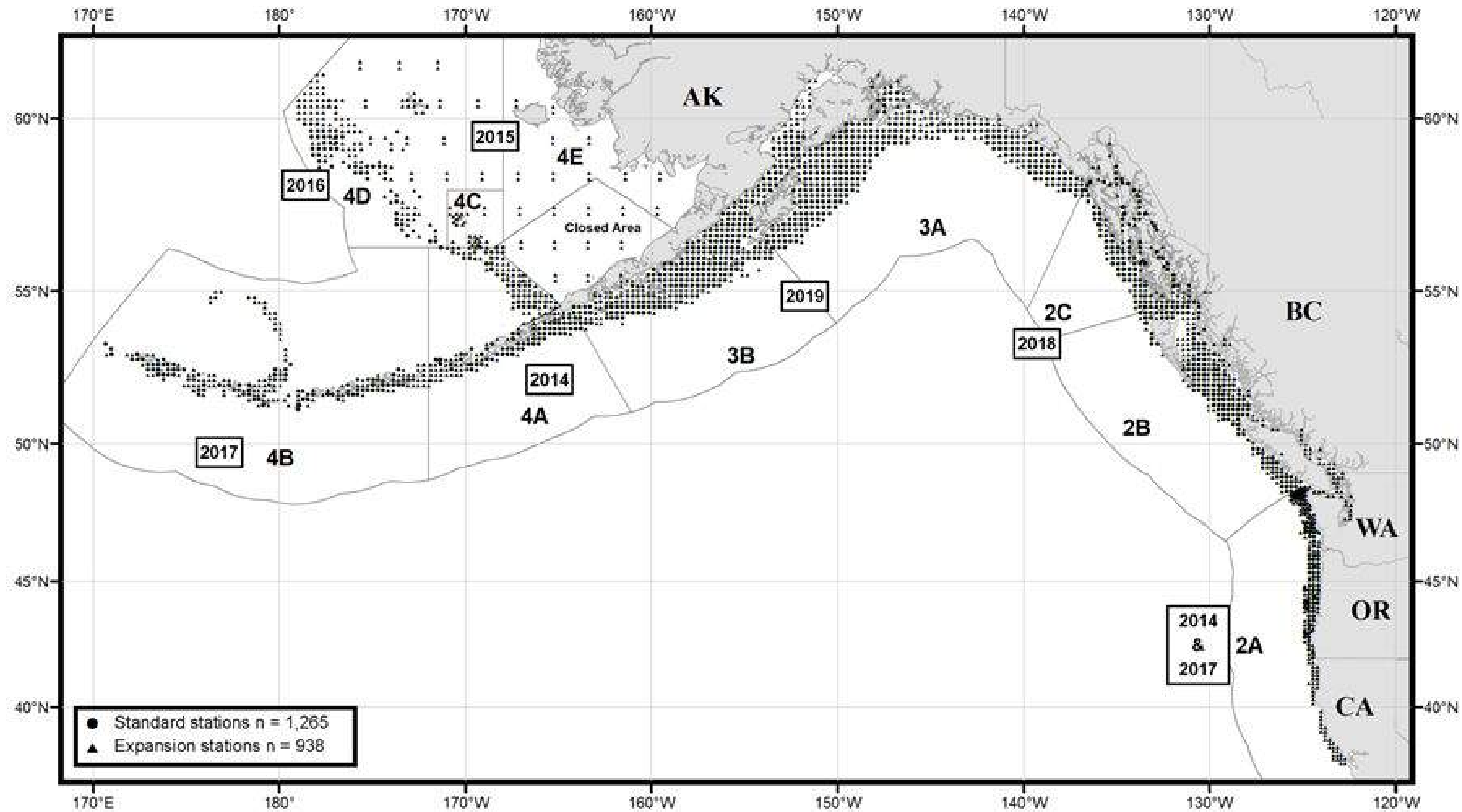

Figure 2. IPHC fishery-independent setline survey (FISS) and expansion stations planned (2014-19).

2017 FISS Expansion in Regulatory Area 2A

This was the third year of expansion in IPHC Regulatory Area 2A which already had an expansion of the grid in Oregon down to 42° N latitude in 2011 and 2014, including Puget Sound in Washington. Northern California stations were first surveyed in 2013 down to 40° N latitude to investigate anecdotal reports of increasing Pacific halibut catches in the southern range. Northern California stations were again surveyed in the expansion in 2014, fishing as far south as 39° N latitude. In 2017, the expansion went further south to 37°45' N latitude (near San Francisco) and included Puget Sound. In addition, an ad-hoc densified expansion grid off the north Washington coast was surveyed for the first time in 2017 (per the ad-hoc Annual Meeting recommendation, AM093–Rec.03, and detailed in papers IPHC-2017-AM093-06_ADD_1 and 2). A total of 212 stations were surveyed in Regulatory Area 2A in 2017, of which 108 were expansion stations, including 26 ad-hoc densified grid stations off the north Washington coast (Figure 3 & Table 2).

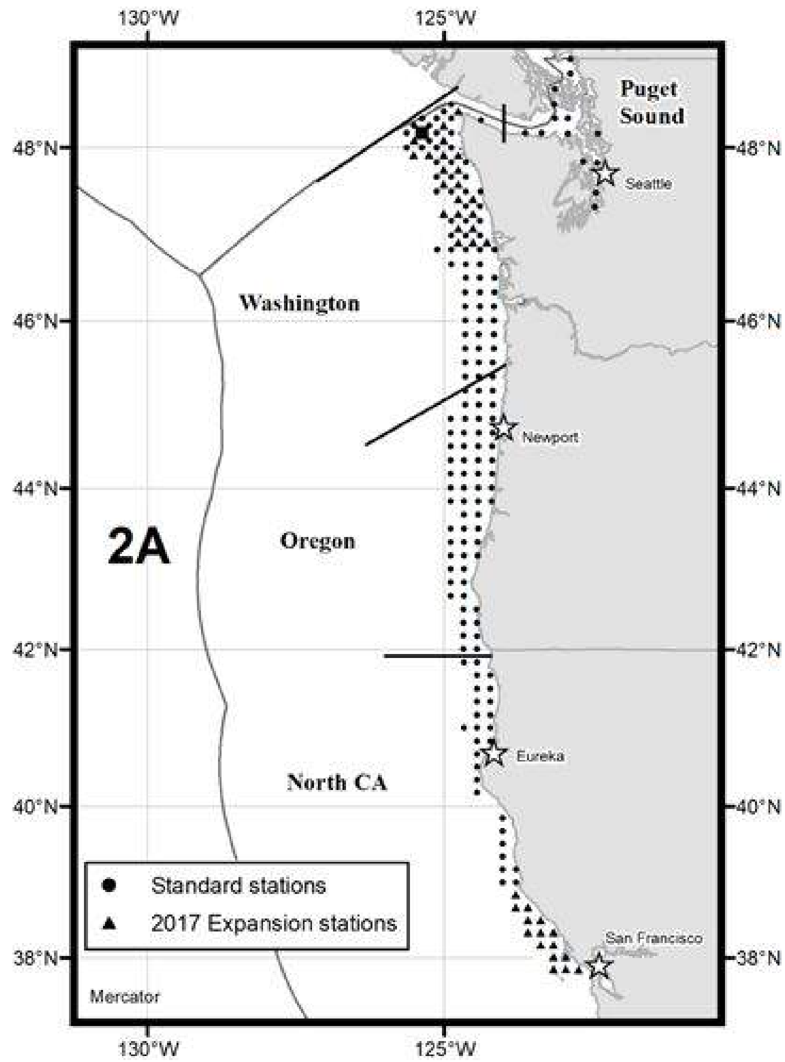

Figure 3. 2017 IPHC fishery-independent setline survey stations in Regulatory Area 2A with charter regions.

Table 2. IPHC Regulatory Area 2A setline survey charter regions and count by station type.

California	Station count
Expansion -Previously fished	27
New expansion	15*
Oregon	
Expansion	13
Standard grid	47
Washington	
Expansion	13
Densified grid	26
Standard grid	49
Rockfish Index	8

*2 stations were not permitted because of habitat closures

2017 FISS Expansion in Regulatory Area 4B

As a continued part of a multi-year coastwide effort to expand our setline survey coverage and depth profile, an additional 145 stations were added to Regulatory Area 4B including stations as shallow as 50 fathoms (91 m) and as deep as 400 fathoms (732 m) (Figure 1, Figure 4). To help manage this expansion, the historical Adak and Attu charter regions were divided into four new regions named Amchitka, Andreanof, north and south Bowers Ridge, and Near Islands (Figure 4 & Table 3).

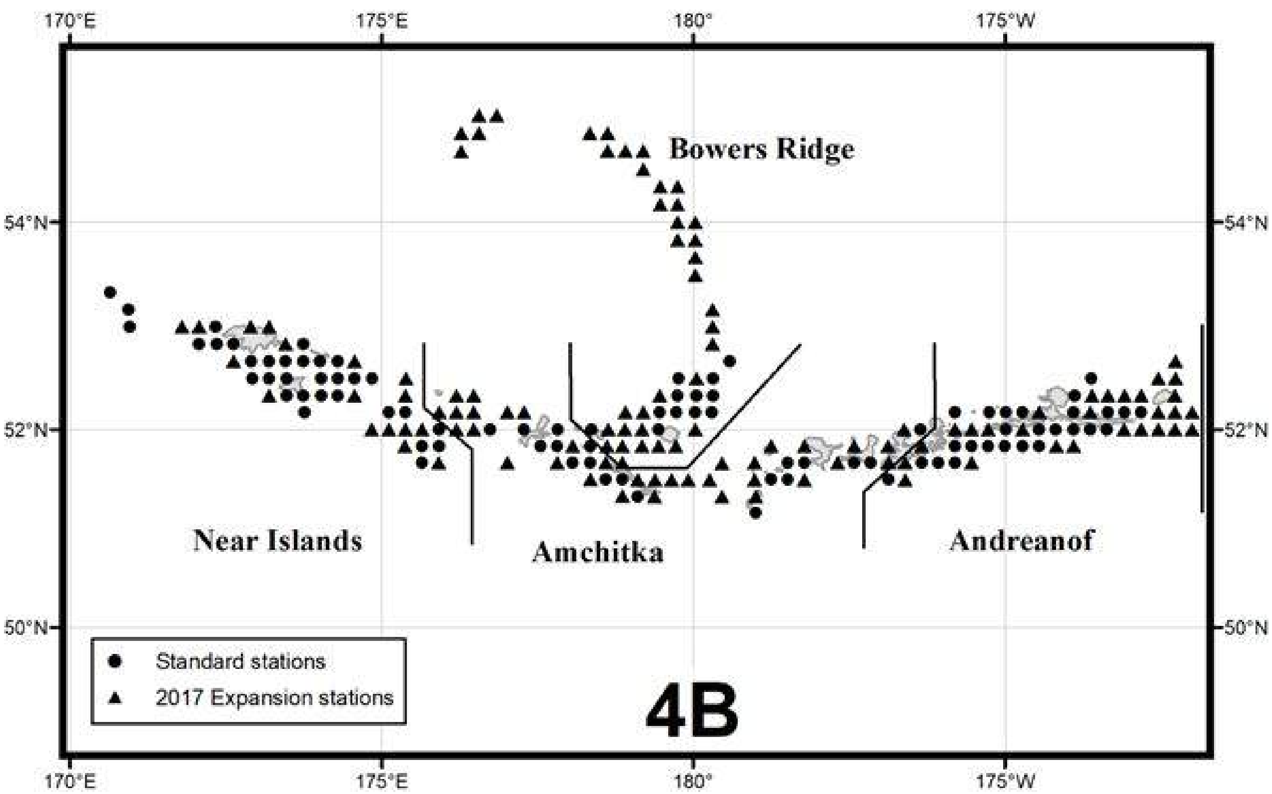

Figure 4. 2017 IPHC fishery-independent setline survey stations in Regulatory Area 4B with charter regions.

Table 3. IPHC Regulatory Area 4B setline survey charter regions and count by station type.

Andreanof	Station count
Expansion	28
Standard grid	26
Amchitka	
Expansion	31
Standard grid	18
Bowers South	
Expansion	13
Standard grid	12
Bowers North	
Expansion	24
Standard grid	1
Near Islands	
Expansion	17
Standard grid	32

Sampling protocols

Sea samplers collected data according to protocols established in the 2017 Fishery-Independent Setline Survey Manual (IPHC 2017a). As the gear was set, IPHC samplers evaluated the performance of the bird avoidance devices that were deployed along with the longline gear and recorded the exact number of hooks set and baits lost per skate of gear fished. During gear retrieval, samplers generally recorded hook status (e.g., empty, returned bait, species captured, bait type) of the first 20 consecutive hooks of each skate. However, processing needs for fish from previous skates, particularly in areas with high catch rates, occasionally affected where in the 100-hook sequence of the skate the sample was taken. In specific northern stations of Regulatory Area 2A, and all of Area 2B, samplers recorded the status of all hooks in the order in which they were hauled, in lieu of 20-hook subsample counts.

Samplers recorded lengths of all Pacific halibut caught along with the corresponding skate number. Vessel crew eviscerated all O32 Pacific halibut and then passed them to an IPHC sampler, who determined sex and maturity, prior hooking injury severity, and evidence of depredation, and collected otoliths from a randomized subsample for later age determination. Male Pacific halibut were assessed as either mature or immature, and females as immature, mature, spawning, or spent/resting. When the maturity stage of either sex could not be determined, the sampler coded the maturity stage as unidentified. The sex and maturity of Pacific halibut less than 32 inches (81.3 cm; U32 Pacific halibut) in length were recorded only if the fish was randomly selected for otolith collection or was already dead upon capture. Samplers used a random sampling table to select Pacific halibut for otolith removal from a subsample of all Pacific halibut caught. All U32 Pacific halibut not selected for otolith collection were measured and released alive.

At the end of each haul, samplers recorded the presence and abundance of seabird species within a 50-m radius from the vessel's stern. Seabird data are used to determine the spatial and temporal variation in the abundance of seabirds. A discussion of seabird data can be found in Geernaert (2017).

Bait purchases

The minimum quality requirement for setline survey bait is No. 2 semi-bright (Alaska Seafood Marketing Institute grades A through E), headed and gutted, and individually quick-frozen chum salmon. The IPHC secures most of the bait needed to supply setline survey operations prior to the start of the setline survey. In August 2016, staff began arranging bait purchases for the 2017 setline survey. Approximately 247,000 pounds (112.0 t) of chum salmon were utilized from three suppliers in the United States. The amount of bait used varied by vessel and charter region (Table 1). Bait quality was monitored and documented throughout the season and found to meet the standard as described above.

Fish sales and revenue sharing

As in previous years, O32 Pacific halibut that were caught on setline survey stations and sacrificed in order to obtain biological data were retained and sold. This helps to offset costs of the setline survey program. Setline survey vessels also retained for sale incidentally captured rockfish (*Sebastes spp*.) and Pacific cod (*Gadus macrocephalus*). These species were retained because they rarely survive the barotrauma resulting from capture. Most vessel contracts provided the vessel a lump sum payment, along with a 10% share of the Pacific halibut proceeds and a 50% share of the incidental catch proceeds. The *R/V Pacific Surveyor* received no share of Pacific halibut or bycatch proceeds. The IPHC does not retain proceeds from the sale of incidentally captured rockfish and Pacific cod. Instead, for retained bycatch captured in U.S. waters, proceeds are divided equally between the vessel (for handling expenses) and the state management agency. In Canada, Fisheries and Oceans Canada (DFO) receives all proceeds from sales of retained bycatch captured in Canadian waters, subsequent to deduction of the predetermined vessel bycatch processing fees.

IPHC's chartered vessels delivered fish to 22 different ports during the 2017 setline survey (Table 4). Fish sales were awarded based on the objectives of obtaining a fair market price and distributing sales among buyers and ports. When awarding sales, the Commission considered the price offered, the number of years that a buyer had been buying and marketing Pacific halibut, how fish were graded at the dock (including the determination of No. 2 and chalky Pacific halibut), and the promptness of settlements following deliveries. Obtaining fair market value was the main consideration in awarding fish sales. However, when factors other than fish price were considered, sales were sometimes awarded to buyers not offering the highest prices, thereby meeting the goal of distributing sales among qualified buyers. Individual sales were evaluated after each event to ensure that the buyer was meeting IPHC's standards.

A summary of landings and prices from the setline survey is provided by species and regulatory area in Table 5. Average prices over the entire setline survey range and season decreased from $6.85 in 2016 to $6.53 in 2017.

Table 4. Fishery-independent setline survey Pacific halibut landings by port, 2017[1].

Offload Port	Trips Landed	Pacific halibut Sold (lbs)	Total (USD)	Average Price (USD/lb)[2]
Adak	6	28,735	$ 145,683	$ 5.07
Akutan	1	1,748	$ 9,931	$ 5.68
Alitak	3	12,209	$ 73,355	$ 6.01
Bellingham	1	727	$ 3,453	$ 4.75
Brookings	2	3,091	$ 24,809	$ 8.03
Cordova	3	33,132	$ 203,177	$ 6.13
Dutch Harbor	4	42,002	$ 238,637	$ 5.68
Homer	7	49,690	$ 321,802	$ 6.48
Juneau/Auke Bay	1	10,612	$ 66,320	$ 6.25
Kodiak	7	53,683	$ 341,150	$ 6.35
Neah Bay	2	1,589	$ 8,741	$ 5.50
Newport	3	8,444	$ 67,554	$ 8.00
Petersburg	2	41,100	$ 255,763	$ 6.22
Port Hardy	4	20,545	$ 168,372	$ 8.20
Prince Rupert	6	81,967	$ 675,954	$ 8.25
Sand Point	3	26,214	$ 156,062	$ 5.95
Seward	4	33,028	$ 211,889	$ 6.42
Sitka	3	43,466	$ 283,423	$ 6.52
St Paul	4	25,698	$ 134,071	$ 5.22
Tofino	1	2,965	$ 22,518	$ 7.59
Westport	2	1,971	$ 11,727	$ 5.95
Yakutat	3	46,960	$ 295,534	$ 6.29
		569,576	$ 3,719,923	$ 6.53

[1] Net weight (head-off, dressed, washed)
[2] Prices based on net weight

Table 5. Setline survey landings by species and Regulatory Area in 2017[1].

Species		2A	2B	2C	3A	3B	4A	4B	4C	4D
Pacific halibut	lbs	15,822	64,729	123,709	197,901	71,762	31,470	44,233	0	19,952
Pacific halibut	USD/lb	$7.35	$8.12	$6.84	$6.97	$6.27	$5.93	$5.19	-	$5.83
Pacific Cod	lbs	8	93	472	4,096	26,365	20,304	0	0	0
Pacific Cod	USD/lb	$0.25	$0.39	$0.37	$0.29	$0.33	$0.20	-	-	-
Rockfish	lbs	1,666	8,333	10,826	10,595	254	0	0	0	0
Rockfish	USD/lb	$0.64	$1.72	$1.29	$0.95	$0.29	-	-	-	-

[1]Weights are net pounds offloaded.

Timing of the setline survey

Each year, the months of May, June, July, and August are targeted for setline survey fishing. In 2017, 90 stations, amounting to approximately 2% of all stations, were fished outside of this window. On a coastwide basis, setline survey vessel activity was highest in intensity at the beginning of the setline survey season and declined early in August as boats finished their charter regions (Figure 5). All setline survey activity was completed by mid-September.

Week Beginning		22-May	29-May	5-Jun	12-Jun	19-Jun	26-Jun	3-Jul	10-Jul	17-Jul	24-Jul	31-Jul	7-Aug	14-Aug	21-Aug	28-Aug	4-Sep	11-Sep	18-Sep
	2013		11%	22%	34%	45%	**61%**	69%	83%	89%	100%								
	2014	6%	11%	18%	26%	36%	47%	**52%**	60%	67%	76%	85%	94%	100%					
2A	2015	13%	20%	33%	**52%**	65%	72%	83%	94%	100%									
	2016		14%	23%	42%	**54%**	73%	82%	93%	100%									
	2017	2%	11%	19%	28%	34%	41%	47%	**51%**	56%	62%	68%	74%	80%	84%	86%	92%	97%	99%
	2013		9%	18%	28%	36%	46%	**54%**	64%	79%	84%	92%	100%						
	2014	8%	14%	26%	38%	45%	49%	**55%**	63%	76%	84%	94%	100%						
2B	2015	9%	18%	26%	34%	44%	**51%**		63%	71%	81%	89%	100%						
	2016				5%	14%	21%	29%	44%	**64%**	79%	89%	100%						
	2017		12%	21%	28%	36%	40%	**59%**	77%	90%	100%								
	2013	7%	20%	33%	46%	**60%**	73%	86%	100%										
	2014	10%	15%		19%	26%	43%	**66%**	95%	100%									
2C	2015	12%	17%	20%		30%	46%	**58%**	71%	100%									
	2016		15%	29%	38%	**51%**	66%	76%	87%	88%	95%	100%							
	2017	2%	14%	28%	38%	**53%**	66%					76%	82%	99%					
	2013	3%	9%	16%	26%	37%	48%	**59%**	71%	81%	90%	95%	98%	100%					
	2014	2%	10%	23%	30%	41%	46%	**55%**	63%	70%	77%	84%	90%	94%	97%	100%			
3A	2015	7%	23%	40%	**61%**	71%	79%	86%		91%	96%	99%	100%						
	2016		11%	22%	33%	44%	49%	**55%**	63%	78%	87%	95%	99%	100%					
	2017		14%	26%	36%	47%	**55%**	67%	76%	82%	88%	89%	91%	95%	98%	100%			
	2013			10%	13%	29%	46%	**66%**	82%	96%	100%								
	2014		9%	21%	33%	42%	**50%**	58%	72%	83%	100%								
3B	2015		1%	12%	19%	34%	**50%**	58%	66%	73%	84%	91%	97%	100%					
	2016		1%	27%	47%	**65%**	83%	91%	98%	100%									
	2017		6%	28%	49%	**70%**	84%	94%	100%										
	2013		19%	32%	45%	**55%**	67%	68%				72%	79%	87%	93%	95%	100%		
	2014		7%	30%	34%	45%	**52%**	68%		72%	79%	85%	91%	99%					
4A	2015		11%	24%	41%	44%	**53%**		72%	82%	92%			99%	100%				
	2016		5%	19%	33%	35%	**51%**	63%	76%	91%	95%	100%							
	2017					6%	12%	27%	40%	**64%**	75%	85%	100%						
	2013				19%	26%	33%		40%	**55%**	58%	82%	97%	100%					
	2014		17%	20%	24%	28%		31%		40%	**54%**	64%		84%	100%				
4B	2015			17%	29%	38%	42%	**52%**			57%	75%	97%	100%					
	2016				13%	26%	38%	**51%**	69%	71%	80%	100%							
	2017				1%	19%	31%	41%	**53%**	64%	70%	72%	81%	85%	93%	97%			
	2013							40%				**60%**		100%					
	2014						10%	25%	40%	**100%**									
4C	2015							18%	**93%**		100%								
	2016								5%	**50%**	100%								
	2017						15%	**50%**				60%		100%					
	2013							5%	47%	**57%**	90%	100%							
	2014				14%	**50%**	69%	84%	100%										
4D	2015							4%	21%	49%	**61%**	79%	90%	100%					
	2016			1%	15%	20%	35%	**55%**	75%	87%	100%								
	2017									31%	**52%**	71%	100%						

Figure 5. The cumulative percentage of each Regulatory Area's planned stations completed and considered effective for stock assessment by the end of the week beginning on the date show for 2017. Highlighted cells are the week in which 50% of setline survey work in that area, cumulatively, was completed.

Weight Per Unit Effort

The FISS covers commercial as well as non-commercial fishing grounds, so the average WPUE for all regulatory areas surveyed was below that of the commercial fleet (Table 6). Not all of the WPUE data included in this report are used in the stock assessment analysis. Three setline survey stations located in the Closed Area (stations 7041, 7047, and 7048; see IPHC [2017a]) fall in the 4A Edge charter region and are listed in Area 4A, but are included in Areas 4CDE for stock assessment purposes. Thirteen stations in southeast Alaska's inside waters occur at a spatial density that is not acceptable for the stock assessment, and are not used in assessment or stock distribution calculations. Detailed information regarding pounds of O32 Pacific halibut and average WPUE by regulatory and statistical area are provided in Table 7 for effectively surveyed stations. Table 8 provides detailed average WPUE for the statistical areas of the Eastern Bering Sea island cluster stations.

Compared to 2017 results, setline survey WPUE increased in Regulatory Areas 2C (+23%), 4A (+2%), 4C (+28%), and 4D (+95%). WPUE decreased in Regulatory Areas 2A (-53%), 2B (-10%), 3A (-10%), 3B (-20%) and 4B (-7%) (Table 6, Figure 6). Since 2011, Area 2C's WPUE has exceeded Area 3A's, and has been the highest WPUE of all the regions (Figure 6).

As seen in Figures 7 and 8, setline survey WPUE increased by 17% in the Oregon charter region, but decreased by 70% in the Washington region. WPUE increased in two out of the four regions of Area 2B, with Charlotte and St. James increasing by 4% and 7%, respectively. In the Vancouver (-39%) and Goose Island (-34%) charter regions, WPUE decreased. WPUE in Area 2C increased in the Sitka (+18%), Ommaney (+12%), and Ketchikan (+44%) charter regions.

In Area 3A, WPUE increased in the PWS (+2%), Shelikof (+74%), and Portlock (+21%) charter regions, while decreases were observed in Fairweather (-27%), Yakutat (-16%), Seward (-14%), Gore Point (-43%), and Albatross (-16%). Area 3B WPUE decreased in Chignik (-19%), Sanak (-36%), Semidi (-23), Shumagin (-2%), and Trinity (-16%) regions when compared to last year. (Figure 7). All four charter regions along the Aleutian chain increased in 2017 as compared to last year, with Attu region's WPUE increasing by 13%, and Adak and Unalaska up 3%. On the Bering Sea continental shelf, WPUE for St. Paul Island decreased by 2% and stations around St. George increased by 30%. The 4A Edge and 4D Edge region's WPUE increased by 8% and 98%, respectfully.

Table 6. Average setline survey and commercial WPUE (lb/skate) of Pacific halibut from 2013 to 2017[1,2].

Reg. Area	Year	Effective Stations	Setline survey WPUE	Commercial WPUE	% of Commercial	Areas Surveyed
2A	2013	111	24	132	18.2%	Northern California to Cape Flattery
	2014	162	18	116	15.5%	Northern California to Cape Flattery, Puget Sound
	2015	96	31	110	28.2%	OR-CA Border to Cape Flattery
	2016	95	30	59	50.8%	OR-CA Border to Cape Flattery
	2017	203	14	95	14.7%	Northern California to Cape Flattery, Puget Sound
2B	2013	170	94	269	34.8%	All 2B
	2014	170	92	315	29.2%	All 2B
	2015	170	89	307	29.0%	All 2B
	2016	169	89	317	28.1%	All 2B
	2017	166	80	301	26.6%	All 2B
2C	2013	122	183	227	80.6%	All 2C
	2014	123	185	228	81.1%	All 2C
	2015	122	207	240	86.3%	All 2C
	2016	123	177	227	78.0%	All 2C
	2017	122	218	231	94.4%	All 2C
3A	2013	372	117	240	48.7%	All 3A
	2014	374	115	232	49.6%	All 3A
	2015	372	103	260	39.6%	All 3A
	2016	373	130	277	46.9%	All 3A
	2017	373	117	273	42.9%	All 3A
3B	2013	229	64	113	56.7%	All 3B
	2014	229	65	99	65.7%	All 3B
	2015	231	79	146	54.1%	All 3B
	2016	231	82	155	52.9%	All 3B
	2017	230	66	142	46.5%	All 3B
4A	2013	105	42	164	25.6%	4A Aleutians and 4A Edge
	2014	185	61	134	45.5%	4A Aleutians and 4A Edge
	2015	111	49	149	32.9%	4A Aleutians and 4A Edge
	2016	111	51	169	30.2%	4A Aleutians and 4A Edge
	2017	113	52	123	42.3%	4A Aleutians and 4A Edge
4B	2013	89	57	122	47.0%	4B Aleutians
	2014	89	50	167	29.9%	4B Aleutians
	2015	89	56	155	36.1%	4B Aleutians
	2016	88	56	113	49.6%	4B Aleutians
	2017	200	52	118	44.1%	4B Aleutians
4C	2013	20	35	55	64.3%	St. George and St. Paul Islands
	2014	20	44	60	73.3%	St. George and St. Paul Islands
	2015	20	44	98	44.9%	St. George and St. Paul Islands
	2016	20	60	72	83.3%	St. George and St. Paul Islands
	2017	20	77	87	88.5%	St. George and St. Paul Islands
4D	2013	58	25	151	16.4%	4D Edge and St. Matthew Island
	2014	58	23	167	13.8%	4D Edge and St. Matthew Island
	2015	58	30	157	19.1%	4D Edge and St. Matthew Island
	2016	141	19	177	10.7%	4D Edge and St. Matthew Island
	2017	58	37	301	12.3%	4D Edge and St. Matthew Island

[1] Commercial WPUE data for the current year are preliminary.
[2] Does not include ineffective, RI, or EBS expansion stations surveyed in 2015. This may differ from that used in the stock assessment.

Table 7. Number of stations effectively surveyed, total O32 Pacific halibut catch, and average setline survey WPUE (lb/skate), by statistical area in 2017[1,2].

Reg. Area	Stat. Area	Effective Stations	O32 Pacific halibut Lbs.	Avg. WPUE
2A	6	25	131	1
	7	12	788	11
	8	11	1,056	16
	9	16	1,536	16
	10	20	6,050	52
	20	20	1,792	15
	30	18	933	9
	40	27	470	3
	50	54	4,296	13
2A Total		**203**	**17,052**	**14**
2B	60	16	2,792	36
	70	13	938	14
	80	5	915	37
	90	7	2,542	72
	91	23	4,979	43
	100	1	137	28
	102	36	12,063	71
	112	31	16,068	104
	121	7	4,951	140
	130	6	8,007	265
	131	3	4,561	303
	132	9	4,181	92
	133	5	2,476	98
	134	3	521	34
	135	1	690	138
2B Total		**166**	**65,822**	**80**
2C	140	9	16,737	375
	141	8	9,878	248
	142	13	12,789	199
	143	8	4,134	104
	144	1	644	131
	150	14	22,389	319
	151	10	10,390	206
	152	3	1,767	116
	153	5	4,085	164
	160	13	18,200	278
	161	4	3,495	175
	162	6	6,326	211
	163	2	2,498	249
	170	7	7,964	226
	171	4	1,429	73
	173	6	2,308	77
	181	4	4,278	212
	182	3	3,305	219
	183	2	535	53
2C Total		**122**	**133,149**	**218**
3A	185	17	9,523	113
	190	27	10,849	81
	200	27	23,324	174
	210	17	11,056	131
	220	13	11,674	180
	230	21	14,888	143
	232	3	2,959	198
	240	31	18,597	121
	242	9	5,699	127
	250	48	21,375	89
	260	54	28,972	107
	261	19	9,512	101
	270	34	23,940	142
	271	14	5,566	79
	280	29	17,575	123
	281	10	1,867	37
3A Total		**373**	**217,375**	**117**
3B	290	54	15,280	57
	300	57	19,095	67
	310	44	17,457	80
	320	32	11,969	75
	330	25	8,290	67
	340	18	3,051	34
3B Total		**230**	**75,141**	**66**
4A	350	22	5,541	51
	360	12	965	16
	370	10	1,338	27
	380	7	4,726	135
	390	2	1,035	103
	523170	1	990	199

Reg. Area	Stat. Area	Effective Stations	O32 Pacific halibut Lbs.	Avg. WPUE
4A	523171	3	674	45
	530168	2	1,068	106
	530169	3	1,816	121
	530170	1	2,300	463
	533167	3	1,023	68
	543165	5	19	1
	543166	11	858	16
	543167	2	100	10
	550166	4	925	46
	550167	6	3,209	107
	550168	1	160	32
	553168	5	411	17
	560168	8	1,217	35
	560169	3	445	30
	560170	2	303	31
4A Total		**113**	**29,123**	**52**
4B	400	10	10,683	214
	410	10	5,579	111
	420	10	3,335	67
	430	8	2,647	66
	440	7	2,390	68
	450	7	297	9
	460	7	219	6
	470	11	537	10
	480	10	493	10
	490	13	1,729	27
	500	6	555	18
	510	1	0	0
	513176	3	1,139	76
	513177	1	1,491	303
	513178	2	1,662	164
	513179	1	76	15
	513277	1	70	14
	513278	8	818	20
	513279	4	143	7
	520172	3	2,392	159
	520173	8	3,593	89
	520174	3	1,461	101

Reg. Area	Stat. Area	Effective Stations	O32 Pacific halibut Lbs.	Avg. WPUE
4B	520175	4	1,733	85
	520176	1	361	73
	520179	6	1,244	42
	520275	2	0	0
	520276	4	653	33
	520277	4	508	26
	520278	1	425	85
	520279	6	515	17
	523172	1	2,030	413
	523173	1	233	49
	523179	4	125	6
	523272	1	46	9
	523273	3	112	7
	523274	4	950	48
	523279	1	0	0
	530179	2	0	0
	530272	1	483	97
	533179	3	467	31
	533279	2	194	20
	540279	5	58	2
	543276	5	0	0
	543278	4	941	48
	543279	1	0	0
4B Total		**200**	**52,386**	**52**
4C	563169	10	3,891	78
	570169	1	300	43
	570170	9	4,824	77
4C Total		**20**	**9,015**	**76**
4D	563171	3	14	1
	563173	2	13	1
	570173	4	65	2
	573173	2	145	10
	580174	1	566	81
	580175	1	981	141
	583174	5	233	7
	583175	3	169	8
	583176	1	18	3
	583177	3	407	19

Reg. Area	Stat. Area	Effective Stations	O32 Pacific halibut Lbs.	Avg. WPUE
4D	590176	2	518	37
	590177	6	939	22
	590178	2	644	46
	593176	3	142	7
	593177	7	1,253	26
	593178	4	1,726	62
	600172	4	3,822	137
	600173	1	111	16
	603172	3	1,009	48
	603173	1	2,152	309
4D Total		**58**	**14,926**	**37**
Grand Total		**1485**	**613,990**	**85**

[1]O32 Pacific halibut pounds and WPUE (lb/skate) are calculated from the length distribution of the catch converted to weight using a standard length-weight relationship (Clark 1992), not from recorded weights of Pacific halibut sold.
[2]Does not include rockfish index stations.

Table 8. Average setline survey WPUE for Eastern Bering Sea island cluster stations, 2017[1,2].

Reg. Area	Stat. Area	Location	Effective Stations	O32 Pacific halibut Lbs.	Avg. WPUE
4C	563169	St. George	10	3,891	78
St. George Total			**10**	**3,891**	**78**
4C	570169	St. Paul	1	300	43
4C	570170	St. Paul	9	4,824	77
St. Paul Total			**10**	**5,124**	**60**
4D	600172	St. Matthew	4	3,822	137
4D	600173	St. Matthew	1	111	16
4D	603172	St. Matthew	3	1,009	48
4D	603173	St. Matthew	1	2,152	309
St. Matthew Total			**9**	**7,093**	**128**
	Grand Total		**29**	**16,108**	**101**

[1]O32 Pacific halibut pounds and WPUE (lb/skate) are calculated from the length distribution of the catch converted to weight using a standard length-weight relationship (Clark 1992), not from recorded weights of Pacific halibut sold.
[2]Values from individual statistical areas are rounded, which may lead to slight discrepancies in total values.

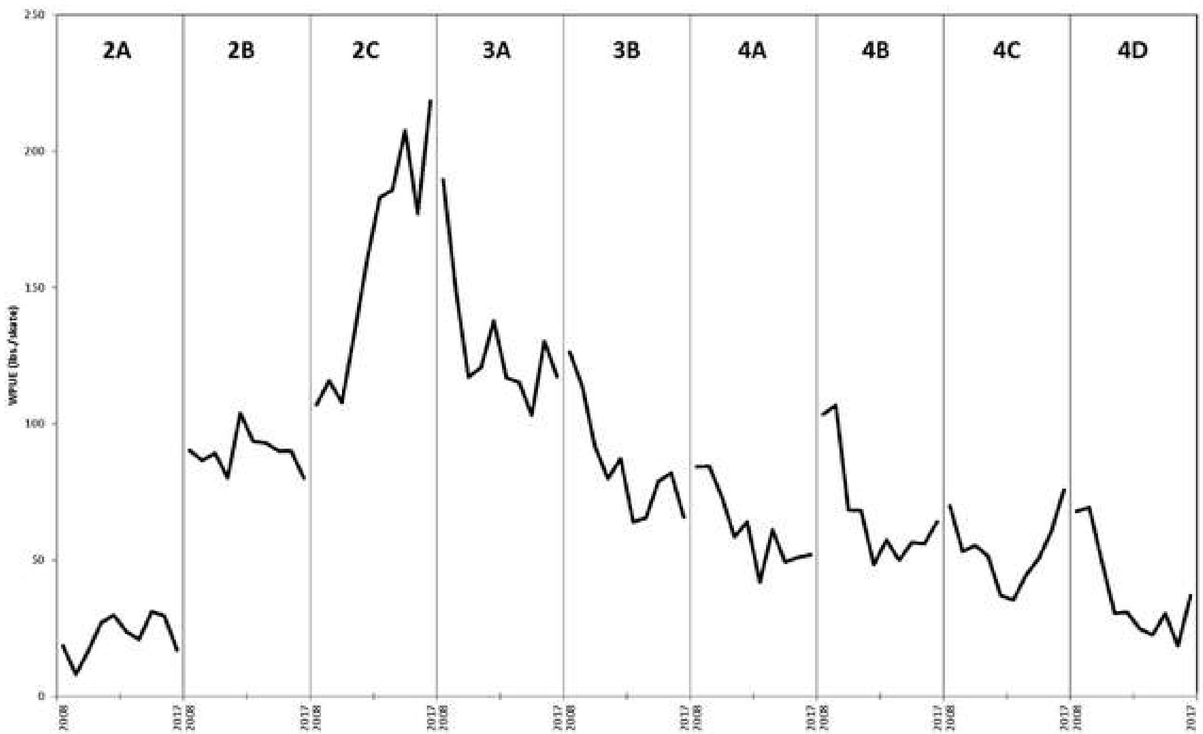

Figure 6. Average O32 WPUE (lbs/skate) of Pacific halibut by IPHC Regulatory Area from all effective standard grid and expansion stations occupied on 2008-2017 setline surveys.

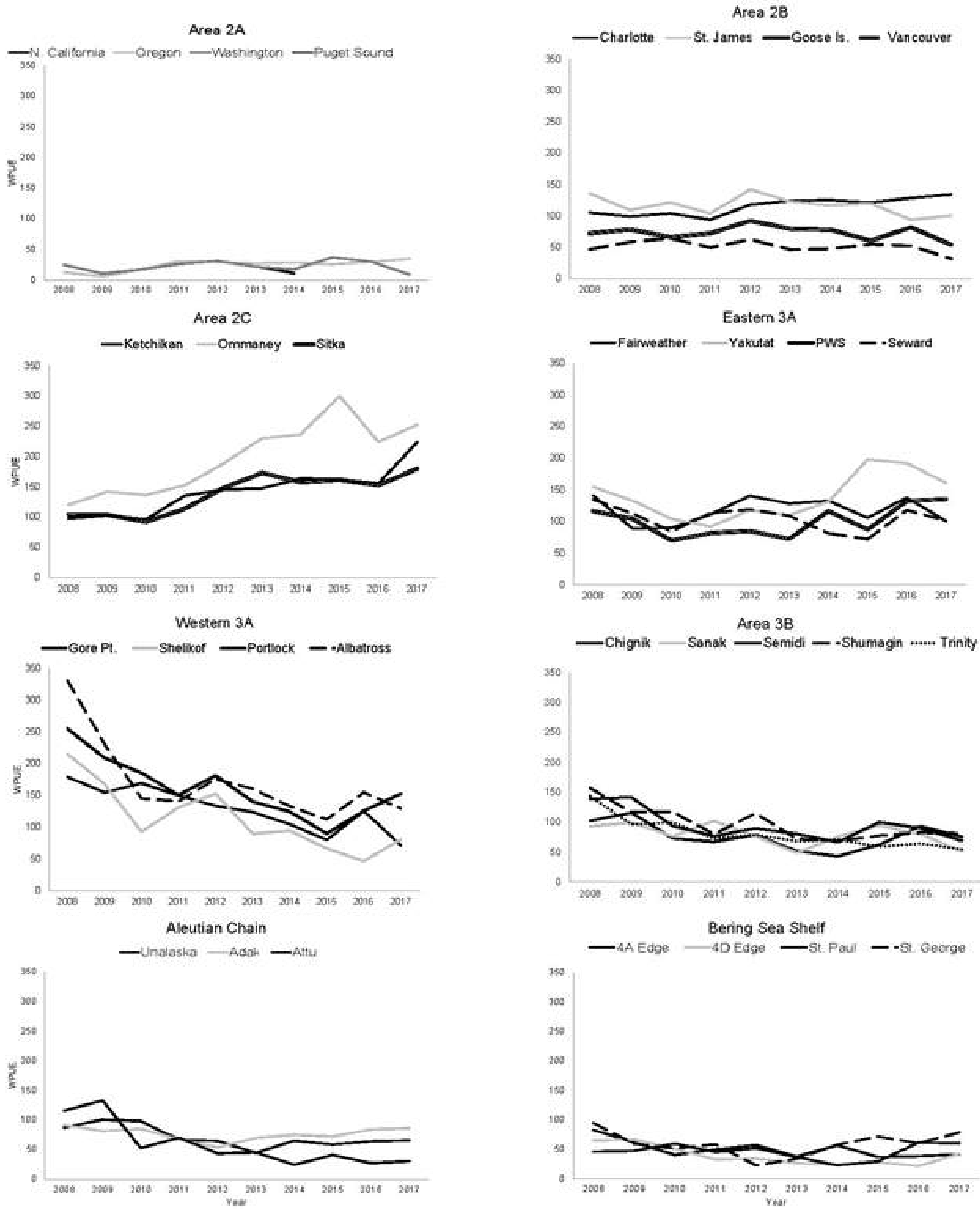

Figure 7. Setline survey WPUE (lbs/skate) by IPHC Regulatory Area 2008-2017. Individual charter regions are plotted within each Regulatory Area panel, as indicated. Includes data from effective standard grid and expansion staions.

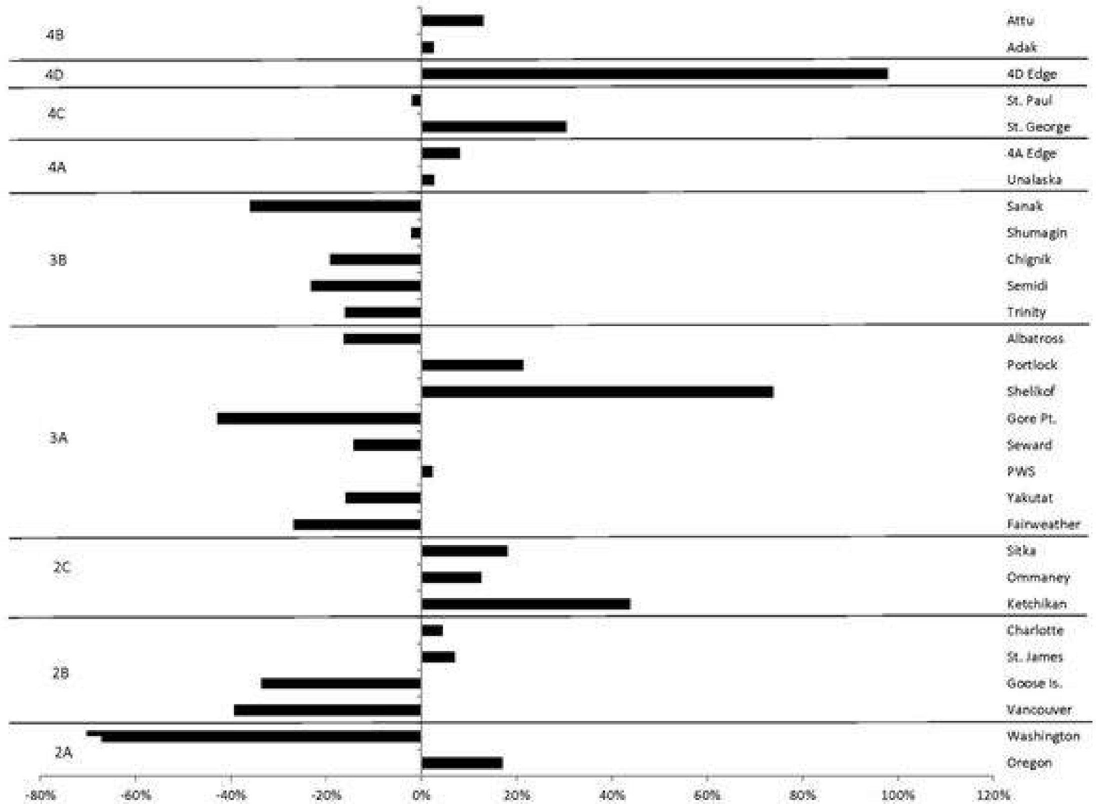

Figure 8. The percent difference between setline survey WPUE (lbs/skate) documented in 2016 as compared to 2017 by charter region.

Numbers per unit effort

Trends in the coastwide numbers per unit effort (NPUE) since 2008 are shown in Figure 9 for both O32 and U32 Pacific halibut. There was a 31% decrease in the relative numbers of U32 caught and a 6% decrease in catch rates of O32 length Pacific halibut when compared to 2016 (Figure. 9). In 2017, there were 16% more U32 Pacific halibut captured than O32 Pacific halibut, which is a 9% decrease in difference from 2016.

Some interesting trends can be noted when NPUE is observed by Regulatory Area (Figure 10). A larger NPUE of O32 as compared to U32 Pacific halibut was seen in all Regulatory Areas except for 3B and 4A. In 2017, Area 2C showed an increase in O32 Pacific halibut with a decrease in U32 Pacific halibut average NPUE. Area 2B had slight decreases in both O32 and U32 average NPUE. Area 4A had a slight increase in both O32 and U32 Pacific halibut rate of capture. Area 3B continues to have the largest gap between O32 and U32 Pacific halibut, with a difference of 51% between the two groups.

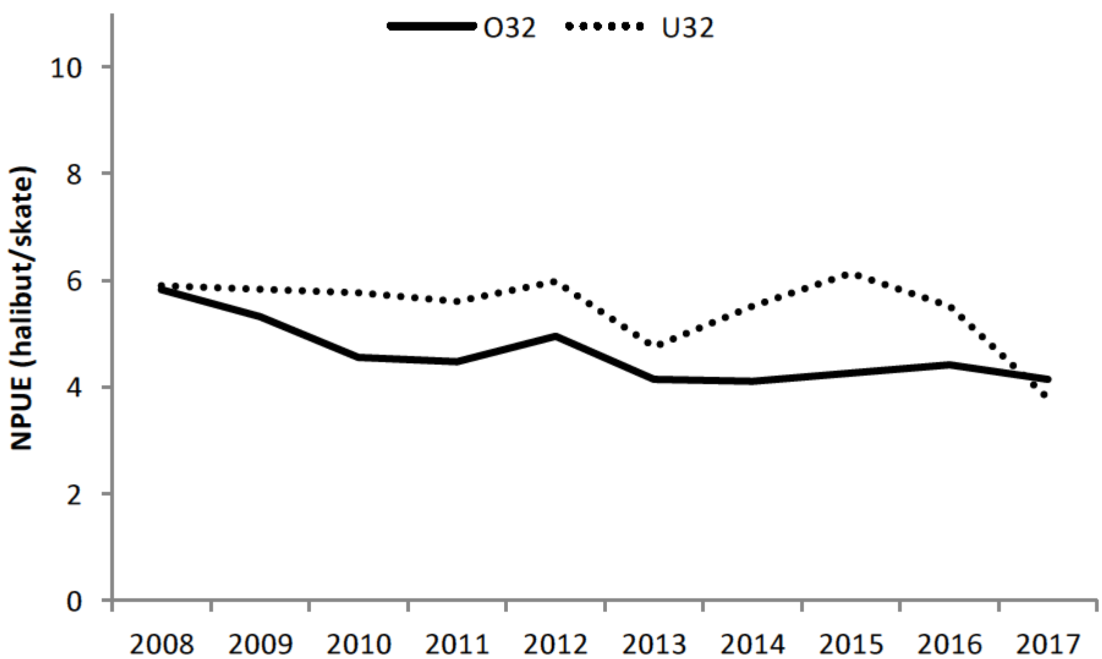

Figure 9. Setline survey NPUE (Pacific halibut/skate) coastwide from 2008-2017. Includes data from SG and ES effective stations.

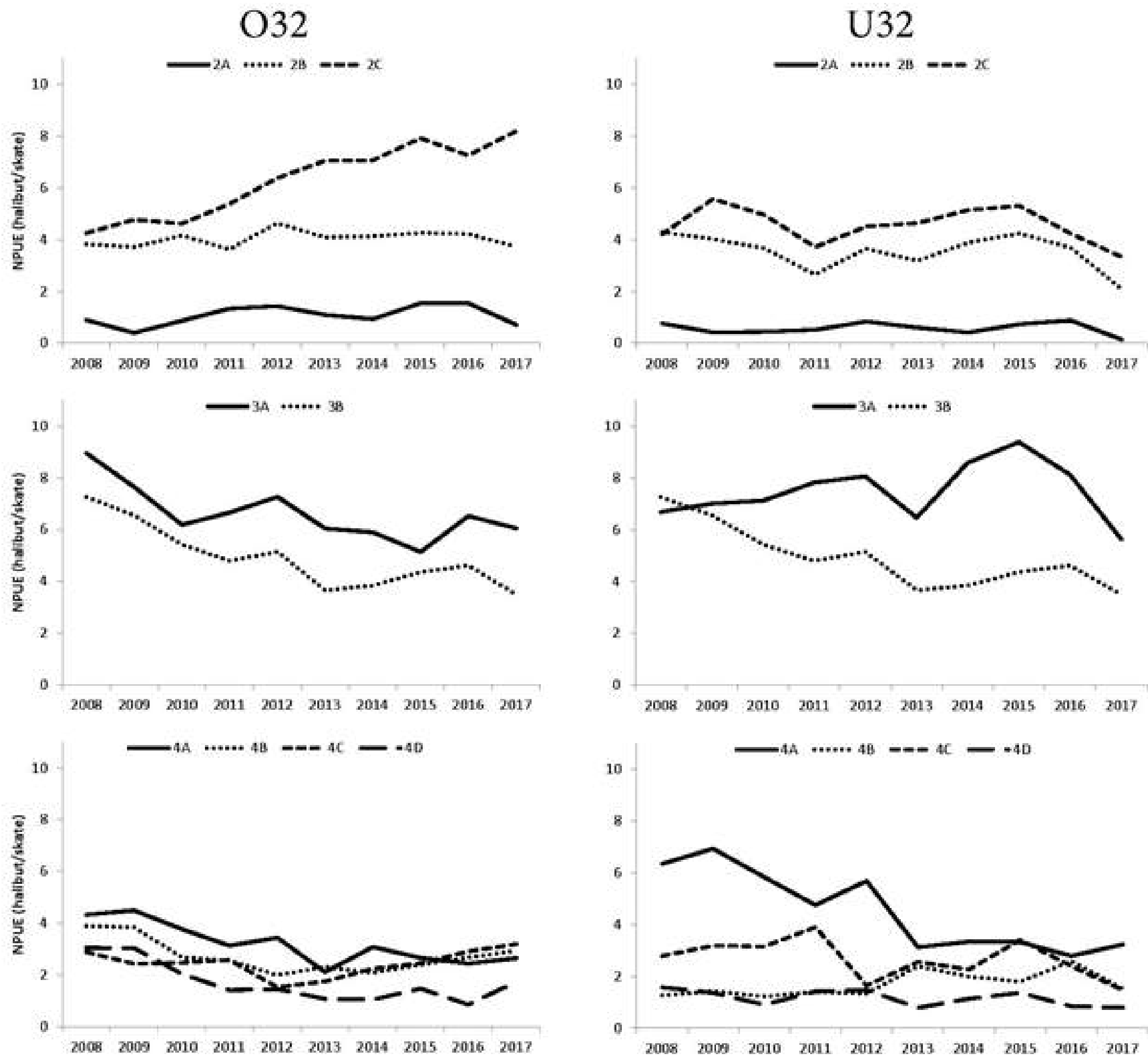

Figure 10. Setline survey NPUE (Pacific halibut/skate) by IPHC Regulatory Area from 2008 to 2017. Individual charter regions are plotted within each Regulatory Area panel, as indicated. O32 Pacific halibut is on the left, U32 on the right. Includes data from effective standard grid and expansion stations.

Length distribution

Slightly less than 47% of Pacific halibut caught on the setline survey were smaller than the current commercial legal size limit (U32 Pacific halibut), with a median length of 79 cm coastwide (Table 9). In 2017, the median lengths of Pacific halibut captured increased in all Regulatory Areas except 4A (Figure 11). Regulatory Areas 3A, 3B, and 4A had median lengths below the legal-size limit (Figure. 15). In 2017, the largest median length was in Area 2A (97 cm). The length frequency distribution of Pacific halibut from catches in the 2017 FISS, by Regulatory Area, are illustrated in Figure 12.

Table 9. Number of Pacific halibut caught on setline survey by 5-cm length category and regulatory area in 2017. The 80-84 cm category is divided to show the U32/O32 split within that category[1].

Fork Length (cm)	Regulatory Area									Setline survey Total	% of Setline survey Removals
	2A	**2B**	**2C**	**3A**	**3B**	**4A**	**4B**	**4C**	**4D**		
30-34						1				1	0.002
40-44				1	2					3	0.005
45-49			1	11	18	2				32	0.058
50-54		1	8	48	73	25	3	2		160	0.291
55-59	1	14	35	136	258	104	8	7	5	568	1.033
60-64	4	49	91	567	852	299	44	24	16	1,946	3.540
65-69	11	178	241	1,577	1,784	438	128	26	61	4,444	8.084
70-74	36	467	519	2,650	2,445	413	333	35	76	6,974	12.686
75-79	80	726	815	3,844	2,101	398	488	58	113	8,623	15.685
80-81	43	296	330	1,615	645	138	182	25	46	3,320	6.039
Total U32 Pacific halibut	**175**	**1,731**	**2,040**	**10,449**	**8,178**	**1,818**	**1,186**	**177**	**317**	**26,071**	**47.4**
82-84	53	533	566	2,230	785	217	278	33	74	4,769	8.675
85-89	102	671	849	2,822	981	326	460	72	155	6,438	11.711
90-94	112	512	686	1,898	692	285	425	63	127	4,800	8.731
95-99	81	322	574	1,226	470	203	297	54	99	3,326	6.050
100-104	99	258	409	889	336	151	236	42	73	2,493	4.535
105-109	82	174	315	584	218	94	183	31	50	1,731	3.149
110-114	90	146	313	453	159	71	146	25	38	1,441	2.621
115-119	49	119	275	321	94	53	93	18	19	1,041	1.894
120-124	34	91	264	238	79	35	67	11	26	845	1.537
125-129	16	82	183	183	73	18	40	11	10	616	1.121
130-134	8	48	141	123	39	11	29	8	11	418	0.760
135-139	6	40	135	101	31	7	19	4	7	350	0.637
140-144	2	23	107	57	9	5	24	7	3	237	0.431
145-149	1	14	58	26	10	3	14	2	2	130	0.236
150-154		8	39	19	1		10	1		78	0.142
155-159		11	25	13	2	1	8		2	62	0.113
160-164		2	16	13	1		4		3	39	0.071
165-169		6	13	3	2	2	5	1		32	0.058
170-174		3	11	3	1	1	3			22	0.040
175-179		1	8	1			1		1	12	0.022
180-184			4	2			2	1		9	0.016
185-189		1	6	4						11	0.020
190-194				1						1	0.002
205-209			1							1	0.002
210-215				1			1			2	0.004
Total O32 Pacific halibut	**735**	**3,065**	**4,998**	**11,211**	**3,983**	**1,483**	**2,345**	**384**	**700**	**28,904**	**52.6**
Total Pacific halibut	**910**	**4,796**	**7,038**	**21,660**	**12,161**	**3,301**	**3,531**	**561**	**1,017**	**54,975**	**100.0**

[1]Excludes Pacific halibut from rockfish index stations and ineffective stations.

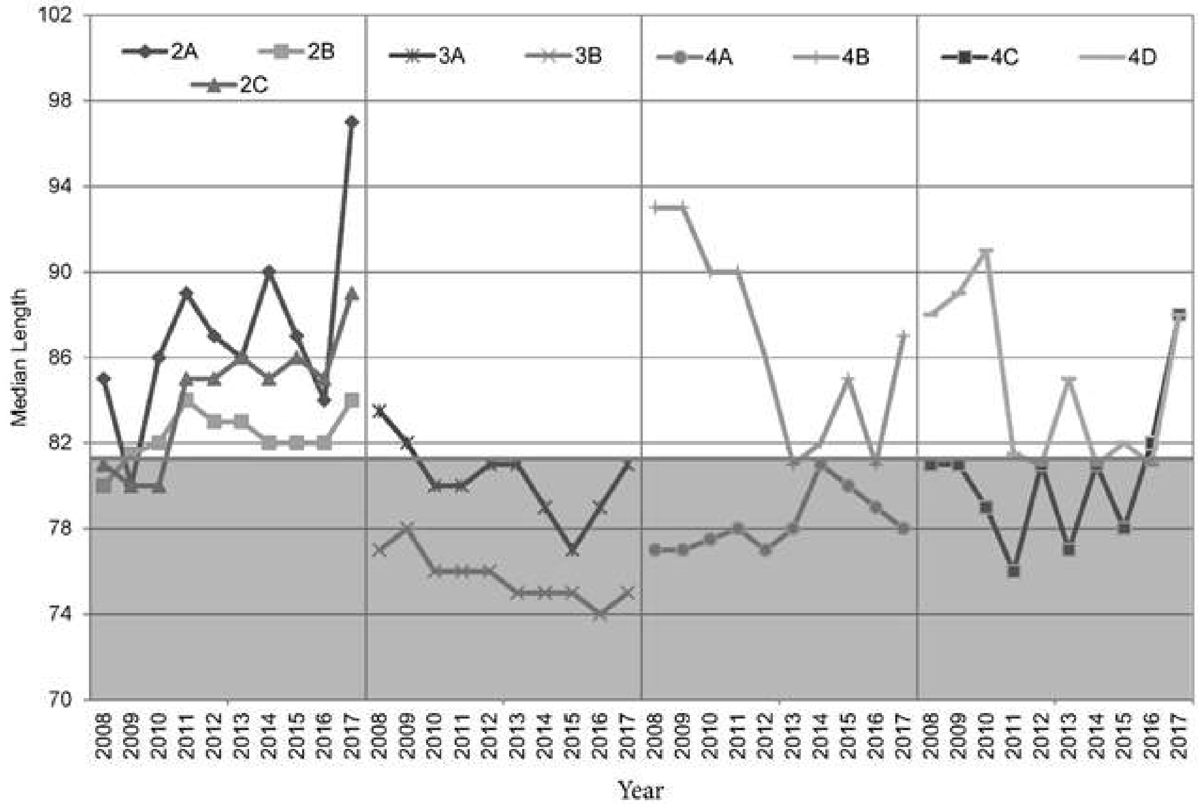

Figure 11. Median length of Pacific halibut caught on setline survey, by Regulatory Area, from 2008 to 2017.The shaded area shows length below the current commercially-legal size limit. Includes data from effective standard grid and expansion stations.

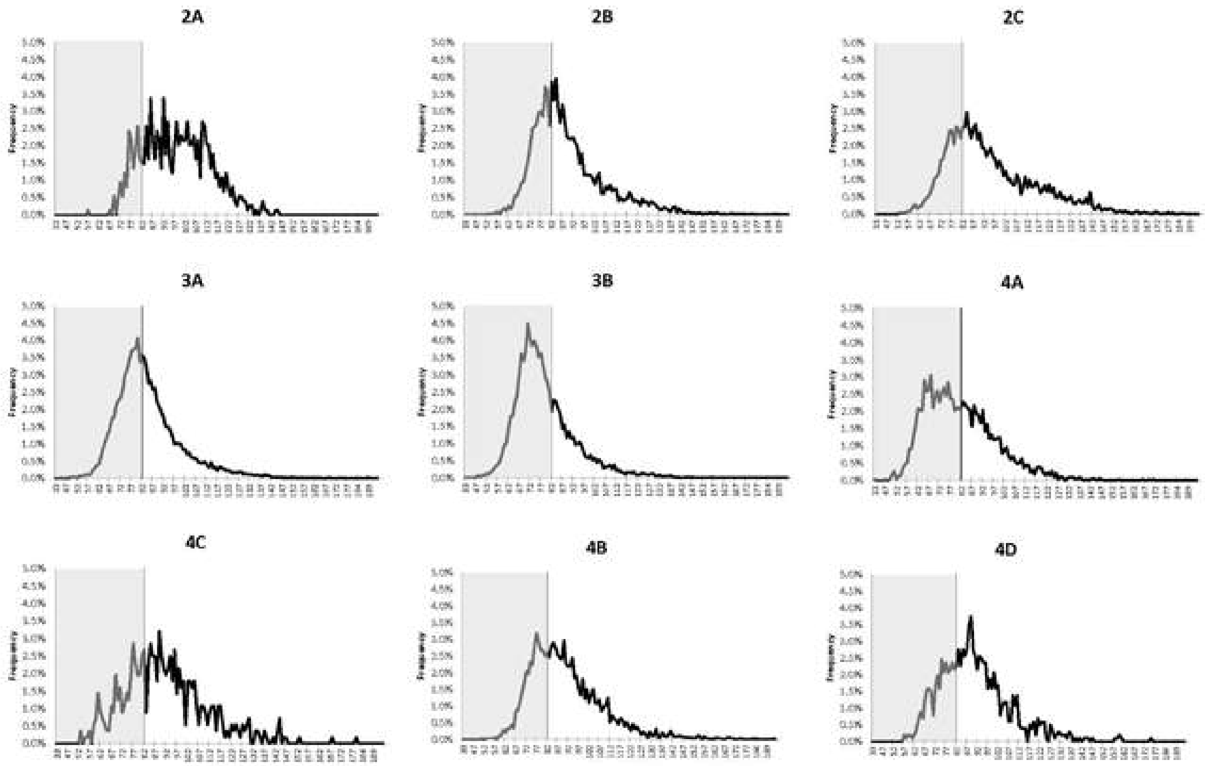

Figure 12. The length (cm) frequency distribution of Pacific halibut, by Regulatory Area, from catches in the 2017 setline survey. Shaded areas denote smaller thtn current legal commercial size limit. Catch from rockfish index staions not included.

Sex composition

The sex composition for Pacific halibut captured and sampled for otolith collection has shown considerable variation among areas, ranging from 41% to 87% females (Figure 13). Regulatory Area 4B had the lowest percentage of females in the catch, and has been consistently below 50% since 1998. Area 4C currently has the highest percentage of females, observing the first decrease in the past couple of years. Most female Pacific halibut caught during the setline survey period (i.e., summer months) were in the ripening stage and expected to spawn in the upcoming season.

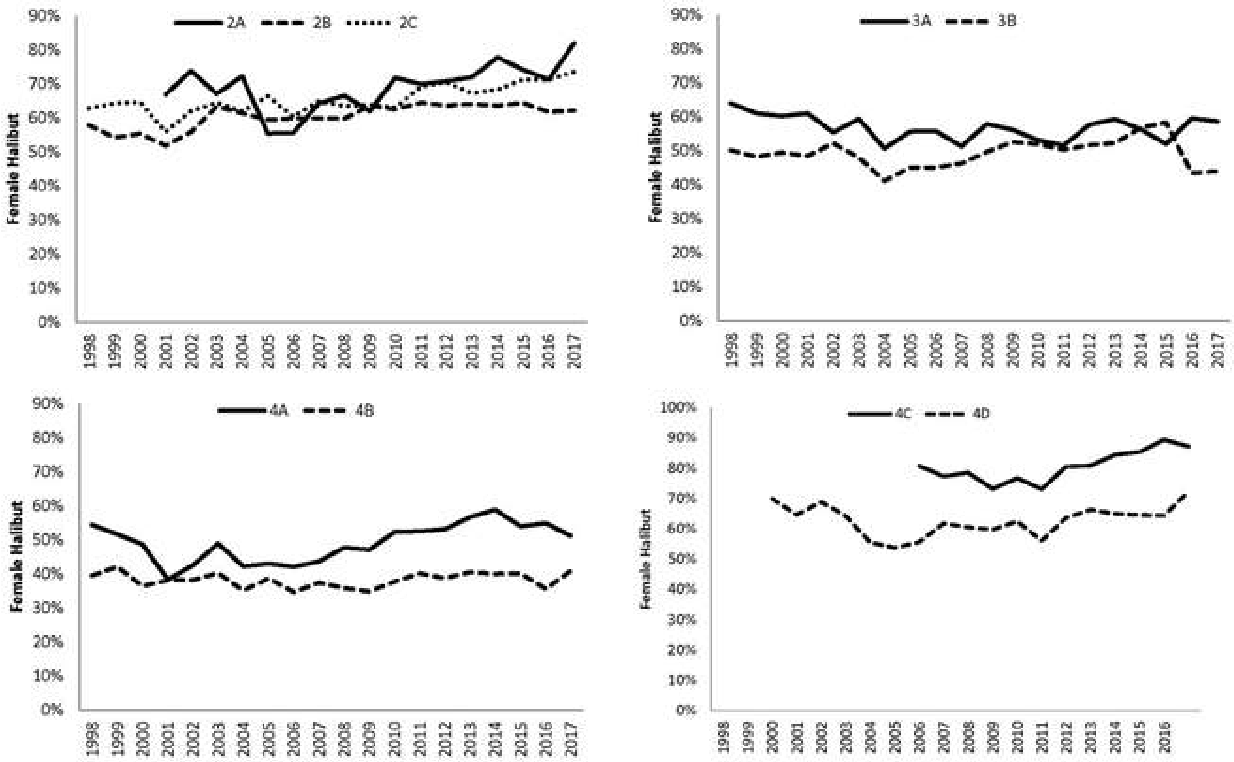

Figure 13. Percentage of Pacific halibut captured and sampled for otolith collection that was composed of females, by Regulatory Area, from 1998 to 2017.

Otolith collection

The otolith collection goal for the 2017 setline survey was 2,000 otoliths per Regulatory Area, with a minimum target of 1,500 per area. Fewer than 1,500 otoliths were collected in Areas 2A, 4C, and 4D as the catch rates were low and there are fewer stations in these areas (Table 10). Information regarding age distributions for the 2017 setline survey can be found in Forsberg (2017a). Additional otoliths were collected in most regulatory areas for the clean otolith archive collection and details can be found in Tobin et. al. (2017).

Table 10. Otolith sampling rates of Pacific halibut captured and sampled from standard stock assessment skates during the 2017 setline survey,[1,2,3].

Reg. Area	Pacific halibut Caught	Pacific halibut Sampled	Sampling Rates			
			Expected	Overall	O32	U32
2A	918	889	100%	97%	81%	19%
2B	4,796	1,521	35%	32%	66%	34%
2C	7,089	2,163	33%	31%	74%	26%
3A	21,668	1,671	9%	8%	56%	44%
3B	12,167	1,456	13%	12%	36%	64%
4A	3,301	2,268	78%	69%	44%	56%
4B	3,629	1,456	45%	40%	64%	36%
4C	561	532	100%	95%	68%	32%
4D	1,017	966	100%	95%	68%	32%
Total	55,146	12,922				

[1]Includes Pacific halibut from ineffective stations, which are not used in stock assessment calculations.
[2]Does not include Pacific halibut lost at the roller (i.e., recorded as “0” length).
[3]Sampling rate does not include otoliths collected for the clean otolith archive collection.

Prior hooking injury results

A prior hooking injury (PHI) is defined an injury that appears to have occurred when the fish was being released during a previous capture by hook-and-line gear. A PHI code was recorded for every Pacific halibut captured (no injury, minor injury, moderate injury, severe injury, or unknown) using criteria outlined in Table11. A total of 55,144 Pacific halibut were examined during the 2017 setline survey (Table 12). Overall, the coastwide average PHI rate was 6.4% for Pacific halibut examined during the 2017 setline survey, 0.5% higher than observed in 2016 (5.9%; Table 13).

Table 11. Descriptions of prior hooking injury (PHI) categories used on the 1998-2017 fishery-independent setline surveys.

Injury locations	**Categories only apply to prior hooking injuries, if any. Worst injury of jaw, eye, & eye socket prevails.**				**Did not check or can't tell**
	None	**Minor**	**Moderate**	**Severe**	**Unknown**
Jaw	No injury	Jaw in one piece, not split or separated from head. Skin of lip may be torn, but jaw is intact.	Upper or lower jaw bone may be torn through, hanging from fish, or torn away on either side of the head. Tear may or may not include tearing through the cheek area. Lower or upper jaw may be split laterally, tearing through either snout or lower mouth.	Removal of hook has torn large flap from side of head, usually originating in cheek area. Flap, usually including part of jaw, is either hanging loosely or missing.	Did not examine the fish, or can't tell.
Eyeball & eye socket	No injury	Eye socket may be torn, but eyeball is undamaged.	Eyeball punctured.		Did not examine the fish, or can't tell.

Table 12. Prior hooking injury (PHI) data collected on 2017 fishery-independent setline survey. Length group definitions: U32 is ≤ 81 cm(32 in); O32 is ≥ 82 cm (32 in). This table does not include Pacific halibut for which the length was not recorded.

		Injuries										
Reg.	**Length**	**None**		**Minor**		**Moderate**		**Severe**		**Unknown**		
Area	**Group**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**Total**
	U32	165	94.29%	8	4.57%	1	0.57%	0	0.00%	1	0.57%	175
2A	O32	708	95.29%	27	3.63%	7	0.94%	1	0.13%	0	0.00%	743
	Total	873	95.10%	35	3.81%	8	0.87%	1	0.11%	1	0.11%	918
	U32	1,614	93.24%	83	4.79%	10	0.58%	0	0.00%	24	1.39%	1,731
2B	O32	2,725	88.91%	273	8.91%	32	1.04%	2	0.07%	33	1.08%	3,065
	Total	4,339	90.47%	356	7.42%	42	0.88%	2	0.04%	57	1.19%	4,796
	U32	1,898	92.50%	90	4.39%	6	0.29%	0	0.00%	58	2.83%	2,052
2C	O32	4,180	83.00%	637	12.65%	75	1.49%	1	0.02%	143	2.84%	5,036
	Total	6,078	85.75%	727	10.26%	81	1.14%	1	0.01%	201	2.84%	7,088
	U32	9,882	88.12%	271	2.42%	80	0.71%	2	0.02%	219	1.95%	11,214
3A	O32	10,026	95.91%	551	5.27%	139	1.33%	3	0.03%	495	4.74%	10,454
	Total	19,908	91.88%	822	3.79%	219	1.01%	5	0.02%	714	3.30%	21,668
	U32	7,810	195.94%	176	4.42%	48	1.20%	2	0.05%	145	3.64%	3,986
3B	O32	3,467	42.38%	120	1.47%	41	0.50%	3	0.04%	355	4.34%	8,181
	Total	11,277	92.69%	296	2.43%	89	0.73%	5	0.04%	500	4.11%	12,167
	U32	1736	95.49%	45	2.48%	34	1.87%	0	0.00%	3	0.17%	1818
4A	O32	1311	88.40%	121	8.16%	43	2.90%	1	0.07%	7	0.47%	1483
	Total	3047	92.31%	166	5.03%	77	2.33%	1	0.03%	10	0.30%	3,301
	U32	1,122	89.90%	35	2.80%	18	1.44%	1	0.08%	72	5.77%	1,248
4B	O32	1,984	83.36%	175	7.35%	42	1.76%	1	0.04%	178	7.48%	2,380
	Total	3,106	85.61%	210	5.79%	60	1.65%	2	0.06%	250	6.89%	3,628
	U32	153	86.44%	12	6.78%	11	6.21%	0	0.00%	1	0.56%	177
4C	O32	309	80.47%	54	14.06%	11	2.86%	0	0.00%	10	2.60%	384
	Total	462	82.35%	66	11.76%	22	3.92%	0	0.00%	11	1.96%	561
	U32	287	90.54%	28	8.83%	1	0.32%	0	0.00%	1	0.32%	317
4D	O32	586	83.71%	96	13.71%	4	0.57%	0	0.00%	14	2.00%	700
	Total	873	85.84%	124	12.19%	5	0.49%	0	0.00%	15	1.47%	1,017
Grand	**Total**	49,963	90.60%	2,802	5.08%	603	1.09%	17	0.03%	1,759	3.19%	55,144

The FISS was conducted under applicable permits, including but not limited to National Marine Sanctuaries Permits OCNMS-2017-006 and MULTI-2017-011.

Table 13. Summary of prior hooking injury (PHI) data collected during the 2017 IPHC fishery-independent setline survey. This table does not include Pacific halibut where the PHI was coded as 'unknown'.

			All Pacific halibut					U32 Pacific halibut (<82cm)			
Reg. Area	**No. of sets**	**No. std. skates**	No. examined	No. with injury	% with injury 2017	No. inj. per std. Skate	% with injury 2016	No. with injury	% with injury 2017	No. inj. per std. skate	% with injury 2016
2A	203	1,218	917	44	4.8%	0.04	5.3%	9	0.98%	0.01	6.3%
2B	166	830	4,739	400	8.4%	0.48	6.0%	93	1.96%	0.11	4.6%
2C	122	610	6,887	809	11.7%	1.33	6.0%	96	1.39%	0.16	3.2%
3A	373	1,865	20,954	1,046	5.0%	0.56	6.5%	353	1.68%	0.19	4.6%
3B	230	1,150	11,667	390	3.3%	0.34	3.8%	226	1.94%	0.20	3.0%
4A	113	565	3,291	244	7.4%	0.43	22.0%	79	2.40%	0.14	19.9%
4B	200	1,000	3,378	272	8.1%	0.27	4.8%	54	1.60%	0.05	3.6%
4C	20	140	550	88	16.0%	0.63	12.9%	23	4.18%	0.16	11.8%
4D	58	406	1,002	129	12.9%	0.32	15.6%	29	2.89%	0.07	12.3%
Total	1,485	7,784	53,385	3,422	6.4%	0.44	5.9%	962	1.80%	0.12	4.2%

Incidental Species

A total of 112 species of fish and invertebrates were caught as incidental catch during the setline survey. Hook occupancy of species groups varied by Regulatory Area (Figure 14). The predominant incidental catches in Regulatory Areas 2A, 2B, 2C, and 3A were sharks. The most frequent incidental catch in Areas 3B, 4A, and 4D was Pacific cod. In Areas 4B and 4C, the "other species" category was most common and was comprised of yellow Irish lord sculpins (*Hemilepidotus jordani*), unidentified starfish, grenadiers (*Macrouridae*), and arrowtooth flounder (*Atheresthes stomias*).

Trends in bycatch NPUE are presented in Figures 15 through 18. Bocaccio (*Sebastes paucispinus*), canary rockfish (*S. pinniger*), and yelloweye rockfish (*S. ruberrimus*) populations are of concern in Areas 2A, 2B, and 2C, and their numbers often drive catch regulations. Catch rates of bocaccio and canary rockfish are so low on the IPHC FISS that it is difficult to make any inferences from them (Figure 15). Trends in bycatch NPUE over the last ten years for the other major incidentally-captured species and species groups show that the encounter rate for most remained relatively constant over time (Figures 15 - 18).

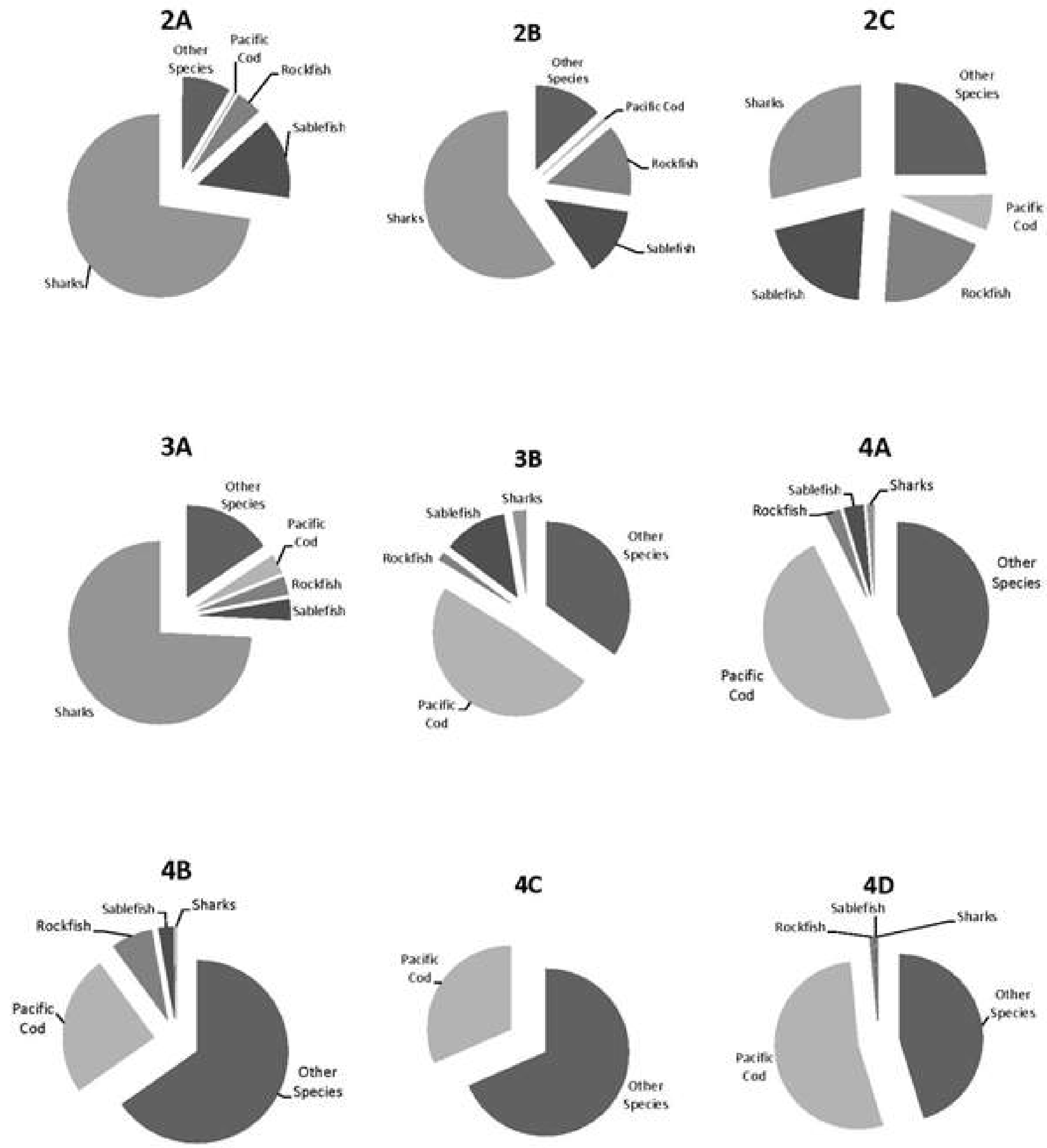

Figure 14. Percent hook occupancy of incidental catch by major species categories in the 2017 IPHC FISS by Regulatory Area.

Bocaccio

Regulatory Area	Trend	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
2A		0.012	0.000	0.000	0.009	0.000	0.000	0.000	0.000	0.000	0.000
2B		0.038	0.020	0.011	0.023	0.014	0.005	0.011	0.008	0.008	0.002
2C		0.012	0.000	0.000	0.054	0.000	0.007	0.000	0.000	0.020	0.000
3A		0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000

Canary Rockfish

Regulatory Area	Trend	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
2A		0.024	0.000	0.037	0.017	0.006	0.005	0.009	0.056	0.097	0.010
2B		0.044	0.058	0.026	0.034	0.017	0.059	0.029	0.027	0.020	0.031
2C		0.089	0.071	0.144	0.047	0.048	0.086	0.097	0.034	0.054	0.041
3A		0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Yelloweye Rockfish

Regulatory Area	Trend	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
2A		0.346	0.163	0.179	0.140	0.204	0.171	0.190	0.117	0.051	0.071
2B		1.004	1.158	1.286	0.952	0.861	0.848	0.601	0.596	0.910	0.907
2C		0.997	1.325	1.614	1.173	1.381	1.287	1.389	1.198	1.273	1.141
3A		0.609	0.421	0.510	0.427	0.501	0.319	0.456	0.418	0.461	0.464
3B		0.096	0.148	0.117	0.145	0.108	0.119	0.131	0.196	0.231	0.067
4A		0.119	0.121	0.091	0.072	0.038	0.040	0.042	0.053	0.046	0.137
4D		0.000	0.000	0.000	0.000	0.000	0.014	0.000	0.000	0.000	0.000

Figure 15. Ten-years of NPUE (numbers per standardized 100-hook skate) for bocaccio, canary and yelloweye rockfish on IPHC's fishery-independent setline surveys across Regulatory Areas.

Arrowtooth Flounder											
Regulatory Area	Trend	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
2A		0.155	0.129	0.112	0.052	0.258	0.254	0.071	0.066	0.080	0.018
2B		1.313	1.586	1.465	1.180	0.939	0.716	0.755	0.745	0.813	0.364
2C		1.535	1.686	1.362	0.963	0.964	0.876	0.865	0.751	0.422	0.764
3A		1.323	1.735	1.200	1.245	1.168	0.950	1.068	0.882	0.443	0.158
3B		2.318	1.231	1.446	1.341	0.502	0.764	1.244	0.965	0.916	0.777
4A		1.917	2.016	0.970	1.136	1.074	0.582	0.833	1.029	1.129	1.068
4B		1.100	0.938	1.348	1.233	0.290	0.777	0.482	0.859	0.709	0.848
4C		0.202	0.564	0.165	0.209	0.083	0.375	0.179	0.150	0.374	0.125
4D		3.263	1.692	1.357	2.476	1.395	1.050	0.739	1.881	1.288	0.813

Sablefish (Blackcod)											
Regulatory Area	Trend	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
2A		4.335	2.798	2.186	1.808	1.356	0.924	1.080	1.839	2.084	1.097
2B		2.805	2.814	2.976	2.607	1.876	2.176	1.438	2.039	2.373	1.937
2C		3.840	2.917	3.310	4.359	3.262	3.955	3.205	2.338	2.525	2.660
3A		2.655	3.576	2.965	2.927	2.338	1.823	2.094	1.290	1.209	0.834
3B		2.707	2.570	2.113	3.030	1.913	1.042	1.272	0.576	0.945	1.337
4A		0.981	0.538	0.816	0.699	0.798	0.773	0.444	0.422	0.423	0.785
4B		0.428	0.269	0.267	0.437	0.506	0.459	0.426	0.313	0.255	0.348
4D		0.104	0.138	0.022	0.000	0.029	0.101	0.025	0.000	0.012	0.037

Figure 16. Ten-years of NPUE (numbers per standardized 100-hook skate) for arrowtooth flounder and sablefish on IPHC's fishery-independent setline surveys across Regulatory Areas**.**

Pacific Cod											
Regulatory Area	Trend	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
2A		0.000	0.000	0.000	0.000	0.000	0.020	0.016	0.023	0.028	0.000
2B		0.067	0.080	0.109	0.266	0.114	0.093	0.206	0.213	0.110	0.074
2C		0.509	0.698	1.064	1.342	1.067	0.863	0.825	1.362	0.610	0.780
3A		2.500	5.336	4.753	6.029	3.983	4.270	5.726	2.360	1.178	0.770
3B		12.552	16.124	15.264	15.590	10.610	16.090	13.245	9.425	6.834	5.402
4A		11.757	12.195	10.923	13.784	10.143	11.170	12.557	14.145	12.416	10.616
4B		8.431	7.048	2.984	5.813	2.650	4.176	3.622	7.086	6.432	6.873
4C		23.384	23.271	14.987	13.303	16.160	17.062	11.977	15.250	10.104	7.750
4D		12.155	8.708	6.281	6.477	7.321	6.284	10.977	15.153	11.204	9.914

Spiny Dogfish											
Regulatory Area	Trend	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
2A		4.073	3.518	3.111	10.98	8.692	7.311	7.582	7.786	6.139	6.163
2B		10.6	16.16	12.96	12.83	7.839	10.34	7.51	5.572	5.502	8.757
2C		6.915	6.195	6.485	4.284	4.54	5.203	3.022	1.622	2.74	3.678
3A		16.21	8.346	12.89	7.256	8.682	4.658	5.533	7.366	11.29	16.81
3B		0.249	0.433	0.15	0.149	0.069	0.159	0.087	0.089	0.061	0.063
4A		0.119	0.047	0.051	0.032	0.046	0.112	0.038	0.053	0.008	0.027
4B		0.232	0.008	0.043	0.039	0.028	0.075	0.032	0	0	0
4C		0	0	0	0	0	0	0.036	0	0	0
4D		0	0	0.011	0	0	0	0	0	0	0

Figure 17. Ten-years of NPUE (numbers per standardized 100-hook skate) for pacific cod and spiny dogfish on IPHC's fishery-independent setline surveys across Regulatory Areas.

Rockfish											
Regulatory Area	Trend	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
2A		0.585	0.438	0.381	0.214	0.438	0.464	0.459	0.599	0.609	0.178
2B		3.256	3.692	3.033	2.651	2.165	2.23	1.913	1.553	2.344	2.039
2C		2.904	3.39	3.541	3.227	2.886	3.464	3.529	2.929	2.84	2.578
3A		1.277	1.051	1.01	0.798	1.139	0.957	0.958	0.859	0.876	0.719
3B		0.157	0.281	0.182	0.225	0.209	0.238	0.243	0.3	0.339	0.171
4A		0.431	0.8	0.399	0.429	0.284	0.303	0.313	0.554	0.415	0.575
4B		0.753	1.24	1.694	1.349	0.73	1.199	0.916	1.059	0.889	1.443
4D		0.155	0.288	0.215	0.331	0.158	0.187	0.16	0.232	0.087	0.172

Skates											
Regulatory Area	Trend	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
2A		0.776	0.438	0.597	0.583	0.78	0.396	0.492	0.711	0.695	0.391
2B		1.074	1.161	1.211	1.141	1.16	1.196	1.19	1.042	0.913	0.746
2C		1.549	2.023	1.788	1.491	1.997	2.628	1.656	1.938	1.36	1.618
3A		2.551	3.481	2.647	3.053	3.851	2.968	3.53	2.622	2.598	2.295
3B		2.855	2.901	3.42	2.461	2.811	2.953	2.298	1.915	2.557	1.635
4A		4.65	4.166	4.377	4.06	3.667	3.944	4.947	4.42	4.003	4.719
4B		5.339	5.139	5.658	4.62	2.715	4.672	3.373	4.887	3.509	6.112
4C		8.838	3.421	1.054	1.626	2.749	3.079	1.645	1.3	0.998	3.208
4D		5.508	4.31	2.65	3.138	5.048	3.451	3.696	5.901	5.96	4.717

Figure 18. Ten-years of NPUE (numbers per standardized 100-hook skate) for rockfish (*Sebastes spp* only) and skates on IPHC's fishery-independent setline surveys across Regulatory Areas**.**

Marine Mammal Depredation Tracking

Since 2009, the IPHC has recorded marine mammal depredation events during FISS hauling operations. Sea samplers record all damaged and missing hooks to establish a baseline rate of gear damage against which to compare stations with suspected interference from marine mammal depredating species. Any toothed whales or pinnipeds within 100 meters of a setline survey vessel are identified to species level and the number recorded. Samplers also note all damaged Pacific halibut and damaged bycatch retrieved during these encounters. In 2017, marine mammals approached IPHC-chartered vessels during FISS gear retrieval on 58 sets (3.9% of total sets); of those, 33 encounters involved either sperm whales or killer whales (Table 14). Though damaged Pacific halibut were observed on 22 of the stations at which whales were present, no sets were deemed ineffective for Pacific halibut stock assessment because of depredation.

We hypothesize that our encounter rates may be lower than experienced by the commercial fleet because each station is occupied for a relatively short period of time and only one set of gear is deployed at each station. Unlike commercial harvesters, who focus effort on high catch areas, FISS operates in both high and low catch areas, thereby making it less efficient for whales to target. Because FISS boats move at least 10 nmi between sets, the whales also have less opportunity to identify and target setline survey gear. Setline survey vessels are instructed to move to other stations when whales are observed, and may opt to buoy-off gear during retrieval and return at a later point in time if whales appear to be targeting a set.

Table 14. Whale sightings by IPHC Regulatory Area during hauling in 2017.

Reg Area	Whale	No. sets with whales during hauling*	Total stations in Reg Area	Percent of total stations
2A	None	0	213	0%
2B	None	0	166	0%
2C	Sperm whale	2	123	2%
3A	Killer whale Sperm whale	1 5	374	0% 1%
3B	Sperm whale	1	231	0%
4A	Killer whale	13	110	12%
4B	Killer whale Sperm whale	5 2	202	2% 1%
4CDE	Killer whale	4	80	5%
	Total	33	1,499	2%

*Whales seen within 100m of gear during hauling or suspected of interacting with gear.

Field personnel

In 2017, the Commission employed 26 sea samplers, who worked a total of 1,716 person-days, including travel days, sea days, and debriefing days. The Commission typically employs two sea samplers aboard each setline survey vessel. One works on deck, handling fish and collecting the required data and biological samples. The other sea sampler, in a portable shelter, records data and observations and stores samples collected by the deck sampler. Since catch rates in Regulatory Area 2A are generally low, one sampler was deployed for all but trips 8 through 11 in the northern portion of the Washington charter region, where two samplers were deployed for 37 days. The IPHC also deployed 5 sea samplers on the National Oceanic and Atmospheric Administration Alaska Fisheries Science Center (NOAA-AFSC) trawl survey (Sadorus et al. 2017a; Sadorus et al. 2017b). The *F/V Ocean Explorer was* staffed by three IPHC samplers who split the work 41, 25, and 21 days, respectively, during the Gulf of Alaska trawl survey. The Bering Sea trawl survey also had two IPHC samplers on the *F/V Vesteraalen* or *F/V Alaska Knight*; one sea sampler was aboard for 49 days and the other sea sampler was aboard for 50 days. The trawl contracts are included in the seasonal hire totals.

Special projects

The FISS program often facilitates experiments that are not directly associated with the Pacific halibut stock assessment, yet which are valuable to IPHC and/or external agencies and researchers. The following is a comprehensive list and description of the projects that the Commission facilitated in 2017:

Rockfish sampling in Regulatory Area 2A

The IPHC sea samplers retained all rockfish caught in Regulatory Area 2A, marked them with a tag, and recorded the station and skate of capture. After the rockfish were offloaded, state biologists from Washington Department of Fish and Wildlife (WDFW) and Oregon Department of Fish and Wildlife collected additional data (such as sex, weight, length, and maturity) and biological material (such as otoliths and fin clips for genetic analysis) from each fish. Tag numbers enabled the biologists to associate the fish at the dock with the skate of capture, and thereby location and depth. In 2017, state biologists sampled 250 rockfish that were captured in Area 2A.

As in 2016, the vessel contracted for the Regulatory Area 2A charter regions fished eight rockfish index (RI) stations in addition to the IPHC FISS stations. WDFW selected the index station locations with the intent of targeting more rocky-bottom habitat than the setline survey stations. RI stations were located at 2.5 nmi intervals within the standard 10-nmi grid around IPHC station 1082 (see IPHC [2017a] for station locations). At each of the RI stations, fishing effort was reduced to three skates to limit impacts on rockfish populations. Pacific halibut captured on RI stations were measured and released alive without removing otoliths or examining gonads for sex and maturity. Data from these stations were not used in the Pacific halibut stock assessment. The IPHC has been approached by WDFW to continue the RI station work on future setline surveys, subject to budgets and ongoing sample design considerations. IPHC intends to continue collaborating with state agencies to collect detailed data regarding rockfish captured on FISS stations in Area 2A.

Rockfish sampling in Regulatory Area 2B

In cooperation and with funding from Canada's DFO and the Pacific Halibut Management Association, IPHC samplers aboard setline survey vessels working in Regulatory Area 2B recorded round weight, round length, sex, and maturity, and collected otoliths from all rockfish caught on the setline survey, according to the sampling criteria in the 2017 Protocols for Rockfish Data Collection in British Columbia (IPHC 2017b). IPHC samplers in Area 2B sampled 1,684 rockfish (representing 14 different species) for length, sex, and maturity, and collected otoliths from 1,346 rockfish. These data and otoliths were shared with DFO. This project began in 2003, and has since been conducted annually, except for 2013. This project is expected to continue in future years.

Yelloweye rockfish enumeration in Alaska

IPHC samplers recorded the capture of all yelloweye rockfish (*Sebastes ruberrimus*) encountered by setline survey vessels working in all of Regulatory Area 2C and in the Fairweather charter region in eastern Area 3A at the request of the Commercial Fisheries Division of the Alaska Department of Fish and Game (ADFG). A total of 1,187 yelloweye rockfish were recorded in 2017.

Oceanography

During FISS operations in 2017, sea samplers deployed water column profilers on every station (unless weather or tide conditions were so risky the units could be lost). Water column profilers measured chlorophyll a and pH in addition to temperature, depth, salinity, and dissolved oxygen concentration (Sadorus and Walker 2017).

Environmental contaminant sampling

IPHC sea samplers collected Pacific halibut muscle and liver samples for the Alaska Department of Environmental Conservation (ADEC) as part of an ongoing study of environmental contaminants in Pacific halibut. A discussion of these data can be found in Dykstra (2017).

Ichthyophonus sampling

In 2017, the IPHC continued investigating *Ichthyophonus* incidence in Pacific halibut. *Ichthyophonus* is a protozoan parasite from the class Mesomycetozoea, a highly diverse group of organisms with characteristics of both animals and fungi, and has been identified in many marine fish. Refer to Dykstra (2017) for more details on this project.

At-sea weights

Net weight is a fundamental concept that the IPHC uses for stock assessment, apportionment, and all facets of Pacific halibut management. However, individual net weight is not a strict biological quantity. It is the result of natural variation and variable processing procedures that occur after the fish is caught. The purpose of this study is to collect data on IPHC's FISS for use in estimating the relationship between fork length and net weight. This includes the estimation of adjustments necessary to convert head-on weight to net weight, as well as estimation of shrinkage (potentially occurring in both length and weight) from time of capture to time of offload. This study complements an on-going project, in which portions of commercial deliveries are measured and weighed at the dock. This study provides length-to-weight data that is not available at commercial offloads: from U32 Pacific halibut, round fish, and freshly eviscerated and dressed fish, allowing for measurements of shrinkage from the time of capture to final weighing at the offload.

In 2017, building on experience from the pilot project in 2016, a motion-compensating scale was used to weigh Pacific halibut on nine trips made by the *F/V Free to Wander*, fishing in the Unalaska and 4A Edge charter regions. These regions were selected because they have a high proportion of larger Pacific halibut. The scale has a maximum load of 132 pounds (60 kg) with 0.04 pounds (20 g) accuracy. In total, 612 fish were weighed and measured at sea in the round and immediately after being dressed. At the time of writing, data collected during offloads had not yet been entered and no analysis had been conducted. This project is anticipated to continue into 2018.

Spiny dogfish sampling

The IPHC samplers recorded the length and sex of the first five spiny dogfish (*Squalus suckleyi*) per station in Regulatory Areas 2 and 3, and all spiny dogfish encountered in Area 4. Spiny dogfish inhabit areas that are more effectively covered by the IPHC than other surveys. Data collected are part of a multi-year project requested by the NOAA-AFSC's Auke Bay Laboratories to compare IPHC's FISS catch rates with those from their sablefish (*Anoplopoma fimbria*) longline surveys. Species distribution will be examined and used in conjunction with tagging data to test the hypothesis that there may be two biological stocks of dogfish in Alaska: an inside population in southeast Alaska and a second that comprises those that live in coastal waters elsewhere. These data will be used to develop a length-based population dynamics model for the annual dogfish stock assessment. The IPHC samplers collected 3,096 spiny dogfish length and sex samples in 2017. This project is anticipated to continue into 2018.

Sixgill shark genetics

The Seattle Aquarium and NOAA-AFSC have been examining the population genetics of the broadnose sixgill sharks (*Hexanchus griseus*) in the North Pacific Ocean. Little is known about these sharks outside of Puget Sound. Since 2014, the IPHC has assisted the Seattle Aquarium by collecting samples of six-gill sharks caught on setline survey. Simple morphometrics (greatest length) to determine maturity and tissue samples (1-2 mm fin clips) to determine approximate age (subadult vs adult) were collected on 55 specimens in 2017. This project is anticipated to continue into 2018.

Pacific cod length frequencies

NOAA-AFSC requested and received data collected from Pacific cod captured on IPHC setline surveys to bolster data currently used by NOAA to assess the Bering Sea and Aleutian Islands Pacific cod stock. Length frequency data was collected by recording the total lengths of the first 15 Pacific cod from each skate on the IPHC setline survey vessels working the Bering Sea continental shelf edge in Regulatory Areas 4A and 4D and in Area 4B. Samplers collected 8,779 Pacific cod length samples in 2017. This project is expected to continue and expand into Area 3 in 2018.

Pop-up Archival Transmitting (PAT) tagging

A total of 22 Pacific halibut were tagged with pop-up archival transmitting tags aboard the *F/V Kema Sue* in the north Bowers Ridge charter region. Eight males, 13 females, and one “unknown”. Additional information can be found in Loher (2017).

Wire tagging

A total of 1,944 U32 Pacific halibut were tagged with wire tags during the 2017 setline survey, with a small fin tissue sample collected before the releasing of each fish. Of those tags, 1,700 were fluorescent yellow and 244 were pink. Additional information can be found in Forsberg (2017b).

Future work

The IPHC plans to continue fishing most of the current FISS stations in the near future. However, setline survey operations are dependent upon the ability of the project to remain self-funding. Although the surveys are designed exclusively to fulfill scientific needs, IPHC has adjusted fishing effort so that the ability to conduct the setline surveys on budget would withstand limited variation in Pacific halibut sale price or WPUE over the long term. If average Pacific halibut sale prices or WPUE fall substantially in the future, the Commission may need to find alternate sources of funding to collect these important data, or scale back the FISS program accordingly. The number of regions surveyed, and the extent of any pilot projects, is subject to change and is dependent upon decisions made at the IPHC's 2018 Annual Meeting.

Future fishery-independent setline survey (FISS) expansions

In 2018, it is anticipated that the setline survey will be conducted in all 27 traditional regions and the IPHC will be continuing with the setline survey expansion into Regulatory Areas 2B and 2C, as approved by the Commission in 2014. The IPHC has begun vetting the proposed expansion setline survey stations with the respective State and Federal agencies. In some cases, this also involves special permitting requirements. There are 103 expansion stations planned in 2018 in Regulatory Area 2B and 55 in Area 2C (Figure 19 & 20).

The FISS was conducted under applicable permits, including but not limited to National Marine Sanctuaries Permits OCNMS-2017-006 and MULTI-2017-011.

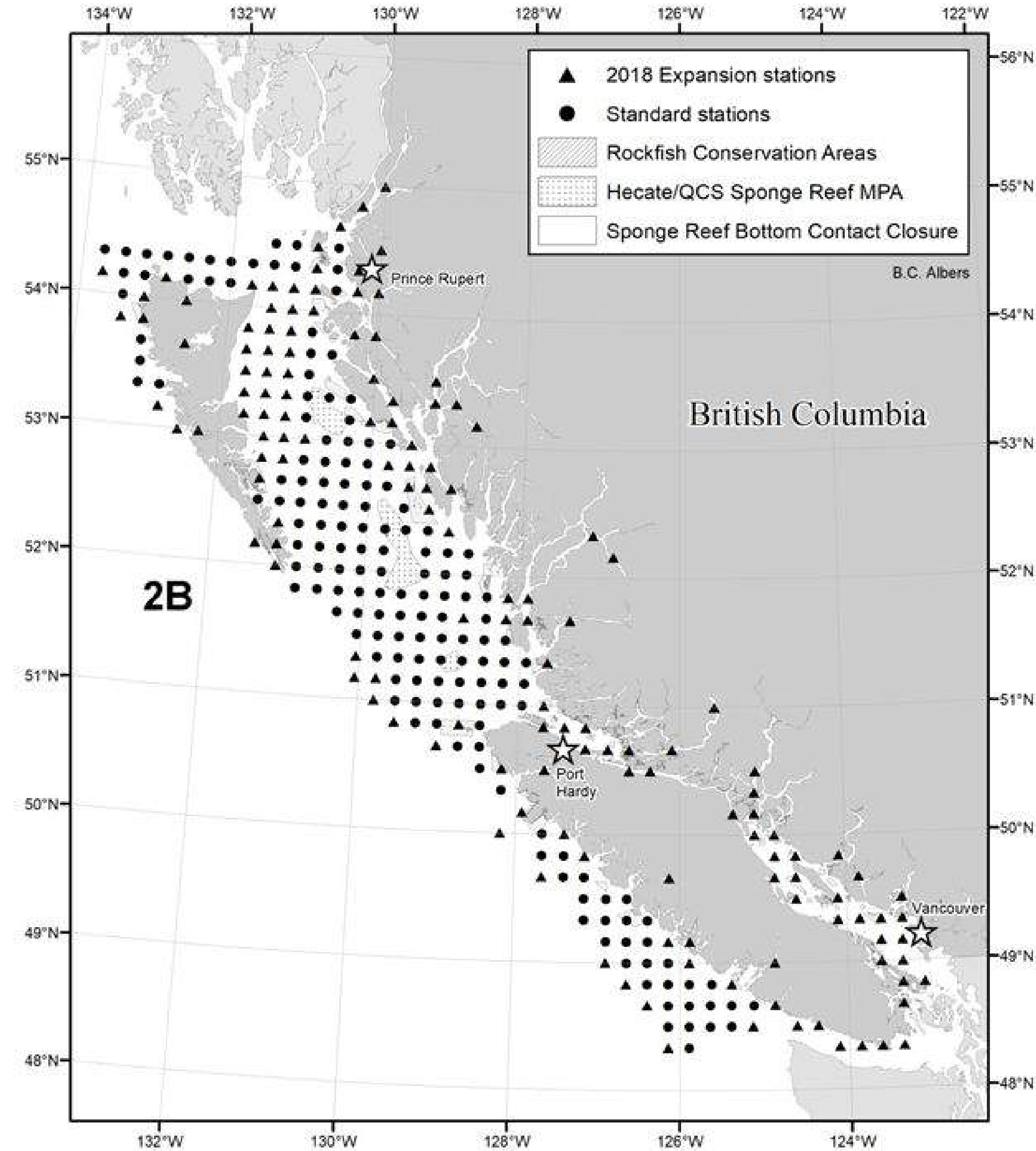

Figure 19. Proposed 2018 IPHC Regulatory Area 2B fishery-independent setline survey (FISS) stations.

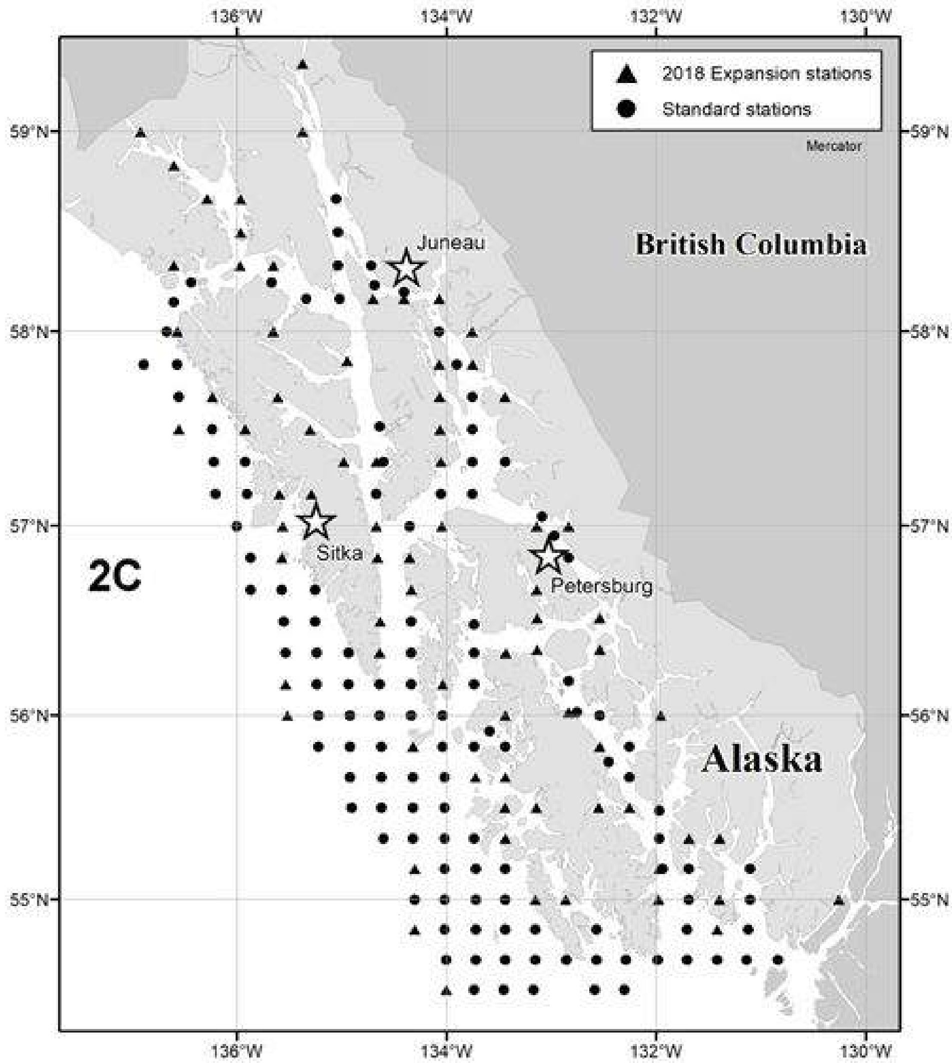

Figure 20. Proposed 2018 IPHC Regulatory Area 2C fishery-independent setline survey (FISS) stations.

For the last year of the proposed expansions (2019), the IPHC plans to move into Regulatory Areas 3A and 3B where 95 and 68 stations are being proposed to be fished, respectively (Figure 21).

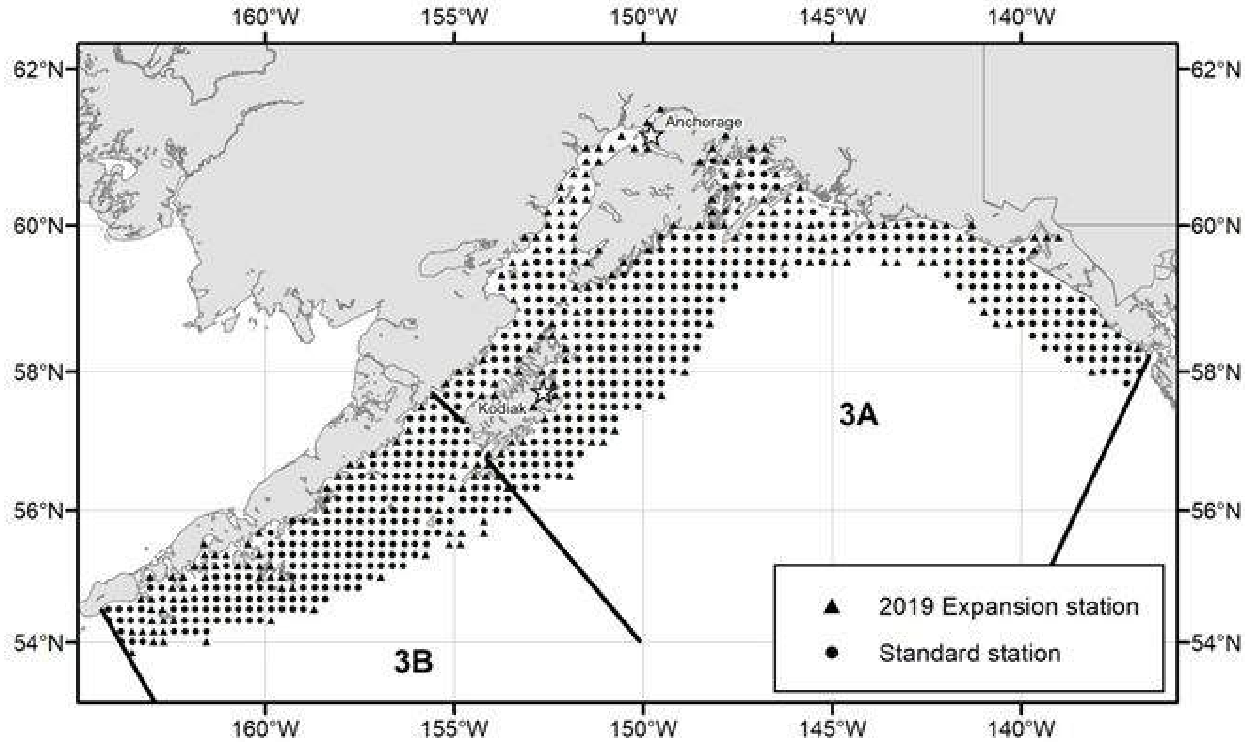

Figure 21. Proposed 2019 IPHC Regulatory Areas 3A and 3B fishery-independent setline survey (FISS) stations.

ACKNOWLEDGEMENTS

The IPHC's fishery-independent setline survey operations occur over a large geographic range, in a wide variety of weather conditions, and often involve long, demanding days. The IPHC gives special thanks to our sea samplers, charter vessel captains and crews, plant personnel, port samplers, and permanent staff, as well as those individuals from outside agencies, whose dedicated contributions and efforts made the 2017 setline survey a success.

RECOMMENDATION/S

That the Commission:

a) **NOTE** paper IPHC-2018-AM094-06 which provided an overview of the IPHC's fishery-independent setline survey (FISS) design and implementation in 2017, including current and future expansions.

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APPENDICES: Nil

Space-time modelling of fishery-independent setline survey data

PREPARED BY: IPHC SECRETARIAT (R. WEBSTER; 19 DECEMBER 2017)

PURPOSE

To provide the Commission with a summary of the methods and output of the space-time modelling in 2017, the results of this year's IPHC fishery-independent setline survey (FISS) expansions in IPHC Regulatory Areas 4B and 2A, and the results of an evaluation of previous setline survey expansions in Regulatory Areas 2A and 4A including the implications for future expansions in these areas.

BACKGROUND

In 2016, a space-time modelling approach was introduced to estimate time series of weight and numbers-per-unit-effort (WPUE and NPUE), and to estimate the stock distribution of Pacific halibut among IPHC Regulatory Areas. This represented an improvement over the largely empirical (data-based) approach used previously, as it made use of additional information within the setline survey data regarding the degree of spatial and temporal of Pacific halibut density, along with information from covariates such as depth (see Webster 2016b and 2017). The modelling also incorporated data from recent setline survey expansions in Regulatory Area 2A (2011 and 2014), Area 4A (2014) and Area 4CDE (2015 and 2016), without the need for applying ad hoc adjustment factors to account for changes in the spatial coverage of the setline survey.

At the 92nd Session of the IPHC Interim Meeting (IM092), the Commission made the following recommendation to the IPHC Secretariat:

> "*The Commission **RECOMMENDED** that the IPHC Staff develop an information paper associated with the survey expansion, which details the likely implications of periodic survey expansion on the stock assessment and apportionment, taking into consideration potential population variability of Pacific halibut in expansion areas which are infrequently surveyed. The paper shall be submitted for initial consideration at the Commission's Work Meeting in September 2017*." (IM092, para. 38)

The requested evaluation was carried in out in 2017 for Regulatory Areas 2A and 4A.

INTRODUCTION

The IPHC fishery-independent setline survey (FISS or setline survey) provides data used to compute indices of Pacific halibut density for use in monitoring stock trends, estimating stock distribution, and as an important input in the stock assessment. Stock distribution estimates are based on the annual mean weight-per-unit effort (WPUE) for each Regulatory Area, computed as the average of WPUE of O32 (greater than or equal to 32" or 81.3cm in length) Pacific halibut estimated at each station in an area. Mean numbers-per-unit-effort (NPUE) is used to index the trend in Pacific halibut density in the stock assessment models. In 2016, the IPHC Secretariat moved to a space-time modelling approach for estimating these indices and calculating estimates of stock distribution (Webster 2017), an approach that was continued in 2017.

In most IPHC Regulatory Areas, the standard, annual setline survey's 18.5 km (10 nmi) grid is fished in waters within the 37-503 m (20-275 fm) depth range. Information from commercial fishery data and other fishery-independent sources showed the presence of Pacific halibut down to depths of 732 m (400 fm) and in waters shallower than 37m in some Regulatory Areas. Further, most Regulatory Areas had significant gaps in coverage within the standard 37-503 m depth range. The incomplete coverage of Pacific halibut habitat by the setline survey likely led to biased estimates of WPUE and NPUE density indices in some Regulatory Areas that were then used in the stock assessment modelling and for stock distribution estimation. For this reason, the IPHC has been undertaking a sequence of setline survey expansions since 2014 (following a 2011 pilot), with stations added to the standard grid to cover habitat not previously sampled in our setline survey. The expansions involve adding stations to one or two Regulatory Areas each year, and reverting to the annual grid for those areas in subsequent years. In 2017, setline survey expansions took place in Areas 4B and 2A. Regulatory Area 4B's expansion resulted in a total of 202 setline survey stations, more than double the 89 annually fished stations (Figure 1).

Regulatory Area 2A's 2017 expansion had three components: a repeat of the 2014 expansion, including deep (503-732 m) and shallow (18-37 m) stations, stations within the Salish Sea, and stations in California from 39°N to 42°N (Figures 2 to 4); new stations in California from 37.75°N to 39°N (Figure 4); and additional stations off the north Washington coast (north of 46°53.3' N, within 37-503 m; Figure 2) resulting in a doubling of station density in that region. The new stations in California allowed the IPHC to get direct information on density in a region that Pacific halibut are known to inhabit (albeit at low densities), as shown by catches of Pacific halibut on the National Marine Fisheries Service (NMFS) West Coast trawl survey (Webster 2016a). The increased station density off the north Washington Coast was motivated by stakeholder concerns that the standard 18.5 km station spacing may be missing localised patches of relatively high Pacific halibut density in that region, and that a denser grid would be more likely to detect such patches if they exist.

One advantage of the space-time modelling approach is that the effect of the setline survey expansions on estimates of density indices and their uncertainty can be investigated in a straightforward manner, by comparing the estimates we obtained with those we would have obtained in the absence of the data from the expansions. In order to undertake such an evaluation, we need an expansion to have already been carried out. Further, to help assess the need for future repeats of the expansion, it helps for some time to have elapsed since the expansion took place. For this reason, this report focuses on Regulatory Area 2A, which had setline survey expansions in 2011 and 2014, and Regulatory Area 4A (expansion in 2014). Work was undertaken prior to the 2017 setline survey, so data from this year's setline survey were not included in the Regulatory Area 2A evaluation.

In this report we outline updates to the space-time modelling of WPUE and NPUE indices of density and present summaries of modelling results for 2017, and present results of the setline survey expansions in Regulatory Areas 4B and 2A. For the evaluation of the need for future repeats of setline survey expansions, we compare estimated mean WPUE and its uncertainty between models fitted using all available setline survey data and those using subsets of the data that exclude groups of expansion stations.

Space-time modelling of WPUE and NPUE

Space-time modelling of setline survey data followed the methods outlined in Webster (2017). In addition to the inclusion of new 2017 setline survey data, data from 1993 to 1997 were also used in the modelling this year. The IPHC setline survey coverage in those years was less consistent than the current annual setline survey, with not all Regulatory Areas being fished each year, or only parts of some Regulatory Areas surveyed in some years (Soderlund et al. 2012). Nevertheless, with the model able to predict in unsurveyed locations, the addition of these data allows us to extend our understanding of changes in Pacific halibut density and distribution back to 1993. Space-time models were fitted to O32 WPUE, total NPUE, and total WPUE. Of these three variables, only O32 WPUE and total NPUE were modelled in 2016.

The standard NMFS Bering Sea trawl survey grid has been fished annually (sometimes with expansions) since 1982 (Lauth and Nichol 2013), and data from this trawl survey from 1993-1997 were also included in the modelling for Regulatory Areas 4A and 4CDE. In 2017, a northern expansion of the Bering Sea trawl survey was fished for the second time (it was first fished in 2010), giving the Bering Sea complete coverage and providing valuable data for improving space-time model estimates of WPUE and NPUE in the northern Bering Sea. Data from the Alaska Department of Fish and Game's (ADFG) triennial Norton Sound trawl survey (Soong and Hamizaki 2012) are also used in the modelling, and along with new data from the 2017 ADFG trawl survey, data from 1996 were added to the data previously used.

The expanded setline survey in California allowed us to produce a direct density estimate as far south as to 37.75°N in the space-time models, where previously an adjustment scalar based on the West Coast trawl survey data had to be applied to account for Pacific halibut within 37.75°N and 39°N. In the modelling, a new covariate was included identifying stations north and south of 40°N. This was needed to improve prediction south of 40°N, where catch rates were extremely low: without this covariate, model predictions of WPUE and NPUE in this region in unsurveyed years would approach the overall Regulatory Area 2A mean, and would therefore likely be positively biased, with bias getting worse with increasing years before or after the setline surveys.

Estimated mean O32 WPUE by Regulatory Area and year is presented in Figure 1. The shaded regions represent 95% posterior credible intervals, i.e., there is a 95% chance that the true mean for each area and year is within these intervals. In general, the 95% intervals for years from 1993-97 are much wider, due to the less consistent setline survey coverage prior to the implementation of the modern annual setline survey design in 1998. In the case of Regulatory Areas 4A and 4CDE, there were no longline data prior to 1997, and the estimates are therefore highly influenced by the NMFS trawl survey data in those years. The trawl survey fishes waters shallower than the setline survey, and its stations have lower WPUE on average than setline survey stations set along the Bering Sea shelf edge. In years with no setline survey, the trawl data influences estimates at unsurveyed locations along the edge through spatial dependence, leading to lower estimates as time prior to the setline surveys increases. This is likely a factor in the low estimates of WPUE in Areas 4A and 4CDE from 1993-96.

Figure 2 compares the estimated mean O32 WPUE time series from the 2016 space-time modelling with this year's estimates. Some differences between the two sets of estimates can be expected, due to changes to the data inputs leading influencing predictions at unsurveyed locations in particular through revision of model parameter estimates. The two sets of estimated time series, however, are extremely consistent, with any differences well within the levels of uncertainty shown by the 95% intervals. Notable differences are at the terminal years of the 2016 time series (1998 and 2016), where new data (from 1997 and prior years, and 2017) influence the new estimates from those terminal years. This is due to temporal dependence in the data, and accounting for such dependence has the effect of smoothing out the time series. Another important change from 2016 is the much narrower 95% intervals for Regulatory Area 4B's O32 WPUE estimates. The 2017 expansion more than doubled setline survey coverage in that area, leading to more precise estimates not only in 2017, but in all other years because of improved predictions at unsurveyed locations.

Results from space-time modelling of total NPUE are presented in Figure 3, and a comparison with the 2016 estimates is shown in Figure 4. As with the O32 WPUE results, the 2017 estimates are generally very similar to those obtained in 2016. We have already noted the change in Regulatory Area 4B estimates above, with the data from the expanded setline survey leading to higher mean NPUE model estimates than those obtained in 2016 prior to the expansion. The other noteworthy difference from 2016 is the much greater estimates of uncertainty in the 2017 NPUE estimates in Regulatory Area 3A. This is due to high estimates of variance at unsurveyed locations, particularly within Cook Inlet which contains a large number of potential future expansion stations. This increased uncertainty appears due to the addition of 1993-1997 data affecting the estimates of the degree of spatial dependence, which was estimated to be stronger in the 2016 modelling than the 2017 modelling that included the earlier data. The greater uncertainty in the 2017 estimates in Regulatory Area 3A also leads to wider 95% intervals for the coastwide time series.

The times series of mean Total (all sizes) WPUE and O32 WPUE are compared in Figure 5. Although direct observations of Total WPUE will always exceed those of O32 WPUE, this is not necessarily true of model estimates. In Regulatory Areas 4A and 4CDE there are regions with large gaps in survey coverage, particularly in the early part of the 1993-2017 time series, and therefore the estimates depend to a large degree on the model predictions in unsurveyed regions. In years without IPHC setline survey coverage, data from the annual NMFS trawl survey strongly influence these predictions. Both spatial and temporal dependence were estimated to be stronger for the Total WPUE data than the O32 data, which means that the influence of trawl survey data on predictions at unsurveyed locations for Total WPUE is greater than it is for O32 WPUE data.

Results of setline survey expansions in Regulatory Areas 4B and 2A

Figure 6 shows a map of O32 WPUE at each fished station in Area 4B. The station catch rates varied greatly among the regions covered by expansion stations. Eastern stations had the highest WPUE, with several stations having values close to or above 180 kg/skate (400 lb/skate). Elsewhere, new stations had relatively low catch rates on average, with the majority catching no Pacific halibut. Average WPUE at the new expansion stations was 26.4 kg/skate (58.2 lb/skate), while at annually fished stations, it was 20.5 kg/skate (45.2 lb/skate). These results imply that at current Pacific halibut densities, the annual Area 4B setline survey was undersampling high-density habitat relative to low-density habitat. Prior to the use of the space-time model, this would have led to a negative bias in estimates of mean WPUE in Area 4B. Instead, the time series of estimated mean O32 WPUE from the 2017 modelling was very similar to the one estimated in 2016 prior to the expansion (Figure 7). This implies that, at least on average, the model predictions of WPUE in previously unsurveyed parts of Area 4B had little bias. This was not the case for total NPUE, which was underestimated in last year's modelling (Figure 8), and therefore the setline survey expansion has led to a correction in the bias of previous estimates of NPUE in Regulatory Area 4B.

The O32 WPUE at each station in Area 2A in 2017 is shown in Figures 9-11. The California expansion south of 39°N captured a single Pacific halibut on a station outside of San Francisco Bay (Figure 9). This confirms that while Pacific halibut are present in this region, densities are very low.

Central Oregon stations had the highest O32 WPUE in Area 2A during 2017 (Figure 10), but catch rates north of there, particularly off Washington (Figure 11), appear to have been greatly affected by an extensive area of low dissolved oxygen centred off the Washington coast (Figure 12). WPUE was zero at almost all stations within the area that had dissolved oxygen less than 0.9 ml/l, and lower than in recent years on average elsewhere off the Washington coast. The area of low dissolved oxygen encompassed the region covered by the dense grid expansion, and so likely affected catches on the new expansion stations, along with neighbouring stations on the annual grid. In 2016, mean O32 WPUE at stations off the north Washington coast was 15.0 kg/skate (33.0 lb/skate). The same annually fished stations in 2017 had mean WPUE of 4.5 kg/skate (9.9 lb/skate), and the new dense grid expansion stations had mean of 7.4 kg/skate (16.3 lb/skate). We made no adjustment for the effect of the hypoxic zone on catches in the modelling, which assumes that Pacific halibut were able to avoid areas of extremely low oxygen and therefore became available to the setline survey elsewhere.

The effect the inclusion of data from the dense grid expansion stations on average O32 WPUE was small (Figure 13). Estimated mean WPUE for Regulatory 2A in 2017 was 2.8% higher with the dense grid data included in the modelling than it was without, a difference that is well within the uncertainly in the estimates shown by the 95% intervals in Figure 13. Note that the model output used for stock assessment and stock distribution estimation comes from fitting models that include the dense grid data, along with all other setline survey expansion data.

Evaluation of the need for future setline survey expansions

Methods: Regulatory Area 2A

This Regulatory Area is unique in having already had a full expansion of the setline survey grid down to 42°N in two years, 2011 and 2014 (prior to this year's setline survey). A comparison of model output including and excluding the 2014 expansion data allows us to assess what is gained by having the expansion repeated after a three-year interval. The 2014 expansion also included additional stations between the latitudes of 39°N and 42°N (northern California), which are considered separately as described below.

For our comparisons, the setline survey expansion stations were split into three geographic regions: coastal deep expansion (DE) and shallow expansion (SE) stations in Oregon and Washington (fished in 2011 and 2014); Salish Sea stations (2011 and 2014); and northern California stations (2014). In this way, we are able to examine the relative contribution of each component of the full expansion to improving estimates of density. Note that a subset of the full 2014 California expansion stations was fished in 2013. As this excluded deep and shallow FISS stations, and stations between 39° and 40°, this is perhaps best considered as a pilot expansion into California and is not an expansion design that is likely to be repeated.

We fitted models to the full data set, along with seven subsets in the following order:

- Annually fished stations only (96 since 2011)
- Annually fished stations, plus 2011 DE/SE stations in OR and WA coastal waters

- Annually fished stations, plus 2011 and 2014 DE/SE stations in OR and WA coastal waters
- Annually fished stations, plus 2011 and 2014 DE/SE stations in OR and WA coastal waters, and 2011 Salish Sea stations
- Annually fished stations, plus 2011 and 2014 DE/SE stations in OR and WA coastal waters, and 2011 and 2014 Salish Sea stations
- Annually fished stations, plus 2011 and 2014 DE/SE stations in OR and WA coastal waters, 2011 and 2014 Salish Sea stations, and 2014 California stations
- All available data (also includes 2013 California expansion stations)

All model runs included data from 1998 to 2016, using the methods discussed in Webster (2017).

Methods: Regulatory Area 4A

The FISS expansion in 2014 in Regulatory Area 4A included additional stations along the Area 4A shelf edge, and the Aleutian Islands. The bulk of the shelf edge setline survey expansion stations are in relatively flat habitat that is likely more homogenous than the areas of incomplete annual setline survey coverage in the Aleutian component of Regulatory Area 4A. It is also surrounded by annually fished setline survey stations and NMFS trawl stations, with some of the latter actually located within the region that does not have annual setline survey coverage. Thus, we may expect that omitting shelf edge expansion stations to have a less significant effect on WPUE estimates than omitting stations along the Aleutian Islands. For this reason, we considered these regions separately in evaluating the effect of the 2014 setline survey expansion of estimates of WPUE. Thus, we fitted models to the following subsets of data and compared the output to that from the model with all setline survey stations:

- Annually fished stations
- Annually fished stations + 2014 shelf edge expansion stations
- Annually fished stations + 2014 Aleutian Islands expansion stations
- All available data

As with Regulatory Area 2A above, model runs included data from 1998 to 2016, using the methods described in Webster (2017).

Results: Regulatory Area 2A

Figure 14 shows the absolute relative difference in estimated mean WPUE (hence called the “relative error”) for Regulatory Area 2A between models using subset of the data and a model fit with all available data.

The model fitted to the smallest subset of data, the 96 annually fished stations off the WA and OR coasts, has very high relative error, being greater than 40% in all years. Areas like the Salish Sea, and particularly California, are distant from the annually fished stations, and estimated WPUE in these regions approaches the Regulatory Area 2A mean, which is likely unrealistically high in most years in these regions. Also, the lack of data from deep and shallow waters means that WPUE estimates at these depths is informed by spatial proximity to setline survey stations in 37-503 m (20-275 fm) waters through the spatial dependence model, leading again to over-estimates of WPUE (since the data generally show below-average WPUE outside of 37-503 m, 20-275 fm).

Adding the 2011 deep and shallow setline survey stations to the annually fished stations provided a substantial improvement, with relative error reducing to below 30% in most years. There is only a small further improvement in relative error from inclusion of the 2014 deep and shallow data. A similar improvement is observed when the 2011 Salish Sea data are included, with inclusion of the 2014 data having a minimal further effect on relative error. The remaining improvement comes from including the 2014 California data, which brings the relative error close to zero (showing that the 2013 California data have little effect on relative error).

Also of interest is the effect of the setline survey expansions on the precision of the mean WPUE estimate for Area 2A. Figure 15 shows the estimated sample coefficients of variation for the subset models listed above, along with the model that uses all available data. Inclusion of the data from deep and shallow stations has, at best, modest effects on relative precision. A greater improvement is found when Salish Sea stations are added, but the greatest decrease comes with the addition of the California stations in 2014. Without the direct observations in California, estimates of WPUE in this region were very imprecise, and this imprecision contributed significantly to the variability in the overall estimates for Regulatory Area 2A. We note that even with the full data set, CVs have been increasing since 2014, as time since the most recent FISS expansion increases. Nevertheless, CVs remain at low levels, and it is not clear from the data in this figure what setline survey expansion frequency would be required to maintain precise estimates of mean WPUE. CVs came down after 2010, but this was only in part due to the expansions, as the distribution of Pacific halibut also became less patchy during this time.

These results show that the 2011 setline survey expansion was on its own sufficient in reducing relative error due to lack of coverage in deep and shallow waters and the Salish Sea up to and including 2016, while the 2014 California expansion was also important for minimising relative error. Thus, the reduction in relative error from an expansion is maintained for several years after the expansion. Based on these results, the expansions in Regulatory Area 2A may not need to be repeated more frequently than every six years. With increasing time, and in the absence of new model covariates (say, for region or latitude), we would still expect estimates in unsurveyed regions to approach the Regulatory Area 2A mean, but it is clear from these results that this is something that occurs relatively slowly.

Results: Regulatory Area 4A

The relative error in models fitted to subsets of the Regulatory Area 4A data is shown in Figure 16. Compared to a model fitted to the annually fished setline survey stations only, addition of expansion stations along the Regulatory Area 4A shelf edge in 2014 leads to small to modest reductions in relative error. A much larger gain comes from the setline survey expansion along the Aleutian Islands, which reduces relative error to below 10% in all years. There is some further benefit from including both components of the 2014 expansion (difference between green line and zero), but the Aleutian setline survey expansion was clearly the more important. Note also that the benefit from including setline survey expansion stations diminishes going back in time, due to the decreasing influence of the 2014 setline survey expansion data on estimates in coverages gaps as time from 2014 increases.

As with relative error, the expansion into the Aleutian Islands had a much greater impact on the CV of mean WPUE than the shelf edge setline survey expansion (Figure 17). Since 2014, the CV has increased quickly, although based on years prior to 2014, we may expect the CV to again stabilise at around 12-13% in the absence of repeats of the setline survey expansion stations in Regulatory Area 4.

In conclusion, due to the presence of NMFS trawl stations near to and within the region of the Regulatory Area 4A shelf edge without annual coverage, this region need only be surveyed infrequently by the setline survey. Regarding the Aleutian Islands, the largest coverage gap is in the western part of this region, where many stations have high WPUE, and includes stations in deep water and standard depths somewhat distant from annually fished stations. An argument could be made for fishing these stations frequently, while (to maintain costs if necessary) reducing coverage in the low-density part of Regulatory Area 4A south-east of the Aleutian Islands.

Implications for stock distribution estimates and the stock assessment

Currently, a Regulatory Area's portion of the coastwide stock distribution is estimated as its biomass index divided by the coastwide biomass index, where an area's biomass index is its mean estimated O32 WPUE (at all stations in the IPHC's setline survey design) multiplied by bottom area. As the examples in Regulatory Areas 2A and 4A show, the first time a setline survey expansion occurs in an area leads to improvements in the relative accuracy of the indices, and more accurate estimates of biomass shares result. The results presented in this report show those gains in accuracy persist with time, with the 2014 setline survey in Regulatory Area 2A having a small effect on the WPUE index relative to the 2011 setline survey. Based on those results, we can expect improvements in stock distribution estimates to also persist for several years after the initial setline survey expansion. With the setline survey expansion being fished only once in Regulatory Area 4A, it is less clear how soon this area, in particular its western portion, should be revisited. The setline survey expansion there had a clear effect on the estimates of biomass distribution, but as time passes since 2014, we can expect model estimates to become driven by a combination of area-wide changes in density, and observed WPUE at the small number of stations that are fished annually there. This increases the chance of bias in the overall estimates of WPUE and biomass distribution for Regulatory Area 4A. It would be prudent, therefore, to re-survey western Regulatory Area 4A in the near future to get a direct measure of its temporal variability and the effect the lack of full annual setline survey coverage in has on the quality of estimates for Regulatory Area 4A as a whole.

Regarding the effect of expansions on the stock assessment, their primary contribution is in improving the coastwise index of total NPUE, a key input into the assessment modelling. This index, like coastwide WPUE, is constructed as a weighted average of Regulatory Area NPUE indices, where bottom areas are used as weights. Thus, data from the largest areas, specifically Regulatory Areas 2B, 3A, 3B and 4CDE, along with Regulatory Area 2C (currently the area with highest density) have the most influence on the coastwide NPUE index. The setline survey expansions in Regulatory Areas 2A and 4A may have led to an index that is slightly higher or lower than it would have been in the absence of data from the expansions, but the effect on trend in the index can only be minor. Nevertheless, the expansion stations over all Regulatory Areas combined represent around 35% of all setline survey stations (Webster et al. 2015), and if the trend for expansion stations differs on average from the trend in annually surveyed stations, there will be bias in the estimates of coastwide NPUE trends in the absence of regular surveys of those stations. The potential scale of this bias can only be assessed once the full series of setline survey expansions have been completed in 2019.

Recommendations for FISS expansion frequency

Table 1 provides a summary of the information we have gained from setline survey expansions to date in Regulatory Areas 2A and 4A. Based on the assessment of the data presented in this paper, we have given a recommendation of the future setline survey frequency in expansion regions. This recommendation is based on a region's influence on the overall density indices for its Regulatory Area, which is affected by its density, variability and size (number of stations). Northern California (north of 40°N), represents the southern limit of Pacific halibut at densities significantly above zero, and as such a case can be made for relatively frequent setline surveys here in order to monitor whether the Pacific halibut range is increasing or retracting. Data here also influence estimates in the low density regions further south, which after 2017 will only have been surveyed once or twice, something that is not the case with regions adjacent to the Salish Sea. No recommendation is currently made for the setline survey frequency from 39-40°N. This low-density region will be included in a future evaluation of all low density habitat south of 40°N, along with the setline stations surveyed within 37.75-39°N for the first time in 2017.

Table 1 also includes a qualitative measure of the relative cost of each expansion region. While the recommended frequency is based on a scientific evaluation, managers will also consider the cost of adding setline survey stations when determining if their addition is feasible in a given setline survey year. The Regulatory Area 2A expansion stations in deep and shallow coastal waters of Washington and Oregon and in the Salish Sea are relatively low cost, as they can be fished along with nearby annual stations thereby reducing fuel costs, and do not require an additional sampler. Those in California have somewhat more complicated logistics and permitting requirements, and so can be considered as medium cost relatively to annually fished parts of Regulatory Area 2A. In Regulatory Area 4A, the Aleutian Islands expansion stations are high cost due to logistics, travel, bait shipping and fishing difficulty (strong tides). The Shelf edge stations are less expensive and the tidal problems encountered when fishing the islands are not a factor there, and so we categorise these stations as medium cost.

Table 1. Summary of IPHC fishery-independent setline survey expansion data and recommendations for future survey frequency.

Reg. Area	**Expansion region**	**Density†**	**Variability (spatial/ temporal)**	**Recommend setline survey frequency**	**Cost‡**
2A	Deep and shallow waters	Low	Low	≥ 10 years	Low
2A	Salish Sea	Low-average	High	5 years	Low
2A	Northern California	Average above 40°N; low south of 40°N	Average	3-5 years north of 40°N	Medium
4A	Aleutian Islands	High	High	3-5 years	High
4A	Shelf edge	Average	Low	≥ 10 years	Medium

† Density relative to annually surveyed parts of the regulatory area

‡ Cost relative to annually surveyed parts of the Regulatory Area

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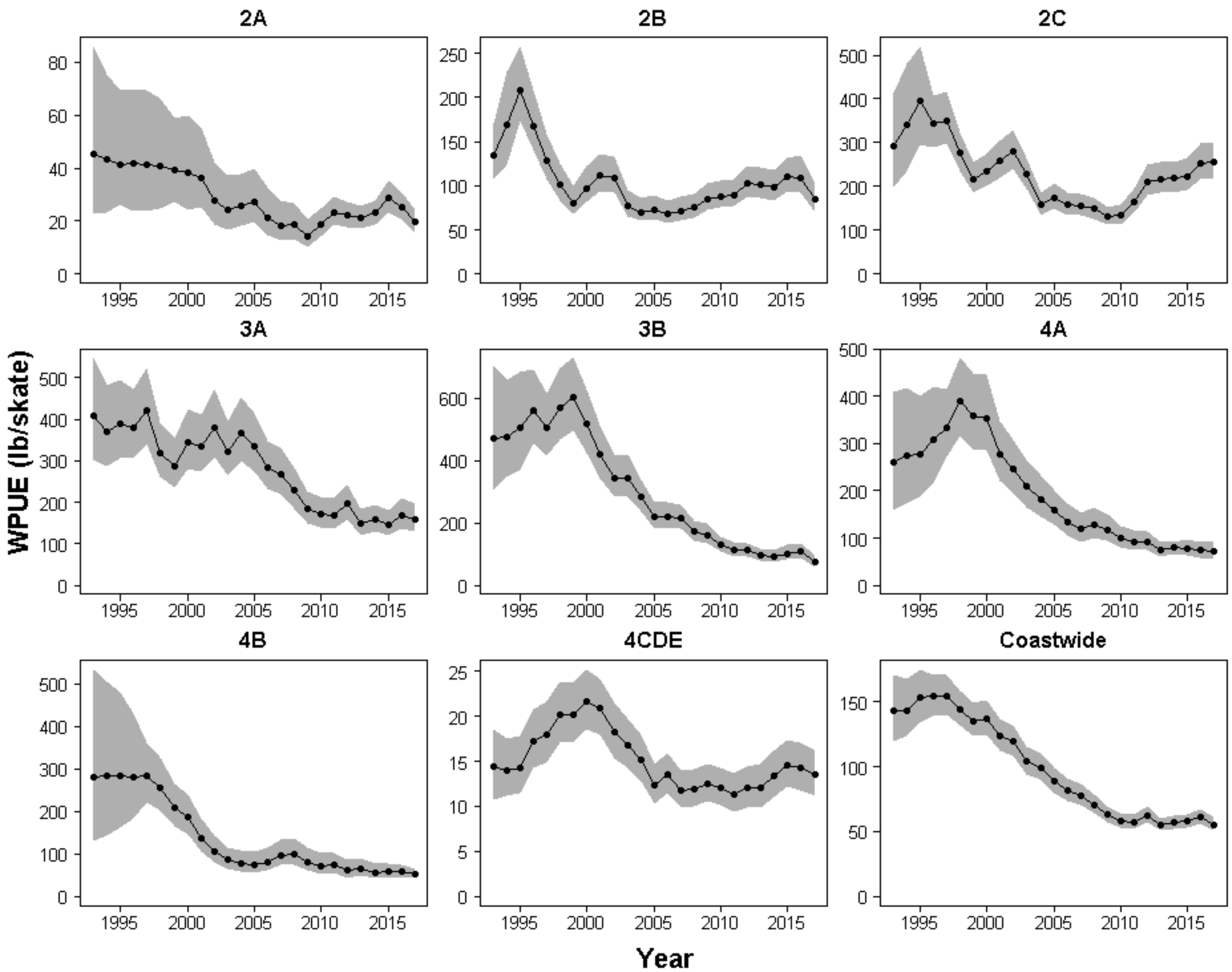

Figure 1. Posterior means (points) and 95% posterior credible intervals (shaded regions) for mean O32 WPUE from the space-time modelling, by Regulatory Area and year from 1993-2017.

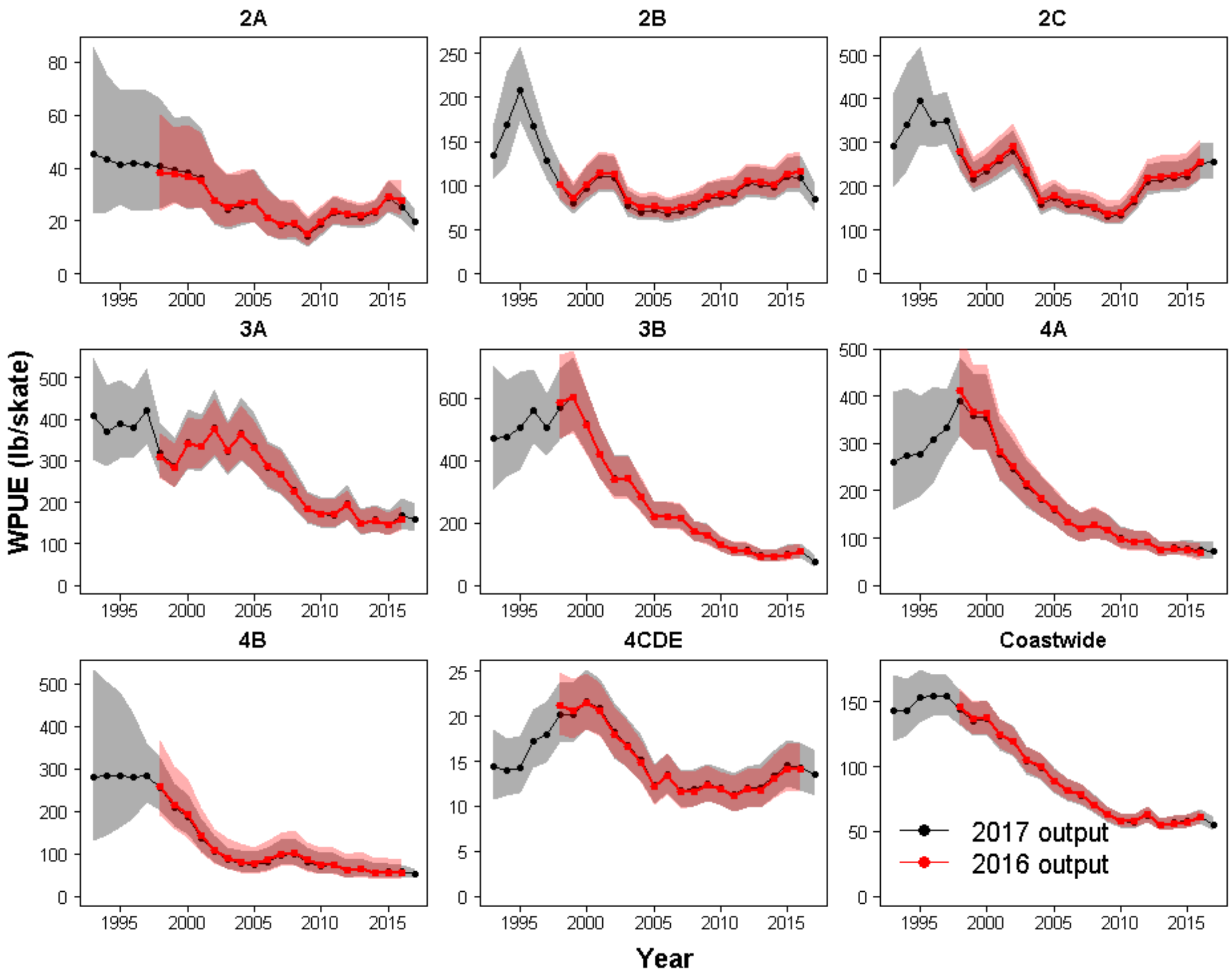

Figure 2. Posterior means (black points) and 95% posterior credible intervals (gray shaded regions) for mean O32 WPUE from the space-time modelling in 2017, compared with modelling output from the 2016 space-time modelling (red points and shaded regions).

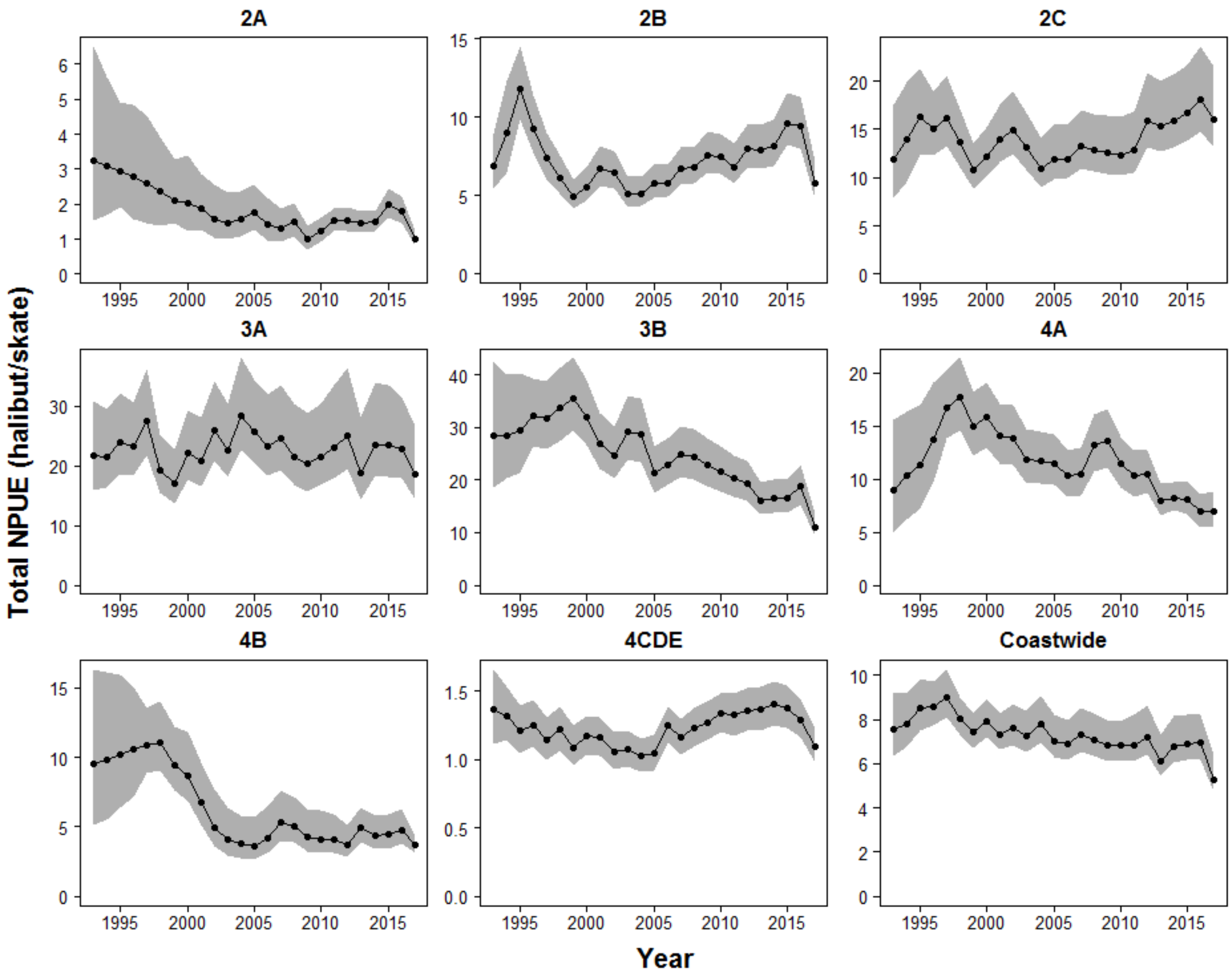

Figure 3. Posterior means (points) and 95% posterior credible intervals (shaded regions) for mean total NPUE from the space-time modelling, by Regulatory Area and year from 1993-2017.

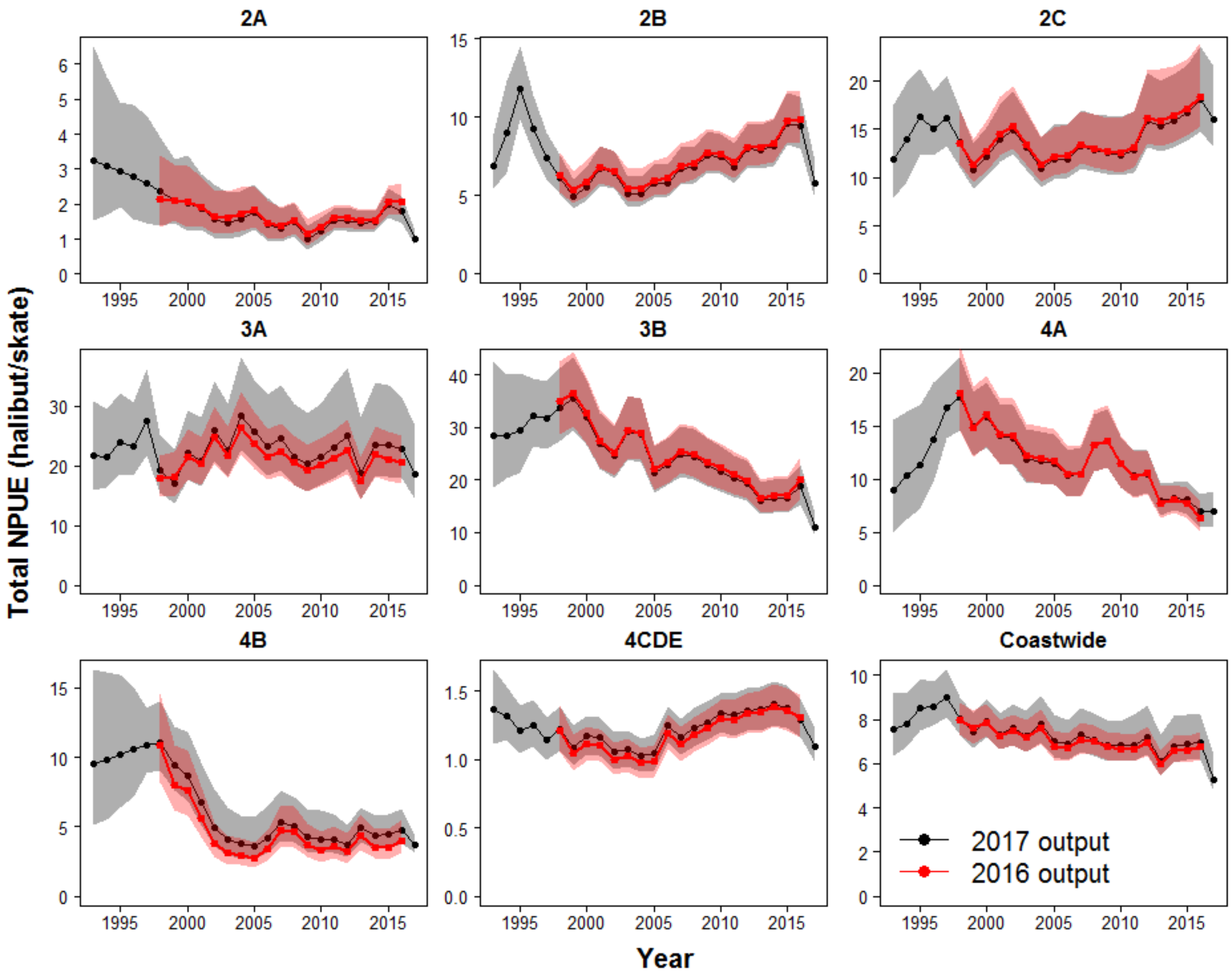

Figure 4. Posterior means (black points) and 95% posterior credible intervals (gray shaded regions) for mean total NPUE from the space-time modelling in 2017, compared with modelling output from the 2016 space-time modelling (red points and shaded regions).

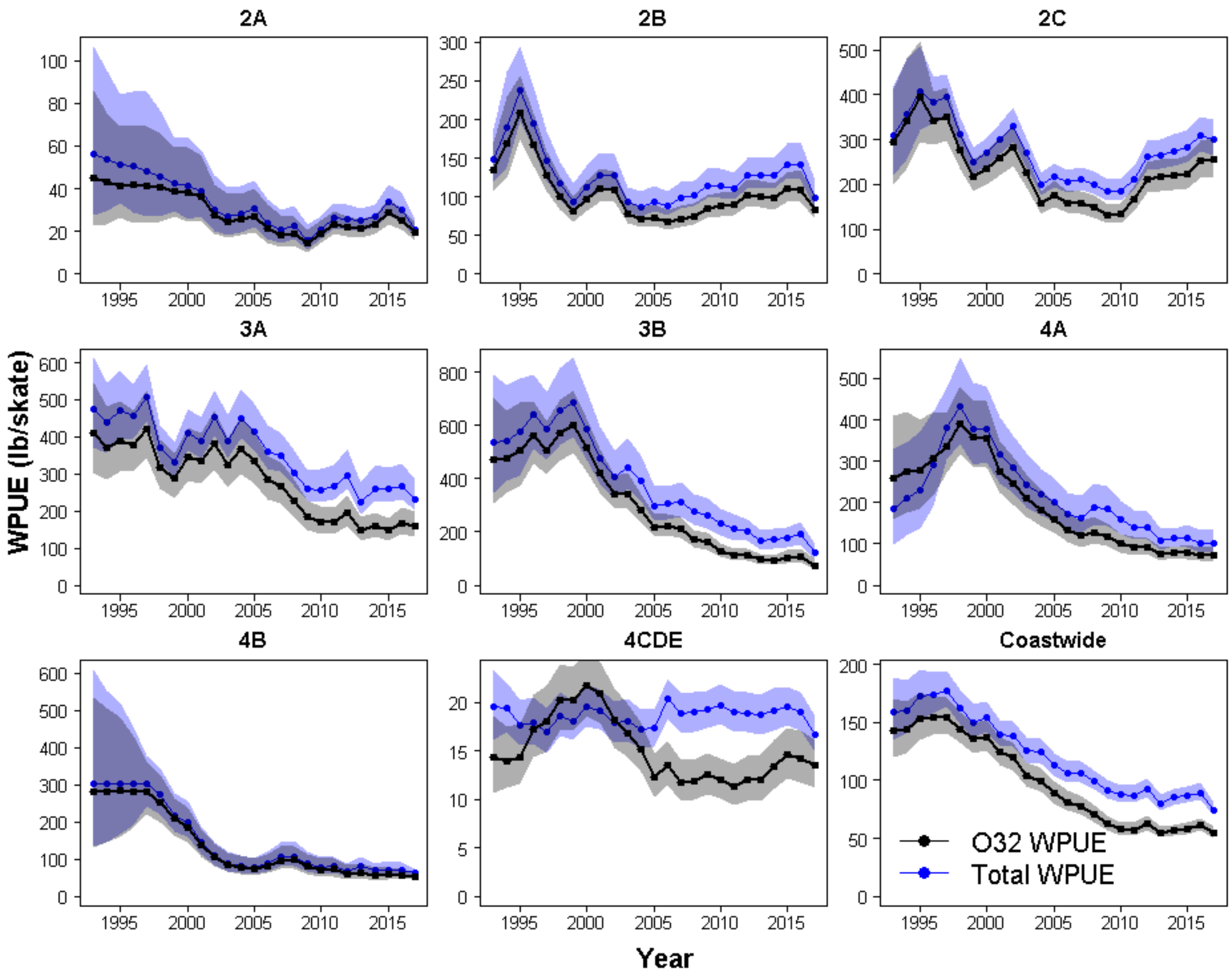

Figure 5. Posterior means (blue points) and 95% posterior credible intervals (blue shaded regions) for mean total WPUE compared with O32 WPUE (black points and gray shaded regions) from the space-time modelling in 2017.

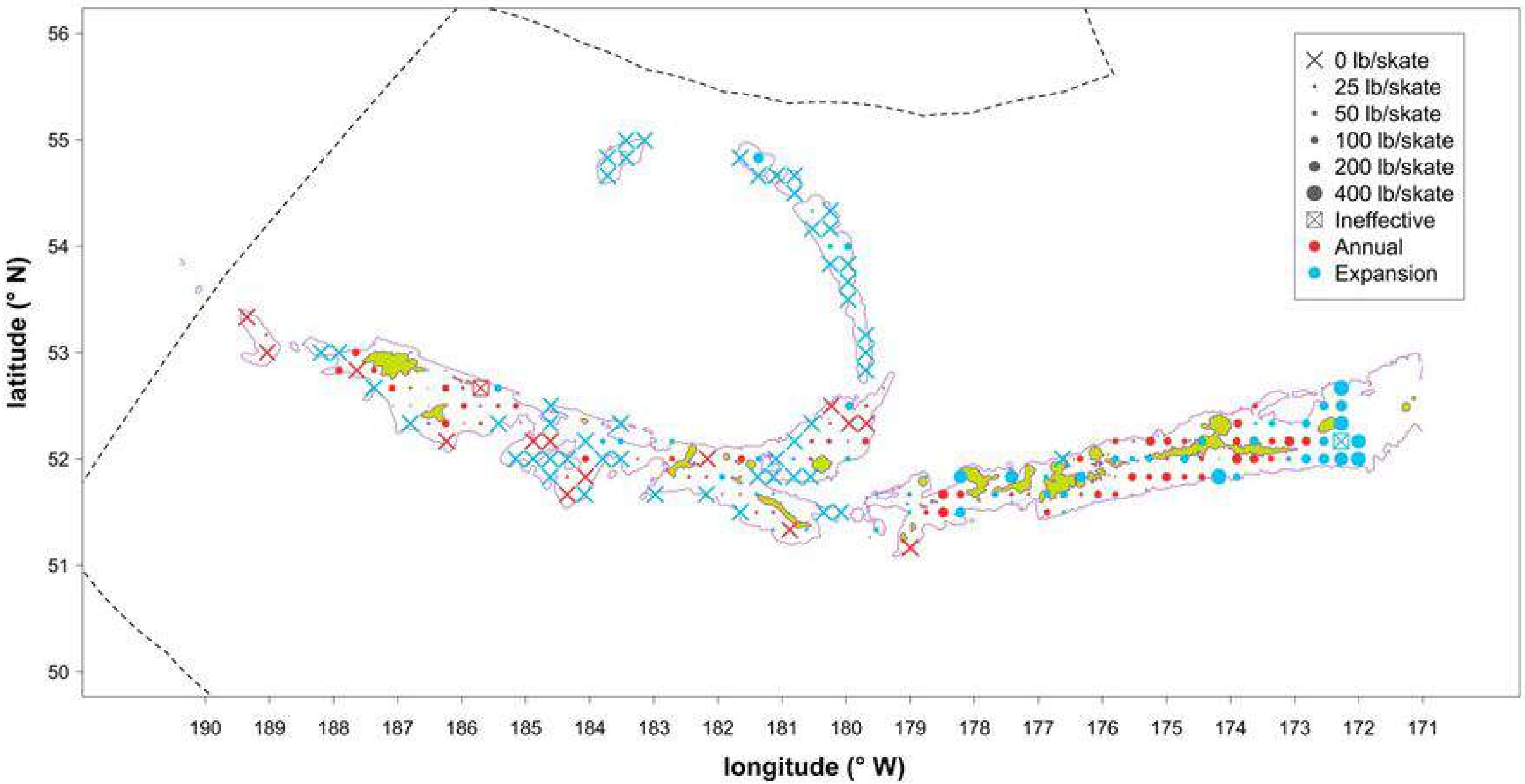

Figure 6. Map of O32 Pacific halibut WPUE by station in Regulatory Area 4B in 2017.

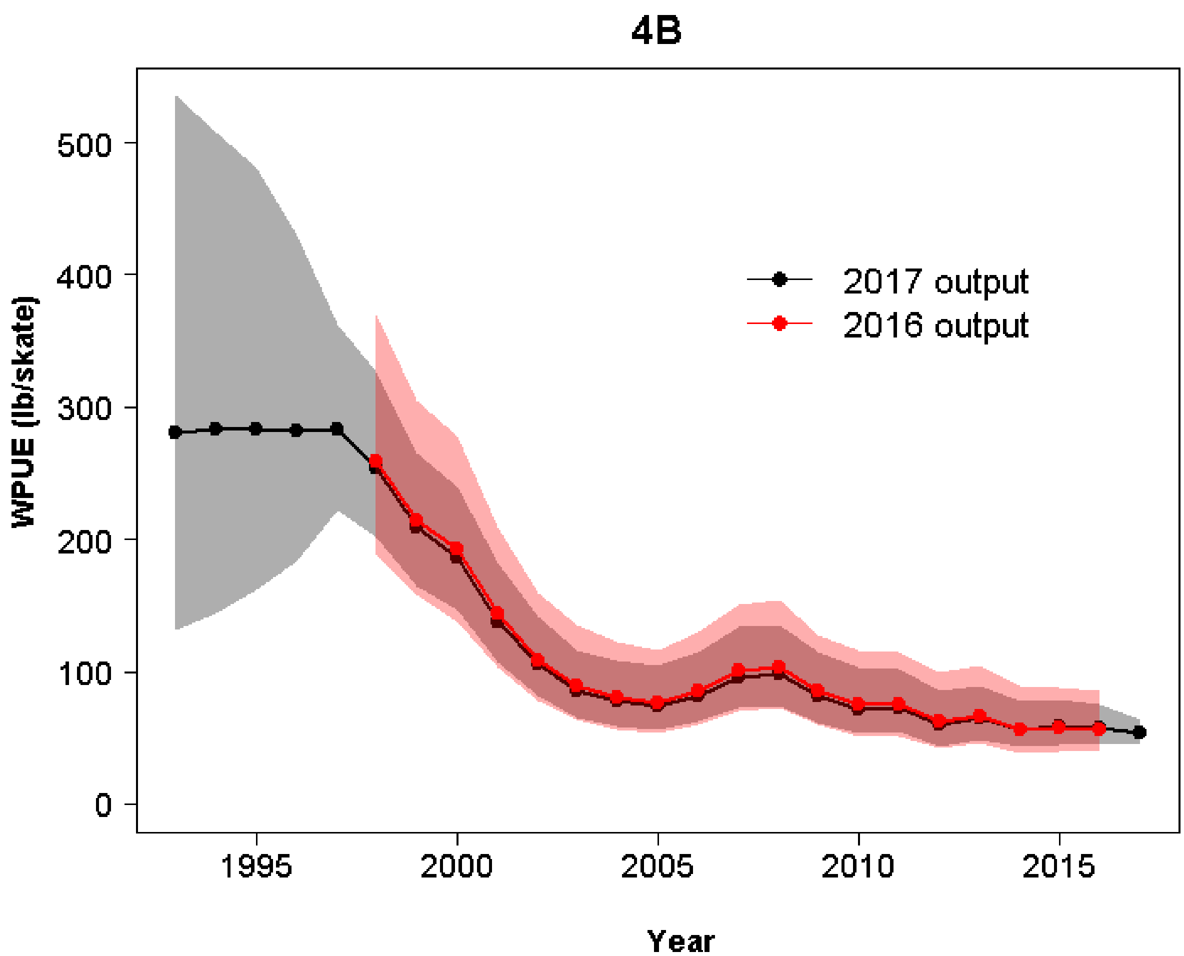

Figure 7. Comparison of the time series of estimated mean O32 Pacific halibut WPUE in Regulatory Area 4B from the 2017 modelling with the output from the 2016 modelling.

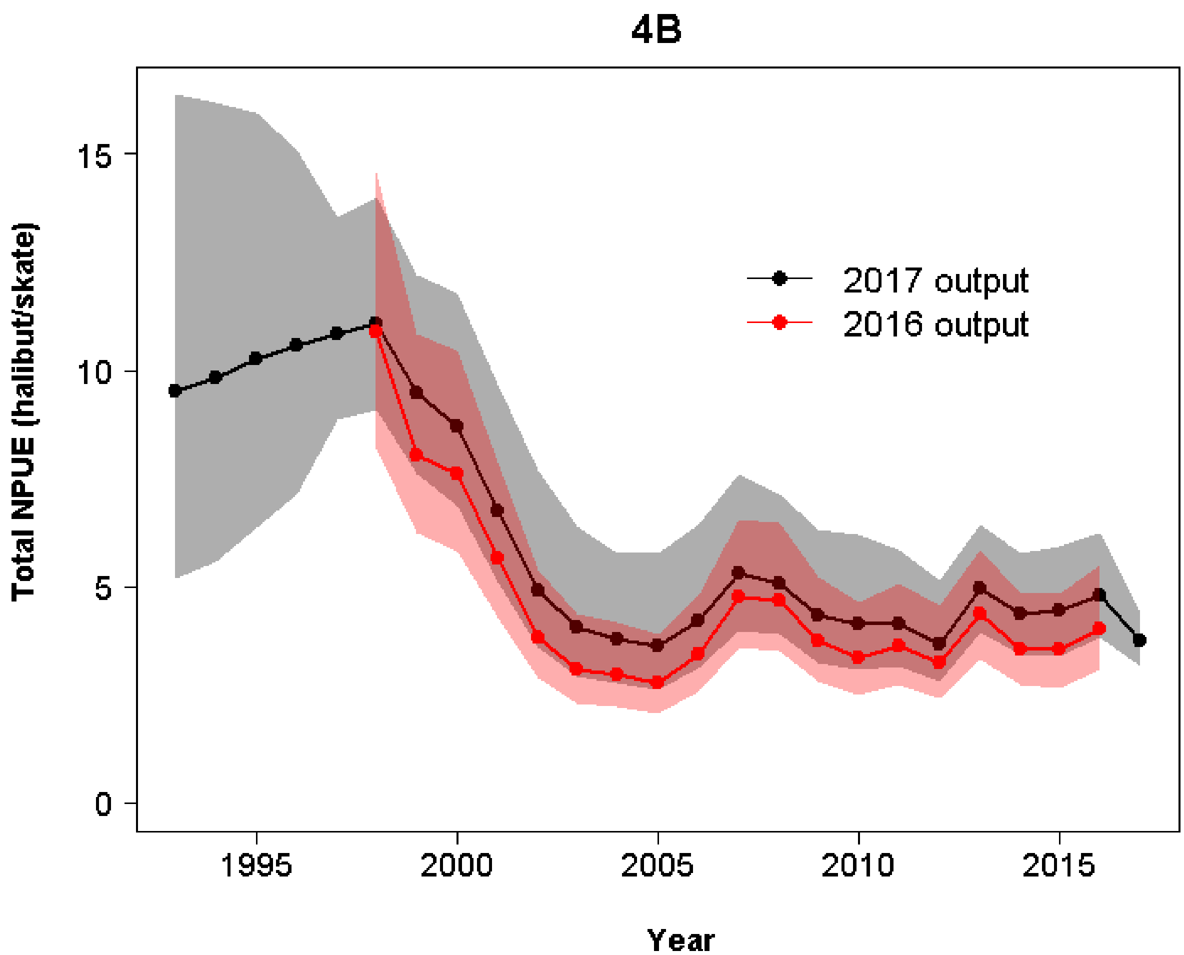

Figure 8. Comparison of the time series of estimated mean total Pacific halibut NPUE in Regulatory Area 4B from the 2017 modelling with the output from the 2016 modelling.

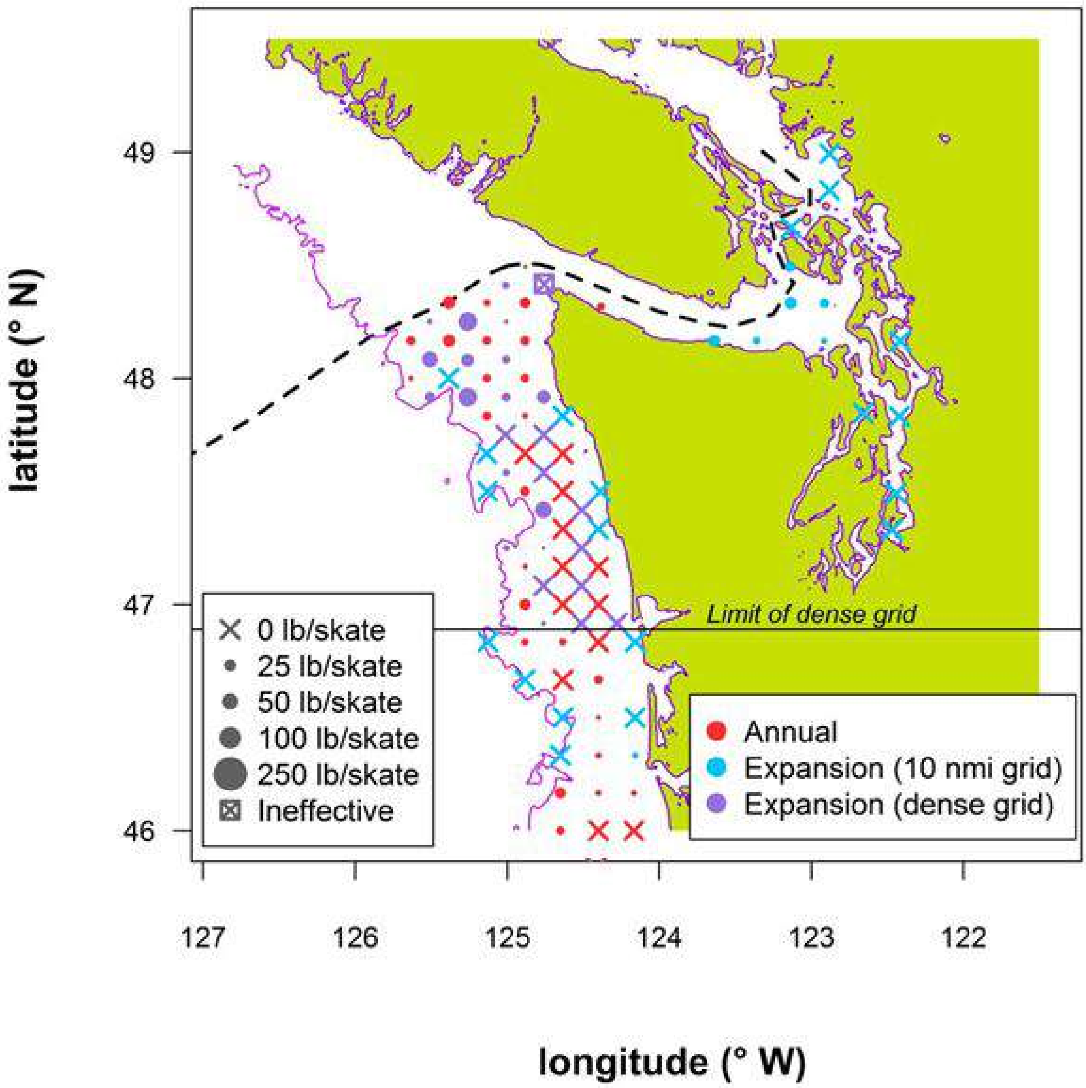

Figure 9. Map of O32 Pacific halibut WPUE by station in northern Regulatory Area 2A in 2017.

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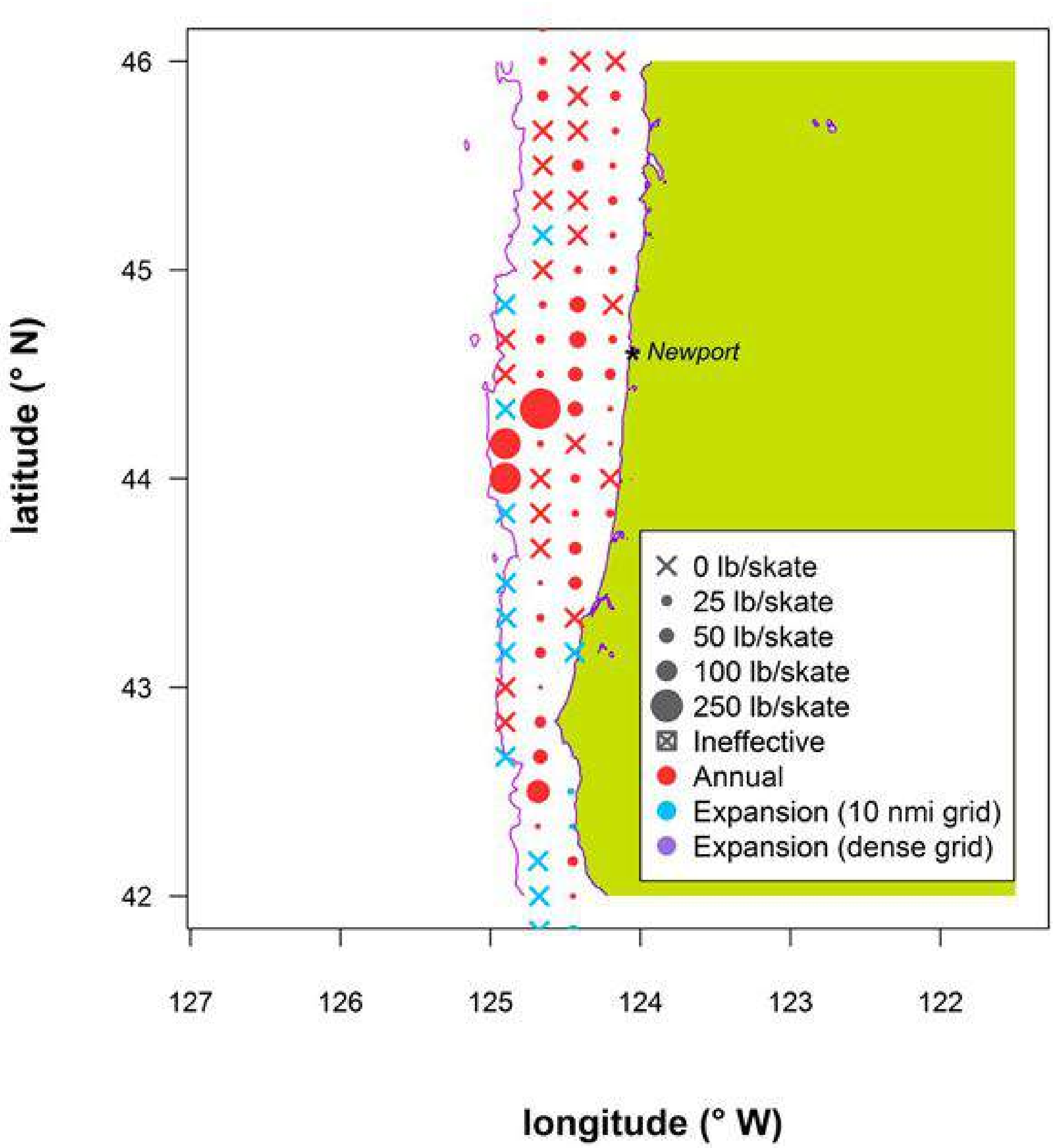

Figure 10. Map of O32 Pacific halibut WPUE by station in central Regulatory Area 2A in 2017.

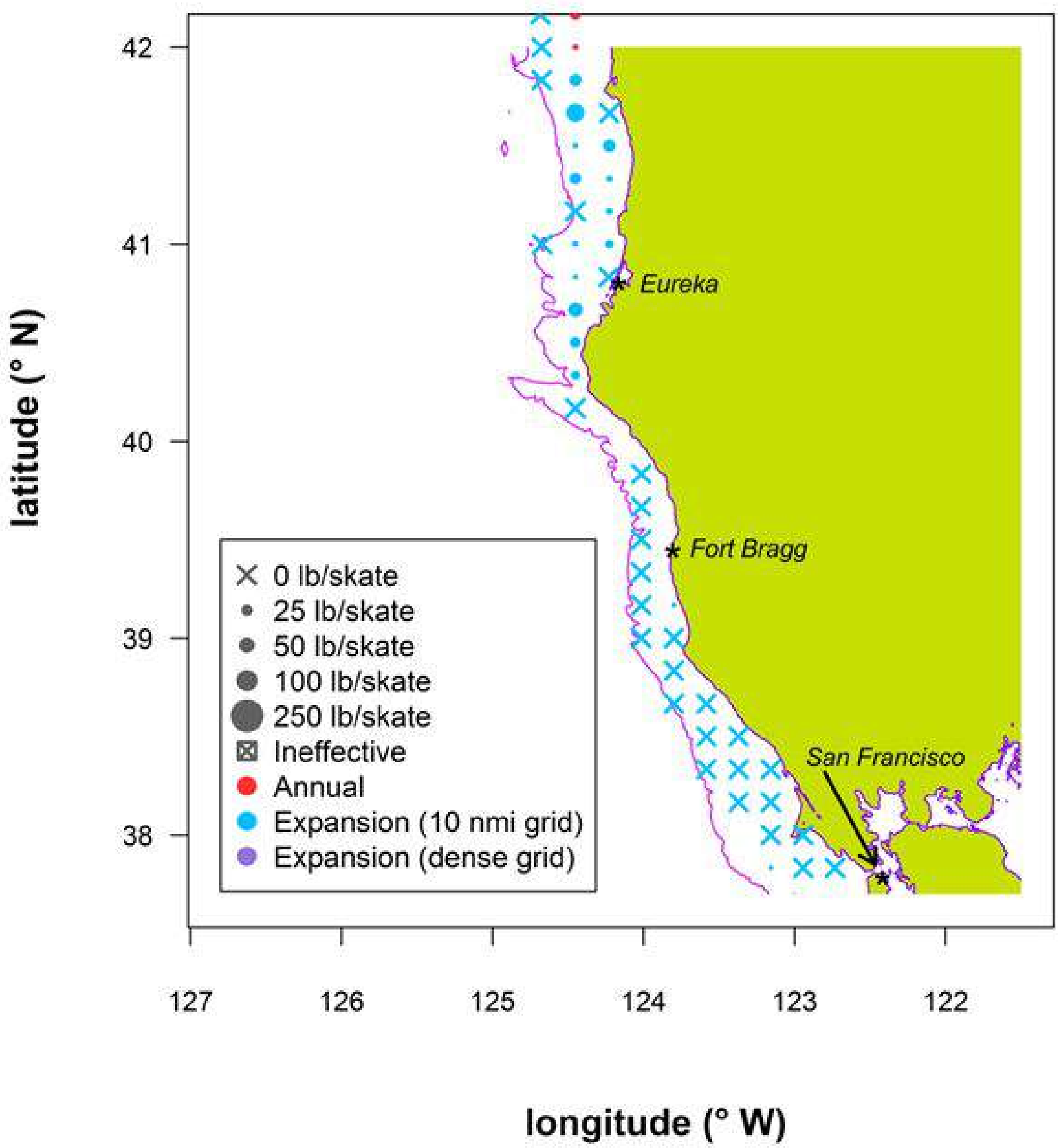

Figure 11. Map of O32 Pacific halibut WPUE by station in southern Regulatory Area 2A (California) in 2017.

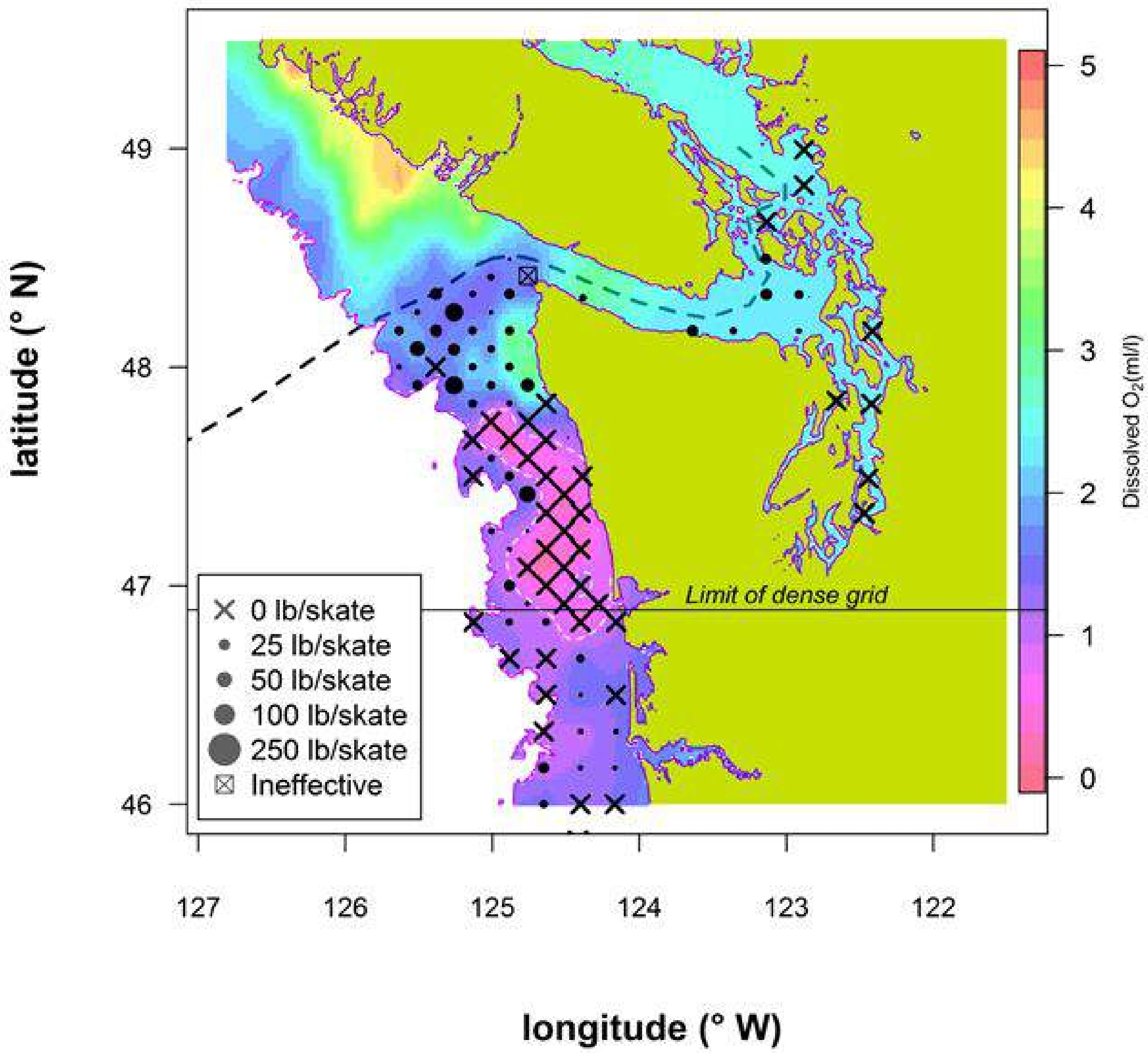

Figure 12. Estimated dissolved oxygen in northern Regulatory Area 2A in 2017. Values are model predictions from a spatial model fitted to the 2017 IPHC water column profiler data. O32 WPUE values from the setline survey are overlaid with black symbols.

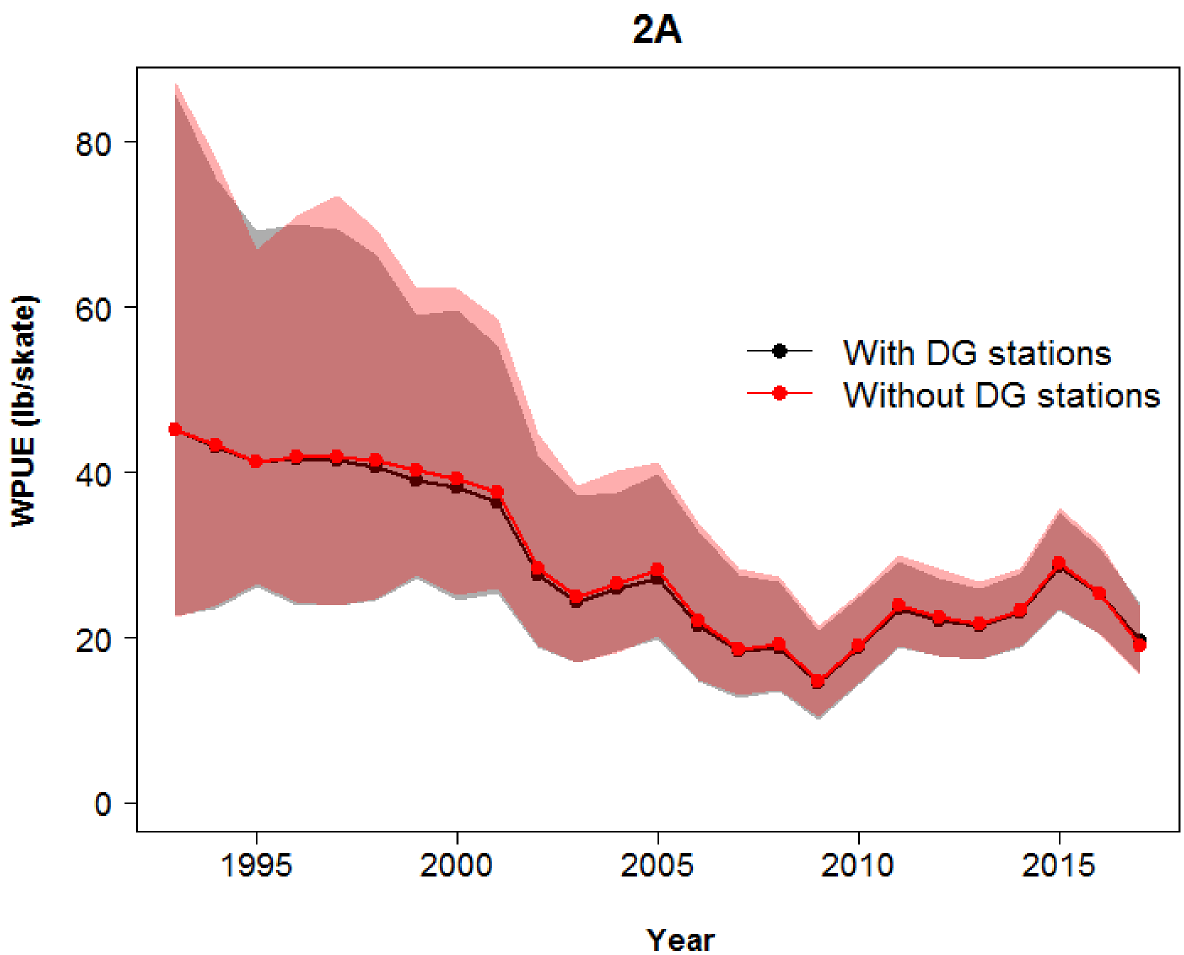

Figure 13. Posterior means (points) and 95% posterior credible intervals (shaded regions) for mean O32 WPUE from the space-time modelling for Regulatory Area 2A from models fitted with data from the dense grid stations (black) and without those data (red).

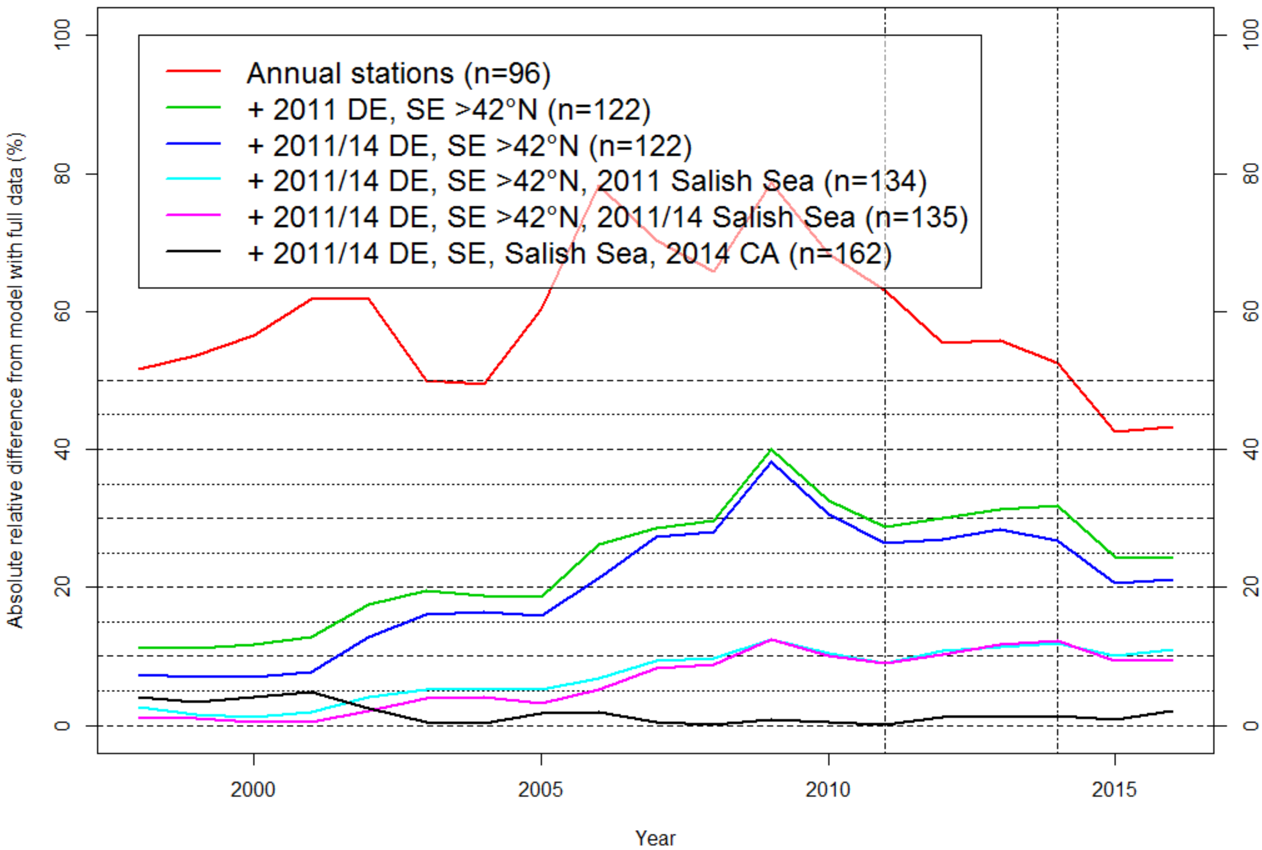

Figure 14. Absolute relative difference in estimated mean WPUE between models fitted to subsets of the Regulatory Area 2A data, and the model using all available data. The vertical lines show the 2011 and 2014 setline survey expansion years in Regulatory Area 2A.

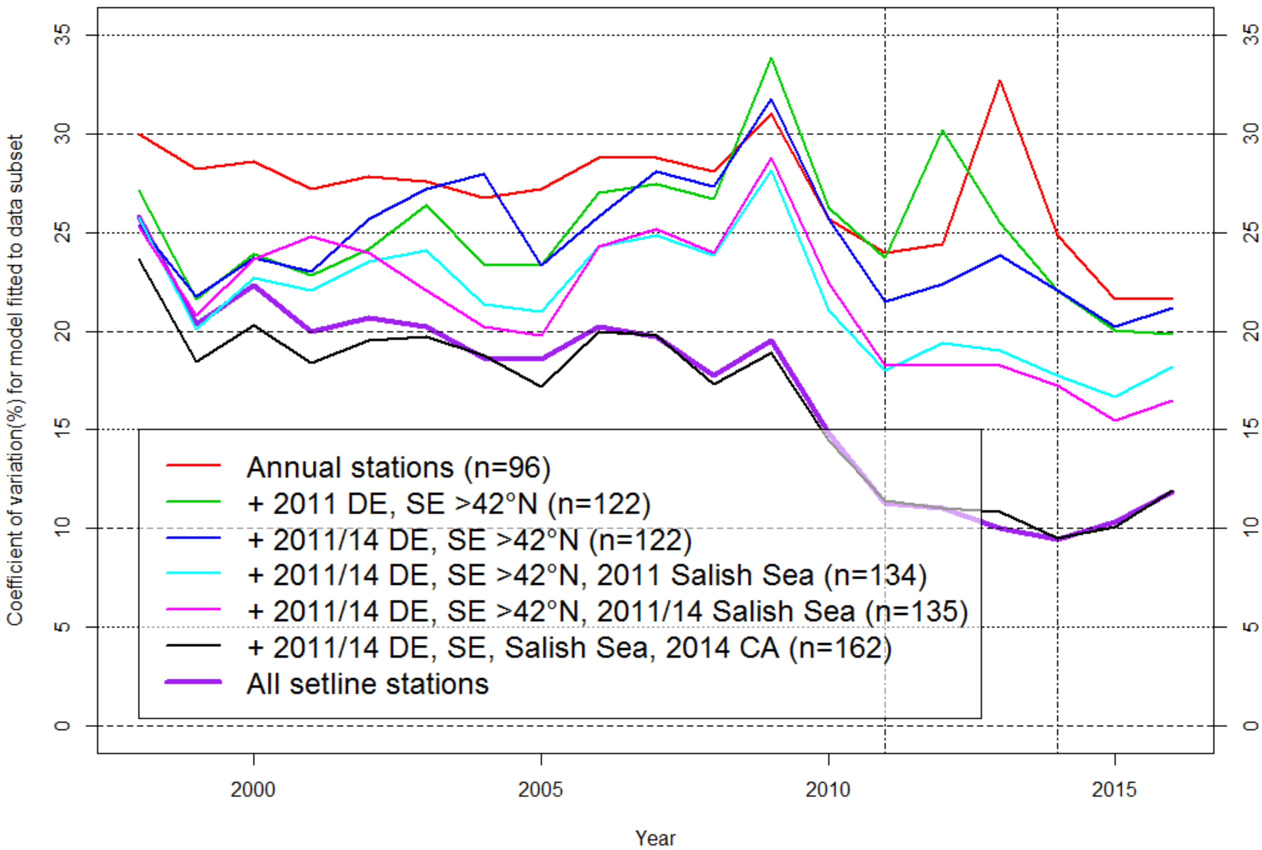

Figure 15. Coefficient of variation of estimated mean WPUE for models fitted to subsets of the Regulatory Area 2A data and the model using all available data. The vertical lines show the 2011 and 2014 setline survey expansion years in Regulatory Area 2A.

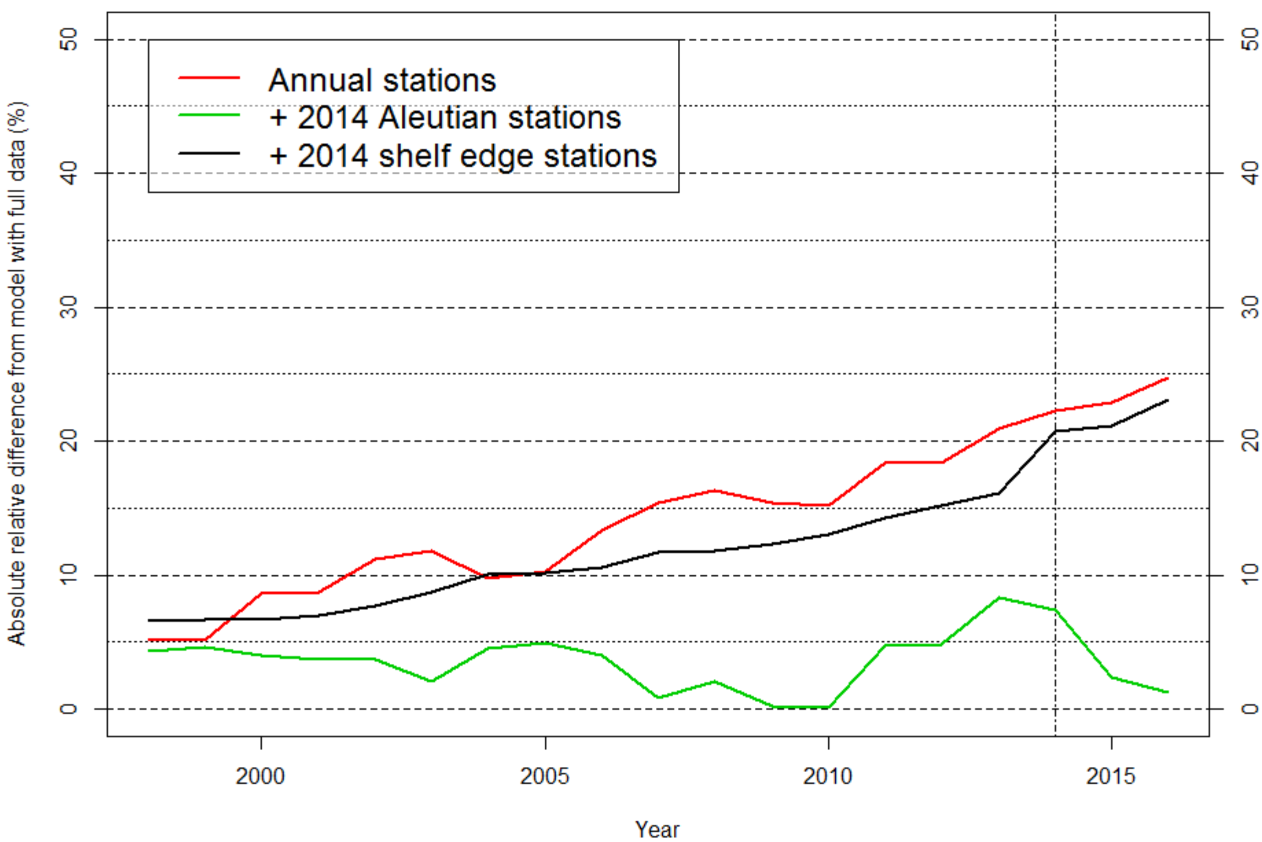

Figure 16. Absolute relative difference in estimated mean WPUE between models fitted to subsets of the Regulatory Area 4A data, and the model using all available data. The vertical line shows 2014, the year of the Regulatory Area 4A setline survey expansion.

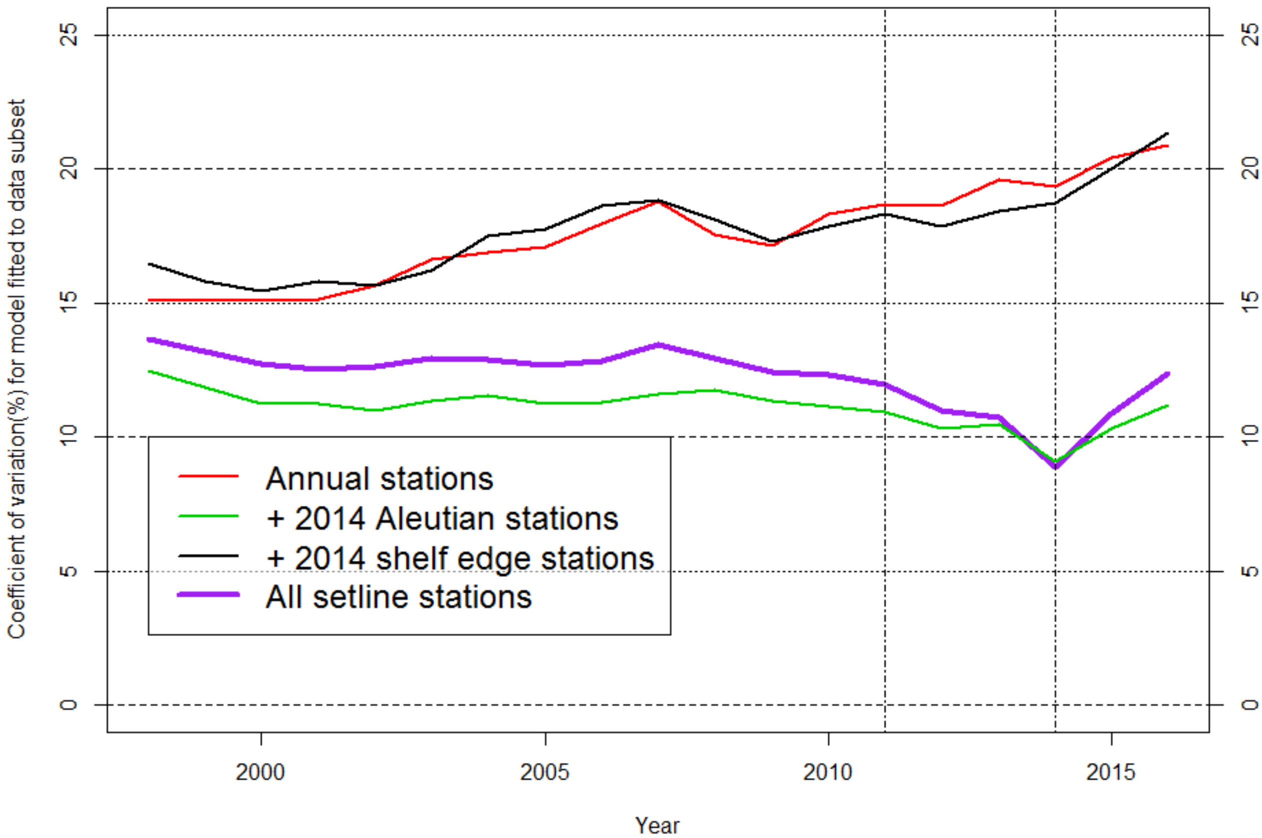

Figure 17. Coefficient of variation of estimated mean WPUE for models fitted to subsets of the Regulatory Area 4A data and the model using all available data. The vertical line shows 2014, the year of the Regulatory Area 4A setline survey expansion.

Summary of the data, stock assessment, and harvest decision table for Pacific halibut (*Hippoglossus stenolepis*) at the end of 2017

PREPARED BY: IPHC SECRETARIAT (I. STEWART, A. HICKS, R. WEBSTER, AND D. WILSON; 19 DECEMBER 2017)

PURPOSE

To provide the Commission with a summary of the data, stock assessment, and harvest decision table at the end of 2017.

INTRODUCTION

In 2017 the International Pacific Halibut Commission (IPHC) undertook its annual coastwide stock assessment of Pacific halibut (*Hippoglossus stenolepis*) using a range of updated data sources. This summary provides an overview of the data sources available for the Pacific halibut stock assessment and related analyses including the population trends and distribution among Regulatory Areas based on the IPHC fishery-independent setline survey, the 2017 stock assessment methodology, and results of the stock assessment. Catch tables detailing Regulatory Area-specific projections are provided separately in paper IPHC-2018-AM094-11.

STOCK AND MANAGEMENT

The stock assessment reports the status of the Pacific halibut (*Hippoglossus stenolepis*) resource in the IPHC Convention Area. As in recent stock assessments, the resource is modelled as a single stock extending from northern California to the Aleutian Islands and Bering Sea, including all inside waters of the St rait of Georgia and Puget Sound, but excludes known extremities in the western Bering Sea within the Russian Exclusive Economic Zone (Figure 1).

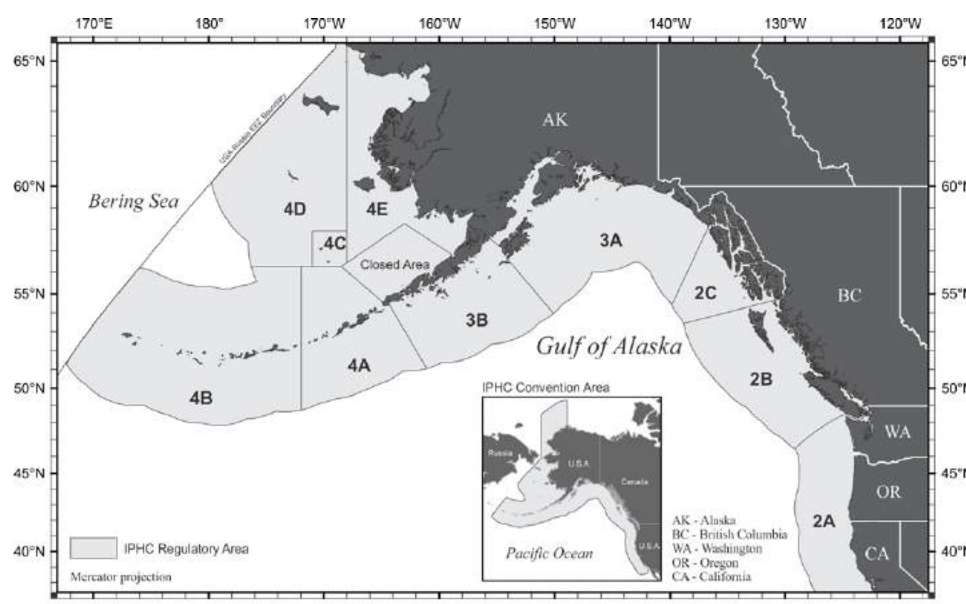

FIGURE 1. IPHC Regulatory Areas and the Pacific halibut geographical range within the territorial waters of Canada and the United States of America.

The Pacific halibut fishery has been managed by the IPHC since 1923. Catch limits for each of eight management Regulatory Areas[1] are set each year by the Commission. The stock assessment provides a summary of recently collected data, and model estimates of stock size and trend. Specific management information is summarized via a decision table reporting the estimated risks associated with alternative management actions and catch tables projecting the level of mortality for fisheries in each Regulatory Area indicated by the IPHC's interim management procedure, as well as other alternatives.

DATA

Historical removals

Known Pacific halibut removals (mortality) consist of target fishery landings and discard mortality (including research), recreational fisheries, subsistence, and bycatch mortality in fisheries targeting other species (where Pacific halibut retention is prohibited). Over the period 1918-2017 removals have totaled 7.2 billion pounds (~3.2 million metric tons, t), ranging annually from 34 to 100 million pounds (16,000-45,000 t) with an annual average of 63 million pounds (~29,000 t; Figure 2). Annual removals were above this long-term average from 1985 through 2010 and have been relatively stable near 42 million pounds (~19,000 t) since 2014.

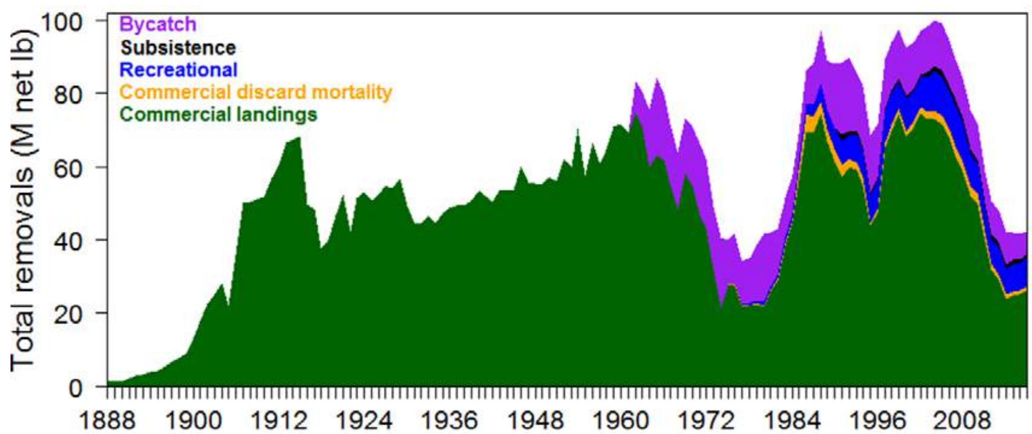

FIGURE 2. Summary of estimated historical mortality by source (colors), 1888-2017.

2017 Fishery and IPHC fishery-independent setline survey statistics

Coastwide commercial Pacific halibut fishery landings in 2017 were approximately 26.2 million pounds (~11,900 t), up from a low of 23.7 million pounds (~10,700 t) in 2014. Bycatch mortality was estimated to be 6.0 million pounds in 2017 (~2,720 t)[2], the lowest level in the estimated time series, beginning with the arrival of foreign fishing fleets in 1962, and just over one million pounds (~450 t) less than estimated for 2016. The total recreational removals was estimated to be 8.1

[1] The IPHC recognizes sub-Areas 4C, 4D, 4E and the Closed Area for use in domestic catch agreements but manages the combined Area 4CDE.

[2] The IPHC receives a preliminary estimate of the current year's bycatch mortality from the National Marine Fisheries Service Alaska Regional Office in early November.

million pounds (~3,675 t), up 10% from 2016. Removals from all sources in 2017 were estimated to be 42.4 million pounds (~19,200 t), up slightly from 41.8 million pounds in 2015 (~18,960 t).

Data are initially compiled by IPHC Regulatory Area and then aggregated to the coastwide level and to four biological Regions: Region 2 (Areas 2A, 2B, and 2C), Region 3 (Areas 3A, 3B), Region 4 (4A, 4CDE) and Region 4B (Figure 1). In addition to the removals (including all sizes of Pacific halibut), the assessment includes data from both fishery dependent and fishery independent sources as well as auxiliary biological information collected over the last 10 years, with the most spatially complete data available since the late-1990s. Primary sources of information for this assessment include indices of abundance from the IPHC's annual fishery-independent setline survey (numbers and weight) and commercial Catch-Per-Unit-Effort (weight), and biological summaries (length-, weight-, and age-composition data).

Efforts to improve the data sources included in the assessment have been ongoing since 2013, with a complete reprocessing of all inputs completed for 2015. Further improvements in 2016 included the transition to model-based setline survey indices (Webster 2017b). For 2017, additional data was included in the form of age data from setline survey expansions and additional stations sampled historically, individual Pacific halibut weights collected during port sampling of commercial fishery landings as well as an extended time-series (1993-2017) from the setline survey modelling (Webster 2017a) making use of 6 additional years of data (1993-1997 and 2017). As is standard practice, all mortality estimates and existing time-series were updated for 2016 and extended to include 2017 observations. All available information was finalized on 9 November 2017 in order to provide adequate time for analysis and modeling. As has been the case in all years, some data are incomplete, or include projections for the remainder of 2017. These include commercial fishery WPUE, commercial fishery age-composition data, and 2017 removals for all fisheries still operating after late-October 2016.

The 2017 IPHC's fishery-independent setline survey detailed a coastwide aggregate legal (O32) WPUE which was 10% lower than the value observed in 2016, with individual IPHC Regulatory Areas varying from a 1% increase (Regulatory Area 2C) to a 32% decrease (Regulatory Area 3B; Figure 3). Setline survey NPUE showed a more pronounced decrease from 2016 to 2017 (24% coastwide), with individual Regulatory Areas ranging from a 1% increase (Regulatory Area 4A) to a 44% decrease (Area 2A; Figure 4). Commercial fishery WPUE (based on extensive, but still incomplete logbook records available for this assessment) was slightly increased (5%) at the coastwide level with mixed trends among Regulatory Areas (Figure 5). Based on review by the IPHC's Scientific Review Board (SRB), a bias correction for each Regulatory Area was developed using the last five years of post-assessment revisions resulting from additional logbooks available after the assessment deadline in early November. Applying these corrections reduced the increase in coastwide commercial fishery WPUE to only 3% and negative trends were predicted for all Regulatory Areas except Area 4D (+71%), Area 4C (+20%) and Regulatory Area 3A (+6%). Tribal and non-tribal commercial fishery trends in Regulatory Area 2A are reported separately this year in response to important differences in the timing and spatial extent of the two components. Tribal fishery WPUE has been increasing since 2014 in that Area, and non-tribal WPUE has been declining over the same period, although a small increase (5%) from 2016 to 2017 was observed. The very large increase in WPUE observed in Regulatory Area 4D appears to be a function of much higher catch-rates around St. Matthew Island (also observed in the setline survey) and a shift of 25% of the catch previously occurring along the shelf-edge to the waters around that island in 2017. Age distributions in 2017 show a 2005 cohort somewhat stronger than those in adjacent years, and weak recruitments from 2006 onward. At the coastwide level, individual size-at-age continues to be very low relative to the rest of the time-series, although there has been little change over the last several years.

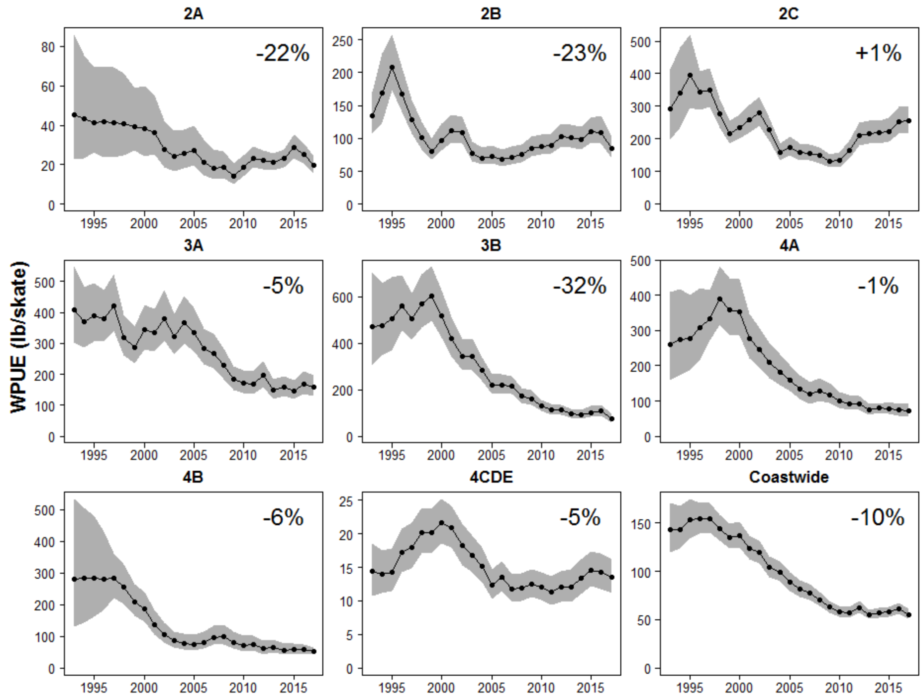

FIGURE 3. Trends in setline survey legal (O32) WPUE by IPHC Regulatory Area, 1993-2017. Percentages indicate the change from 2016 to 2017. Shaded zones indicate approximate 95% credibility intervals.

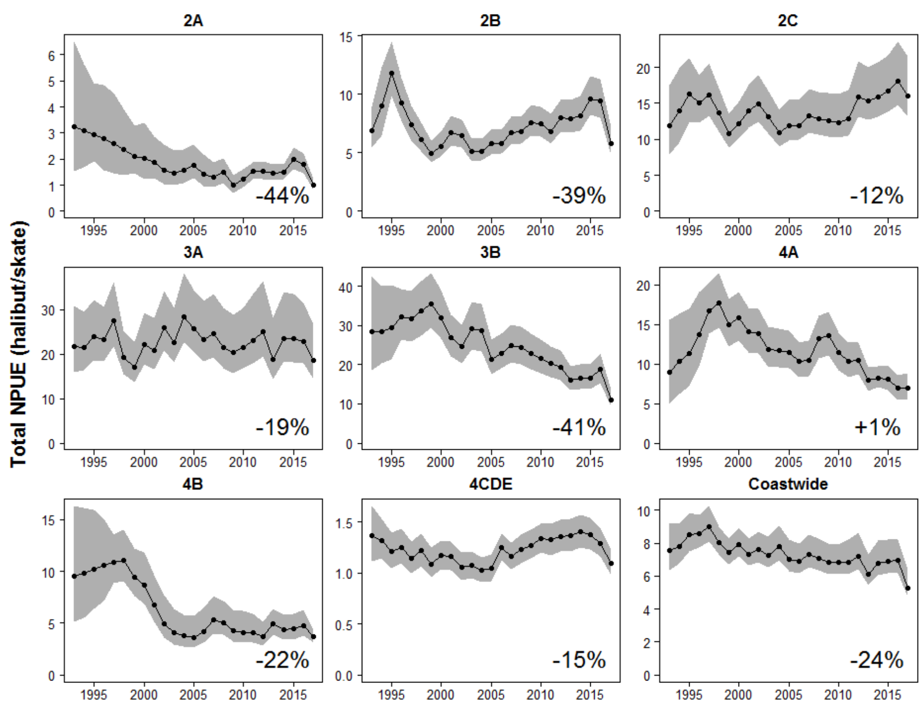

FIGURE 4. Trends in setline survey all-sizes NPUE by IPHC Regulatory Area, 1993-2017. Percentages indicate the change from 2016 to 2017. Shaded zones indicate approximate 95% credibility intervals.

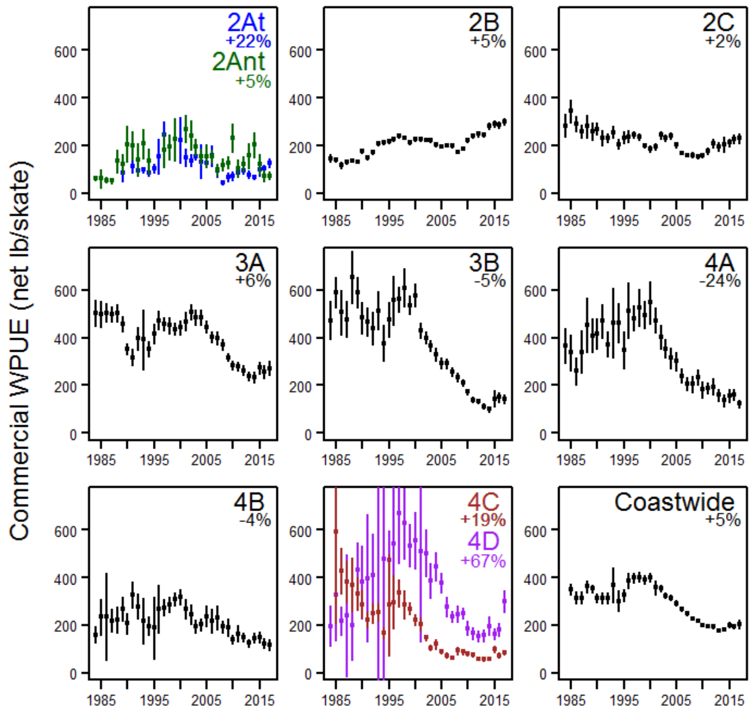

FIGURE 5. Trends in commercial fishery WPUE by Regulatory Area, 1984-2017. Percentages indicate the uncorrected change from 2016 to 2017 (see text above). Vertical lines indicate approximate 95% confidence intervals.

Stock distribution

During 2017, there was extensive consideration by the IPHC Secretariat of what constitutes a biologically-based stock distribution estimate (Hicks and Stewart 2017). Although IPHC Regulatory Areas have been used for distributional summary historically, there is no biological basis for that level of resolution. Instead, population-level information suggests that broader regions (with the exception of Regulatory Area 4B) are more biologically meaningful (Seitz et al. 2017).

Trends over the last five years indicate that population distribution, measured either via the O32 component of the setline survey catch or all sizes has been relatively stable (Figure 1, Table 2). However, over a decadal time-period (setline survey data prior to 1993 is insufficient to provide stock distribution estimates) there has been an increasing proportion of the coastwide stock occurring in Region 2 and a decreasing proportion occurring in Region 3. It is unknown to what degree either of these periods corresponds to historical distributions from the mid-1900s or to the average distribution likely to occur in the absence of fishing mortality.

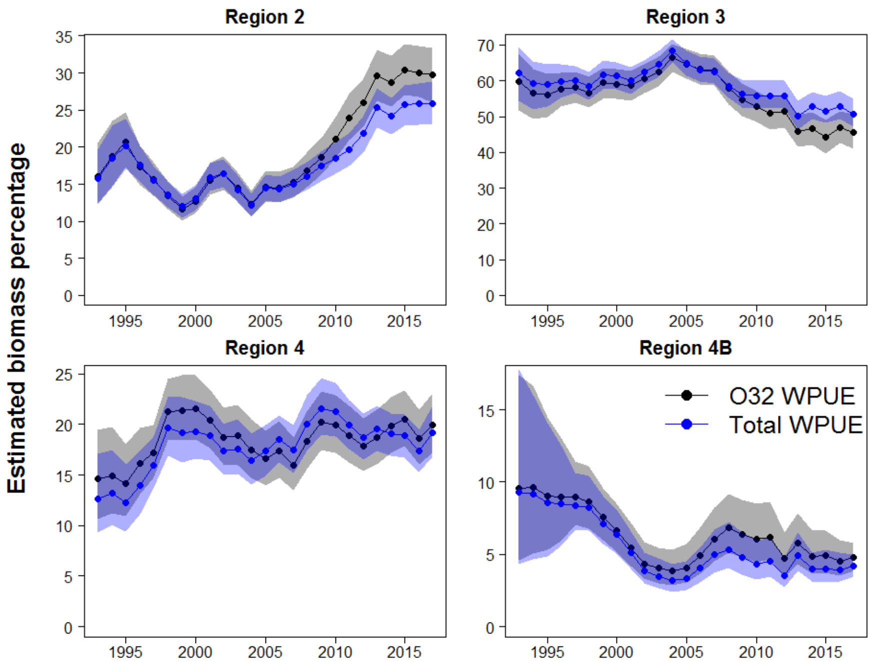

FIGURE 6. Estimated stock distribution (1993-2017) based on setline survey catch of O32 (black series) and all sizes (blue series) of Pacific halibut. Shaded zones indicate approximate 95% credibility intervals.

TABLE 1. Recent regional stock distribution estimates based on modelling of the fishery-independent setline survey data.

	O32 stock distribution				**All sizes stock distribution**			
Year	**Region 2 (2A, 2B, 2C)**	**Region 3 (3A, 3B)**	**Region 4 (4A, 4CDE)**	**Region 4B**	**Region 2 (2A, 2B, 2C)**	**Region 3 (3A, 3B)**	**Region 4 (4A, 4CDE)**	**Region 4B**
2013	29.6%	45.9%	18.7%	5.8%	25.4%	50.1%	19.6%	4.9%
2014	28.8%	46.5%	19.8%	4.9%	24.2%	52.8%	19.1%	4.0%
2015	30.4%	44.2%	20.5%	4.9%	25.7%	51.4%	18.9%	4.0%
2016	30.0%	46.8%	18.6%	4.5%	25.9%	52.8%	17.4%	3.9%
2017	29.7%	45.6%	20.0%	4.8%	25.9%	50.7%	19.2%	4.2%

STOCK ASSESSMENT

This stock assessment is implemented using the generalized software stock synthesis (Methot Jr and Wetzel 2013), and consists of an ensemble of four equally-weighted models; the basic approach remains unchanged since 2014.The ensemble is comprised of two long time-series models, reconstructing historical dynamics back to the beginning of the modern fishery, and two short time-series models incorporating data only from 1996 to the present when all sources of removals and surveys are available for all regions. For each time-series length there are two models: one fitting to coastwide aggregate data, and one to data disaggregated into the four geographic regions. This combination of models also includes uncertainty in natural mortality rates (estimated in the long time-series models, fixed in the short time-series models), environmental effects on recruitment (estimated in the long time-series models), and other model parameters.

As has been the case since 2012, this stock assessment is based on the approximate probability distributions derived from the ensemble of models, thereby incorporating the uncertainty within each model as well as the uncertainty among models. This approach reduces the potential for abrupt changes in management quantities as improvements and additional data are added to individual models, and provides a more realistic perception of uncertainty than any single model, and therefore a stronger basis for risk assessment. For 2017, the four models were equally weighted, as work-to-date on retrospective and predictive performance continues to suggest that each can be considered approximately equally plausible. Within-model uncertainty from each model was propagated through to the ensemble results via an asymptotic approximation. Point estimates reported in this stock assessment correspond to median values from the ensemble, and can therefore be described probabilistically.

BIOMASS AND RECRUITMENT TRENDS

The results of the 2017 stock assessment indicate that the Pacific halibut stock declined continuously from the late 1990s to around 2010 (Figure 7). That trend is estimated to have been largely a result of decreasing size-at-age, as well as somewhat weaker recruitment strengths than those observed during the 1980s. Since the estimated female spawning biomass (SB) stabilized near 200 million pounds (~90,100 t) in 2010, the stock is estimated to have increased gradually to 2017. The SB at the beginning of 2018 is estimated to be 202 million pounds (~91,600 t), with an approximate 95% confidence interval ranging from 148 to 256 million pounds (~67,100-116,100 t; Figure 8). Comparison with previous stock assessments indicates that the 2017 results are very consistent (although slightly lower) with estimates from 2012 through 2016, all of which lie inside the 50% interval (Figure 9.). The 2017 SB estimate from the 2017 stock assessment is only 2% below the estimate from the 2016 stock assessment.

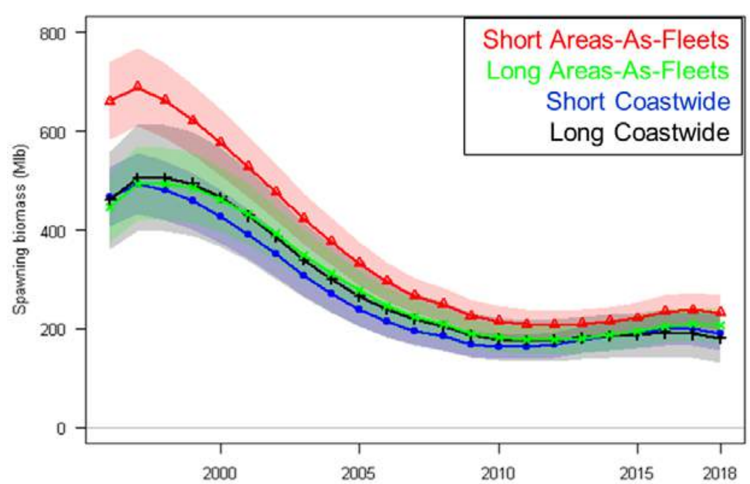

FIGURE 7. Estimated spawning biomass trends (1996-2018) based on the four individual models included in the 2017 stock assessment ensemble. Series indicate the maximum likelihood estimates; shaded intervals indicate approximate 95% confidence intervals.

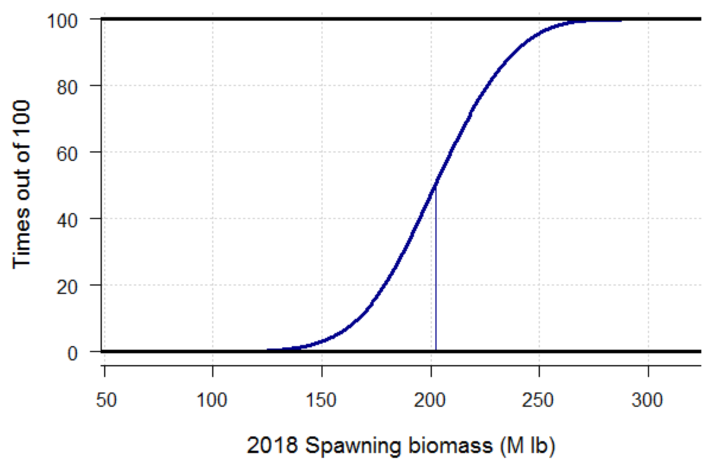

FIGURE 8. Cumulative distribution of the estimated spawning biomass at the beginning of 2018. Curve represents the estimated probability that the biomass is less than or equal to the value on the x-axis; vertical line represents the median (202 million pounds; ~91,600 t).

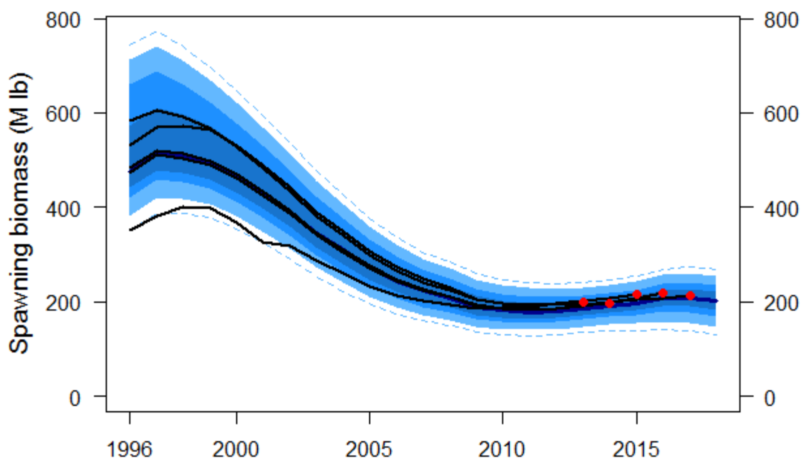

FIGURE 9. Retrospective comparison among recent IPHC stock assessments. Black lines indicate estimates of spawning biomass from assessments conducted from 2012-2016 with the terminal estimate shown as a point, the shaded distribution denotes the 2017 ensemble: the dark blue line indicates the median (or “50:50 line”) with an equal probability of the estimate falling above or below that level; colored bands moving away from the median indicate the intervals containing 50/100, 75/100, and 95/100 estimates; dashed lines indicating the 99/100 interval.

Based on the two long time-series models, average Pacific halibut recruitment is estimated to be higher (41 and 76% for the coastwide and AAF models respectively) during favorable Pacific Decadal Oscillation (PDO) regimes, a widely used indicator of productivity in the north Pacific. Historically, these regimes included positive conditions prior to 1947, poor conditions from 1947-77, positive conditions from 1978-2006, and poor conditions from 2007-13. Annual averages from 2014 through October 2016 have been positive; however, many other environmental indicators, current and temperature patterns have been anomalous relative to historical periods. Further, observed declines in Pacific cod (*Gadus macrocephalus*) in the Gulf of Alaska, seabird mortality events and other conditions suggest that historical patterns of productivity related to the PDO may not be relevant to the most recent few years. Pacific halibut recruitment estimates show the largest recent cohorts in 1999 and 2005. Cohorts from 2006 through 2013 are estimated to be smaller than those from 1999-2005 (Figure 10). This indicates a high probability of decline in both the stock and fishery yield as recent recruitments become increasingly important to the age range over which much of the harvest and spawning takes place.

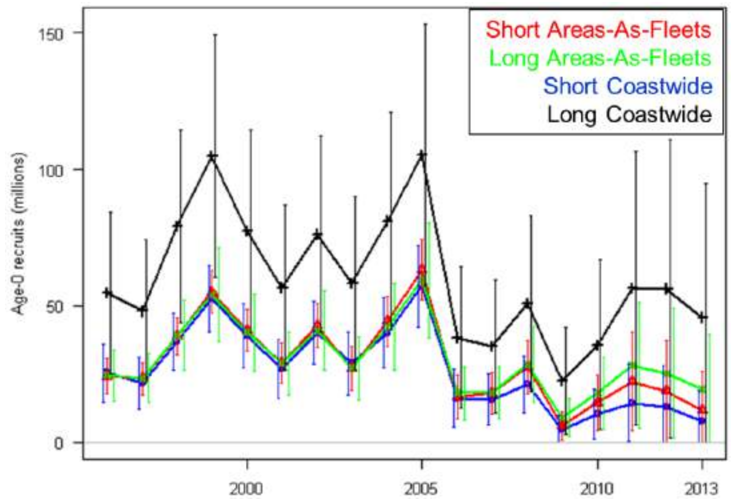

FIGURE 10. Estimated age-0 recruitment trends (1996-2013) based on the four individual models included in the 2017 stock assessment ensemble. Series indicate the maximum likelihood estimates; vertical lines indicate approximate 95% confidence intervals.

HARVEST POLICY AND OTHER REFERENCE POINTS

A comparison of the median 2018 ensemble SB to reference levels specified by the interim management procedure suggests that the stock is currently at 40% (approximate 95% credible range = 26-60%) of specified unfished levels (relative to the SB specified by the current management procedure). The probability that the stock is below the $SB_{30\%}$ level is estimated to be 6%, with less than a 1% chance that the stock is below $SB_{20\%}$ (Table 2). Consistent with the interim management procedure (while improvements are ongoing), estimates of spawning biomass are compared to equilibrium values representing poor recruitment regimes and relatively large size-at-age. Alternative reference points include the spawning biomass estimated to have occurred at the lowest point in the historical time-series (1977-78), as well as the spawning biomass that would be estimated to occur at present (given recent recruitment and biology) in the absence of fishing (dynamic SB0; Hicks and Stewart 2017). The two long time-series models provide a comparison with SB levels estimated to have occurred during the historically low stock sizes of the 1970s: the AAF model suggests that recent stock sizes are at 96% of those levels, and the coastwide model at 215%. The estimates of current spawning biomass relative to the dynamic reference point range from 26-43% among the four stock assessment models, with an average value of 33%. Relatively large differences among models reflect both the uncertainty in historical dynamics as well as the importance of spatial patterns in the data and population processes, for which all of the models represent only simple approximations.

MAJOR SOURCES OF UNCERTAINTY

This stock assessment includes uncertainty associated with estimation of model parameters, treatment of the data sources (e.g., short and long time-series), natural mortality (fixed vs. estimated), approach to spatial structure in the data, and other differences among the models included in the ensemble. Although this is an improvement over the use of a single assessment model, there are important sources of uncertainty that are not included.

Two uncertainties in our current understanding of the Pacific halibut resource are:

1) The sex-ratio of the commercial catch (not sampled due to the dressing of fish at sea), which serves to set the scale of the estimated female abundance in tandem with assumptions regarding natural mortality. Voluntary marking in tandem with genetic sampling of all Pacific halibut sampled from the commercial landings will allow an estimate of the 2017 landings to be available for the next stock assessment. It will take several years to generate enough information on the sex ratio of the landings to begin to meaningfully inform the stock assessment models; however, this represents a crucial step toward addressing this source of uncertainty for future stock assessments. The uncertainty in the historical time-series will remain.

2) The treatment of spatial dynamics and movement rates among Regulatory Areas, which are represented via the coastwide and AAF approaches, and have large implications for the current stock trend. In addition, movement rates for adult and younger Pacific halibut (roughly ages 0-6, which were not well-represented in the PIT-tagging study), particularly to and from Area 4, are necessary for parameterizing a spatially explicit stock assessment. Current understanding of these rates has now been summarized, but remains problematic for tactical stock assessment modelling.

Other important contributors to assessment uncertainty and potential bias include recruitment, size-at-age, and fishery removals. The link between Pacific halibut recruitment strengths and environmental conditions remains poorly understood, and there is no guarantee that observed correlations will continue in the future. Therefore, recruitment variability remains a substantial source of uncertainty in current stock estimates due to the lag between birth year and direct observation in the fishery and survey data (6-10 years). Reduced size-at-age relative to levels observed in the 1970s is the most important driver of recent stock trends, but its cause also remains unknown. The historical record suggests that size-at-age changes relatively slowly; therefore, although projection of future values is highly uncertain, near-term values are unlikely to be substantially different than those currently observed. Data suggest that the decreasing trend in size-at-age has slowed and coastwide values have been relatively stable over the last decade. Like most stock assessments, estimated removals from the stock are assumed to be accurate. Therefore uncertainty due to bycatch mortality estimation (observer sampling and representativeness), discard mortality rates, and any other unreported sources of removals in either directed or non-directed fisheries could create bias in this assessment. Ongoing research on these topics may help to inform our understanding of these processes in the long-term, but in the near-future it appears likely that a high degree of uncertainty in both stock scale and trend will continue to be an integral part of the annual management process.

This stock assessment contains a broader representation of uncertainty in stock levels relative to analyses for many other species. Although the data available for this stock assessment has narrowed both the historical and projected confidence intervals for stock size and trend relative to last year's assessment and projections, the considerable remaining uncertainty can be seen in the distribution for spawning biomass estimated at the beginning of 2017 (Figure 8), such that the small differences between the estimate from the 2017 and recent assessments (Figure 9) are not statistically significant.

OUTLOOK

Stock projections were conducted using the integrated results from the stock assessment ensemble, summaries of the 2017 directed fisheries and other sources of mortality. The harvest decision table (Table 3) provides a comparison of the relative risk (in times out of 100), using stock and fishery metrics (rows), against a range of alternative harvest levels for 2018 (columns). The orientation of this table has changed from previous analyses in order to make the comparison of additional metrics easier (the second year of projection is now explicitly included), and to increase consistency with the results produced from the Management Strategy Evaluation (Hicks & Stewart 2017). The block of rows entitled “Stock Trend” provides for evaluation of the risks to short-term trend in spawning biomass, independent of all harvest policy calculations. The remaining rows portray risks relative to the spawning biomass reference points (“Stock Status”) and fishery performance identified in the interim management procedure. The alternatives (columns) provided include several coarsely spaced levels of mortality intended to provide for evaluation of stock dynamics including:

- No mortality (useful to evaluate the stock trend due solely to population processes),
- A 10 million pound (~4,500 t) 2018 Total Constant Exploitation Yield (TCEY[3])
- A 50 million pound (~22,700 t) 2018 TCEY
- A 60 million pound (~27,200 t) 2018 TCEY
- The removals consistent with the reference SPR ($F_{46\%}$) level.

A finer grid of alternative TCEY values is provided around the column corresponding to the reference level of fishing intensity (SPR=46%; for 2018 a TCEY of 31 million pounds, ~14,060 t).

For each row of the decision table, the total mortality of all sizes and from all sources, the coastwide TCEY and the associated level of fishing intensity (median value with the 95% credible range below; measured via the Spawning Potential Ratio) are reported. Fishing intensity reflects the relative reduction in equilibrium (long-term) spawning biomass per recruit from all sources and sizes of removals, reported as $F_{x\%}$, (where x = the SPR) for comparison to other management processes in both nations where harvest rate targets and limits are commonly reported in these units. As in previous years, it is expected that additional alternatives will be produced during the IPHCs annual process such that all management alternatives considered for 2018 can be directly evaluated in terms projected total mortality and risk.

The stock is projected to decrease gradually over the period from 2018-20 for removals around the reference SPR level (Figure 11). The risk of stock declines begins to increase rapidly for TCEYs above 31 million pounds (~14,060 t), becoming more pronounced by 2020 (Table 3). The reference SPR corresponds to a 78/100 (78%) chance of stock decline through 2019, and a 46% chance of at least a 5% decline through 2021 at that constant level of TCEY. TCEYs

[3] The TCEY corresponds approximately to the mortality comprised of Pacific halibut greater than 26 inches (66 cm) in length.

corresponding to recent levels of fishing mortality correspond to probabilities of stock decline over the next one to three years greater than 95%. There is a relatively small chance (<21/100; 21%) that the stock will decline below the threshold reference point (SB30%) in projections for all the levels of TCEY up to 40 million pounds (~18,100 t) evaluated over three years; for TCEYs exceeding that level, the probability begins to increase rapidly.

TABLE 3. Harvest decision table for 2018. Columns correspond to yield alternatives and rows to risk metrics. Values in the table represent the probability, in "times out of 100" (or percent chance) of a particular risk.

		2018 Alternative	No removals							Reference: SPR=46%								
		Total removals (M lb)	0.0	11.8	21.8	28.8	29.8	30.8	31.8	32.8	33.8	34.8	35.8	37.3	41.8	51.8	61.9	
		TCEY (M lb)	0.0	10.0	20.0	27.0	28.0	29.0	30.0	31.0	32.0	33.0	34.0	35.5	40.0	50.0	60.0	
		Fishing intensity	$F_{100\%}$	$F_{73\%}$	$F_{58\%}$	$F_{50\%}$	$F_{49\%}$	$F_{48\%}$	$F_{47\%}$	$F_{46\%}$	$F_{45\%}$	$F_{44\%}$	$F_{43\%}$	$F_{42\%}$	$F_{39\%}$	$F_{32\%}$	$F_{27\%}$	
		Fishing intensity interval	--	61-84%	45-73%	37-67%	36-66%	36-65%	35-65%	34-64%	33-63%	32-63%	32-62%	31-61%	28-58%	23-53%	19-48%	
Stock Trend (spawning biomass)	in 2019	is less than 2018	1	3	24	59	64	69	74	78	81	85	87	91	98	>99	>99	a
		is 5% less than 2018	<1	<1	<1	2	2	3	4	5	7	9	11	14	29	69	96	b
	in 2020	is less than 2018	<1	1	14	46	52	57	62	67	71	76	80	85	95	>99	>99	c
		is 5% less than 2018	<1	<1	1	9	11	14	18	21	25	29	34	41	61	94	>99	d
	in 2021	is less than 2018	<1	2	23	59	63	68	72	76	79	83	86	90	97	>99	>99	e
		is 5% less than 2018	<1	<1	5	27	32	36	41	46	50	55	59	66	83	99	>99	f
Stock Status (Spawning biomass)	in 2019	is less than 30%	3	4	5	6	6	7	7	7	7	7	7	8	9	11	15	g
		is less than 20%	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1	h
	in 2020	is less than 30%	2	2	4	6	6	6	7	7	8	8	9	9	12	21	32	i
		is less than 20%	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1	1	j
	in 2021	is less than 30%	1	1	4	7	8	8	9	10	11	12	13	15	21	37	54	k
		is less than 20%	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1	2	7	l
Fishery Trend (TCEY)	in 2019	is less than 2018	<1	<1	7	33	38	43	49	55	60	64	68	71	78	89	97	m
		is 10% less than 2018	<1	<1	3	23	26	30	34	38	43	48	53	59	72	82	92	n
	in 2020	is less than 2018	<1	<1	10	38	43	49	54	59	63	67	70	73	79	91	98	o
		is 10% less than 2018	<1	<1	6	27	31	36	40	45	50	54	59	64	74	84	95	p
	in 2021	is less than 2018	<1	<1	14	44	50	55	59	63	67	69	72	74	81	93	>99	q
		is 10% less than 2018	<1	<1	9	34	38	43	48	52	56	60	63	67	75	86	99	r
Fishery Status (Fishing intensity)	in 2018	is above $F_{46\%}$	0	<1	4	29	33	38	43	50	54	60	64	69	77	87	95	s

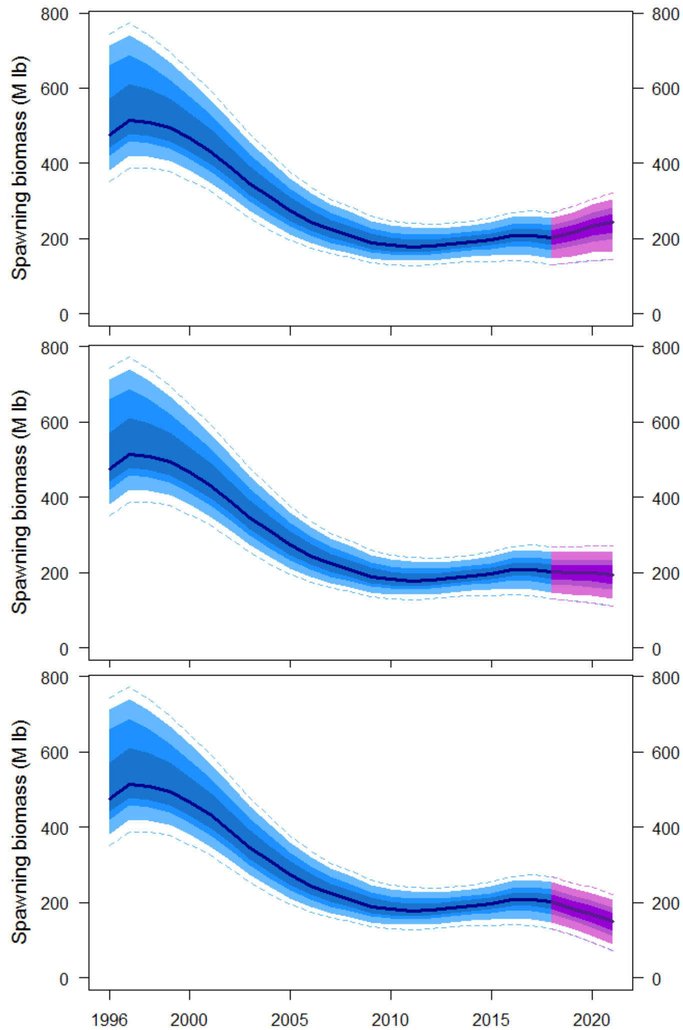

FIGURE 11. Three-year projections of stock trend under alternative levels of mortality: no removals (upper panel), Reference SPR=46% (32.8 million pounds, ~14,900 t; middle panel) and a TCEY of 60 million pounds (~27,200 t; lower panel).

SCIENTIFIC ADVICE

Sources of mortality: In 2017, total removals were below the 100-year average, and have been stable near 42 million pounds (19,050 t) from 2014-17 (Figure 2). In 2017, 83% of the total removals from the stock were retained compared to 80% in 2016.

Fishing intensity: The 2017 mortality from all sources corresponds to a point estimate of SPR = 40% (there is a 75% chance that fishing intensity exceeded the IPHC's reference level of 46%; Table 2). In order to reach the interim reference level, catch limits would need to be reduced for 2018. The Commission does not currently have a coastwide limit fishing intensity reference point.

Stock status (spawning biomass): Current female spawning biomass is estimated to be just above 200 million pounds (90,700 t), which corresponds to only a 6% chance of being below the

IPHC threshold (trigger) reference point of $SB_{30\%}$, and less than a 1% chance of being below the IPHC limit reference point of $SB_{20\%}$. Therefore, no adjustment to the target fishing intensity is required, and the stock is not considered to be '**overfished**'. Projections indicate that the target fishing intensity is likely to result in similar, but declining biomass levels in the near future (Figure 11).

Stock distribution: Regional stock distribution has been stable within estimated credibility intervals over the last five years (Figure 6). Region 2 currently represents a greater proportion, and Region 3 a lesser proportion of the coastwide stock than observed in previous decades.

TABLE 2. Status summary of Pacific halibut in the IPHC Convention Area at the end of 2017.

Indicators	Values	Trends	Status
Total mortality 2017: Retained mortality 2017: Average mortality 2013-17:	42.44 Mlbs, 19,250 t[1] 35.29 Mlbs, 11,864 t 43.34 Mlbs, 19,659 t	Mortality stable 2014-17	**2017 MORTALITY BELOW 100-YEAR AVERAGE**
SPR_{2017}: P(SPR<46%): P(SPR<limit):	40% (29-58%)[2] 75% Limit not specified	Fishing intensity increased from 2016 to 2017	**FISHING INTENSITY HIGHER THAN REFERENCE LEVEL**[3]
SB_{2018} (Mlb): SB_{2018}/SB_0: $P(SB_{2018}<SB_{30})$: $P(SB_{2018}<SB_{20})$:	202 Mlbs (148–256) 40% (26-60%) 6% <1%	SB decreased from 2017 to 2018	**NOT OVERFISHED**[4]
O32 stock distribution: All stock distribution:	See Table 1 and Figure 6	Distribution stable 2013-17	**REGION 2 ABOVE, REGION 3 BELOW HISTORICAL VALUES**

[1] Weights in this document are reported as 'net' weights, head and guts removed; this is approximately 75% of the round (wet) weight).
[2] Ranges denote approximate 95% confidence intervals from the stock assessment ensemble.
[3] Status determined relative to the IPHC's interim reference Spawning Potential Ratio level of 46%.
[4] Status determined relative to the IPHC's interim management procedure biomass limit of $SB_{20\%}$.

RESEARCH PRIORITIES

Research priorities for the stock assessment and related analyses can be delineated into two broad categories: gaps in biological understanding and technical development.

Biological understanding: During the last several years, the IPHC Secretariat has developed a comprehensive five-year research program (Planas 2017). The development of the research priorities has been closely tied to the needs of the stock assessment and harvest strategy policy analyses, such that each of the IPHC's ongoing projects (e.g., determining the sex-ratio of the commercial landings, updating estimates of the maturity schedule for Pacific halibut, better understanding of recruitment processes and stock structure, etc.) will provide data, and hopefully knowledge, about key biological and ecosystem processes that can then be incorporated directly into analyses supporting the management of Pacific halibut.

Technical development: The IPHC's stock assessment, Management Strategy Evaluation (MSE), and harvest strategy policy methods is ongoing, and responds to new developments in the data or analyses necessary each year. New approaches are tested, reported to the IPHC's SRB (generally in June), refined (and reviewed again in October, as needed), and ultimately incorporated in the development of the best scientific information available for the annual management process. Current technical research priorities include:

1) Maintaining consistency and coordination between MSE, and stock assessment data, modelling and methodology.
2) Continued refinement of the ensemble of models used in the stock assessment.
3) Continued development of weighting approaches for models included in the ensemble, potentially including fit to the survey index of abundance, retrospective, and predictive performance.
4) Exploration of methods for better including uncertainty in discard mortality and bycatch estimates in the assessment (now evaluated only via alternative catch tables or model sensitivity tests) in order to better include these sources uncertainty in the decision table.
5) Bayesian methods for fully integrating parameter uncertainty may provide improved uncertainty estimates within the models contributing to the assessment, and a more natural approach for combining the individual models in the ensemble.

RECOMMENDATION/S

That the Commission:

a) **NOTE** paper IPHC-2018-AM094-08 which provides a summary of data, the stock assessment and the harvest decision table for 2018.

References

Hicks, A., and Stewart, I. 2017. IPHC Managment Strategy Evaluation (MSE): Update. IPHC-2017-IM093-10. 32 p.

Methot Jr, R.D., and Wetzel, C.R. 2013. Stock synthesis: A biological and statistical framework for fish stock assessment and fishery management. Fish. Res. **142**(0): 86-99.

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Webster, R. 2017a. Space-time modelling of fishery-independent setline survey data. IPHC-2017-IM093-07.

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Overview of data sources for the Pacific halibut stock assessment, harvest strategy policy, and related analyses

PREPARED BY: IPHC SECRETARIAT (I. STEWART AND R. WEBSTER; 21 DECEMBER 2017)

PURPOSE

To provide the Commission with an overview of the data sources available for the Pacific halibut (*Hippoglossus stenolepis*) stock assessment, harvest policy, Management Strategy Evaluation (MSE) and other related analyses.

INTRODUCTION

This document began as background for the 2013 stock assessment (Stewart 2014), and serves as an annually updated source for direct evaluation of the data and processing methods employed. For each data source, a brief narrative is provided which includes the source, steps taken to filter and analyze the data, and the key quantities available for subsequent analysis. Data sources are described within the categories of: fishery-independent, fishery-dependent, and auxiliary sources of information. The level of detail is adjusted annually to allow for additional description of new sources or changes in analysis methods; final detail presented in previous versions is not repeated annually if there has been no change to the methods or results.

Also provided in this document is a brief synopsis of important changes made in the current year, as well as a list of data sources or analyses that are currently not directly used, but are available for comparison and/or future analysis. The latter includes some comment on avenues for additional data collection and/or analysis. The stock assessment is provided separately as document IPHC-2018-AM094-10. Catch tables detailing Regulatory Area-specific harvest projections are also provided separately in IPHC-2018-AM094-11.

FISHERY-INDEPENDENT DATA

Fishery-independent data are generated each year by the IPHC's setline survey, covering most of the range of Pacific halibut habitat from the northern Bering Sea and Aleutian Islands to California, and depths of 20-275 fathoms (Soderlund et al. 2012; Figure 1). The setline survey generates catch rate information, as well as biological samples from individual fish sampled randomly from the catch including: sex, length, age, maturity, the presence of prior hooking injury, and recently a small subsample of individual fish weights. Data are initially compiled by IPHC Regulatory Area, and then aggregated to the coastwide level, and into four biological Regions: Region 2 (Areas 2A, 2B, and 2C), Region 3 (Areas 3A, 3B), Region 4 (4A, 4CDE) and Region 4B. During 2017, there was extensive consideration by the IPHC Secretariat of what constitutes a biologically-based stock distribution estimate (Hicks and Stewart 2017). Although IPHC Regulatory Areas have been used for distributional summary historically, there is no biological basis for that level of resolution. Instead, population-level information suggests that the broader regions (with the exception of Area 4B) are more biologically meaningful (Seitz et al. 2017).

These data are reprocessed each year for use in the stock assessment as new observations become available. In 2017, setline survey expansions included Regulatory Areas 4B and 2A. This expansion represents the fourth in a six-year planned effort to sample all Pacific halibut habitat logistically possible within the 10-400 fathom (fm; 18-732 m) depth range. Beginning in 2016, all setline survey data reported here are the result of the IPHC's space-time model initially described in Webster (2017). That model was extended during 2017 to include additional data from the period 1993-1997 (Webster 2017).

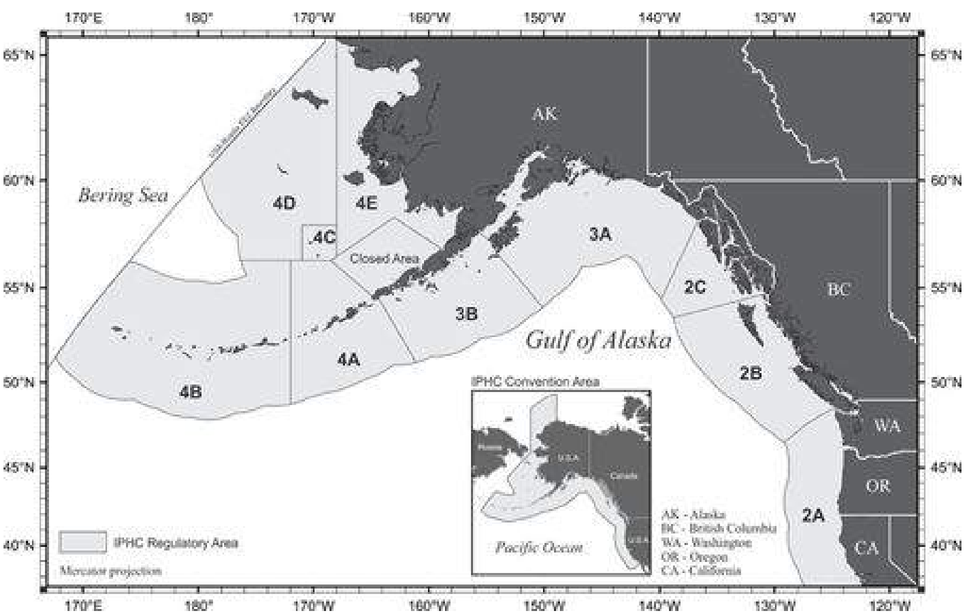

FIGURE 1. IPHC Regulatory Areas and the Pacific halibut geographical range within the territorial waters of the United States of America and Canada.

In addition to its use in supplementing the IPHC setline survey data, the NMFS trawl surveys in Alaska (particularly the Bering Sea) provide valuable information on the size and abundance of Pacific halibut in the Eastern Bering Sea. Beginning in 2015, these data have been used to estimate size-at-age for young Pacific halibut not frequently encountered in the IPHC setline survey, as well as trends in abundance and age structure of that demographic component of the overall Pacific halibut stock.

Setline survey WPUE (Weight-Per-Unit-Effort) and NPUE (Numbers-Per-Unit-Effort)

The catch-rate information from the setline survey serves as the primary source of relative trend information (along with commercial catch-rates) for the stock assessment as well as the understanding of current stock distribution.

The setline survey trends reported here reflect the output of the space-time model documented in Webster (2017). For 2017 WPUE was modelled for both legal-size (above the 32 inch (81.3 cm) minimum size limit, or O32) and total biomass. The coastwide O32 setline survey WPUE index is estimated to have decreased by 10% from 2016 to 2017 (Appendix A, Figures 2-3). This follows slight increases in the three previous years, and results in a relatively flat coastwide trend in WPUE since 2010. Decreases ranged from 4% to 13% among Regions, with Region 2 decreasing by 11% after 7 years of increase, and all other Regions near historical lows. The three largest decreases from 2016 to 2017 by Regulatory Area occurred in Areas 2A (-22%), 2B (-23%), and 3B (-32%); Area 2C showed the sole increase at +1%. The patterns were similar, but the magnitude larger for the WPUE for all sizes of Pacific halibut, which was down 17% at the coastwide level and ranged among Regulatory Areas from +1% (4A) to -36% (3B; Figures 4-5).

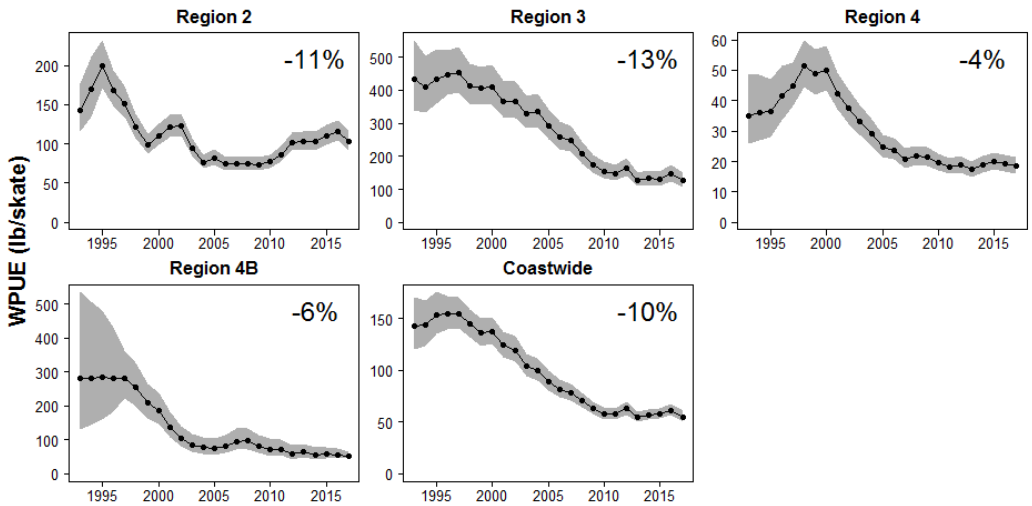

FIGURE 2. Trends in setline survey legal (O32) WPUE by biological Region, 1993-2017. Percentages indicate the change from 2016 to 2017. Shaded zones indicate 95% credible intervals.

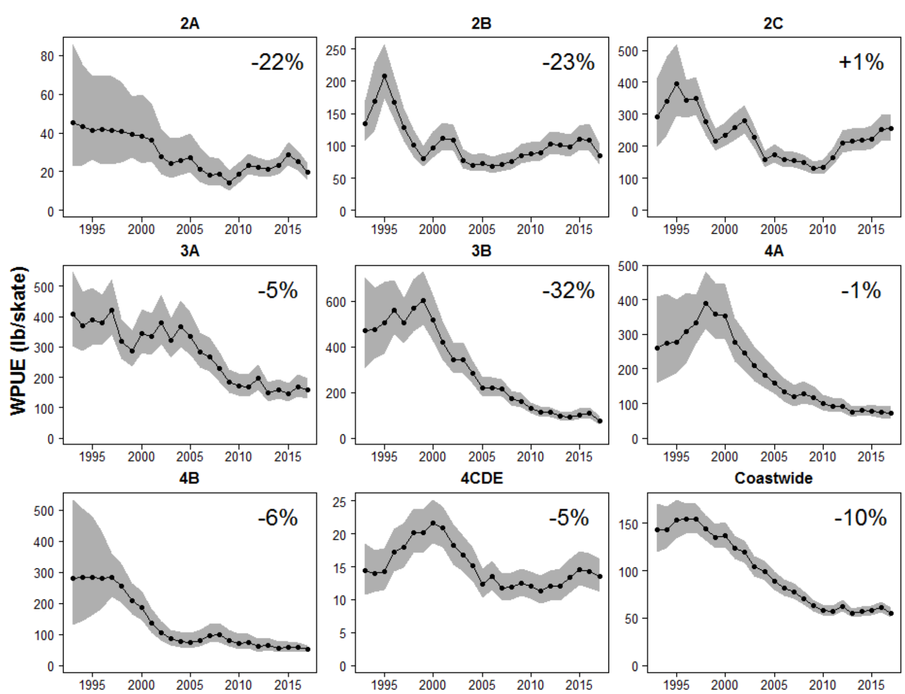

FIGURE 3. Trends in setline survey legal (O32) WPUE by IPHC Regulatory Area, 1993-2017. Percentages indicate the change from 2016 to 2017. Shaded zones indicate 95% credible intervals.

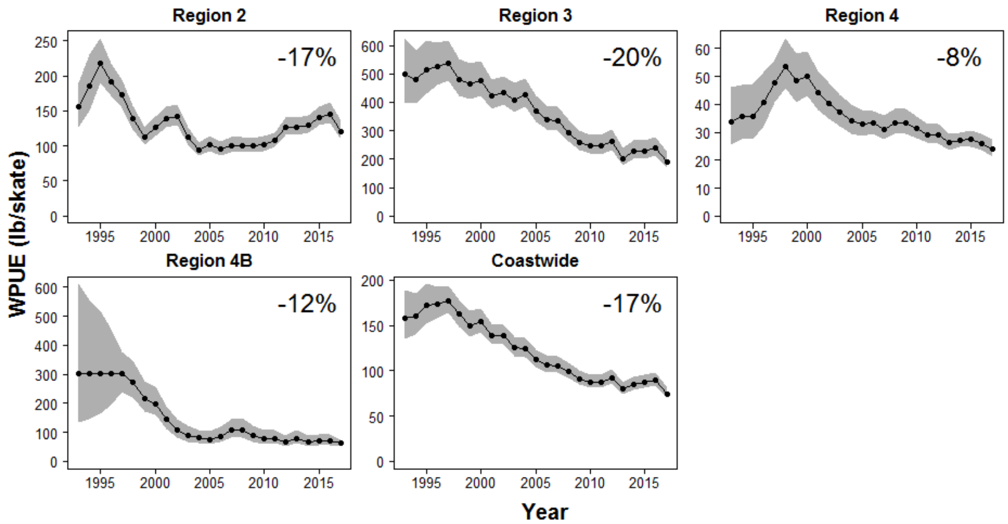

FIGURE 4. Trends in setline survey all-sizes WPUE by biological Region, 1993-2017. Percentages indicate the change from 2016 to 2017. Shaded zones indicate 95% credible intervals.

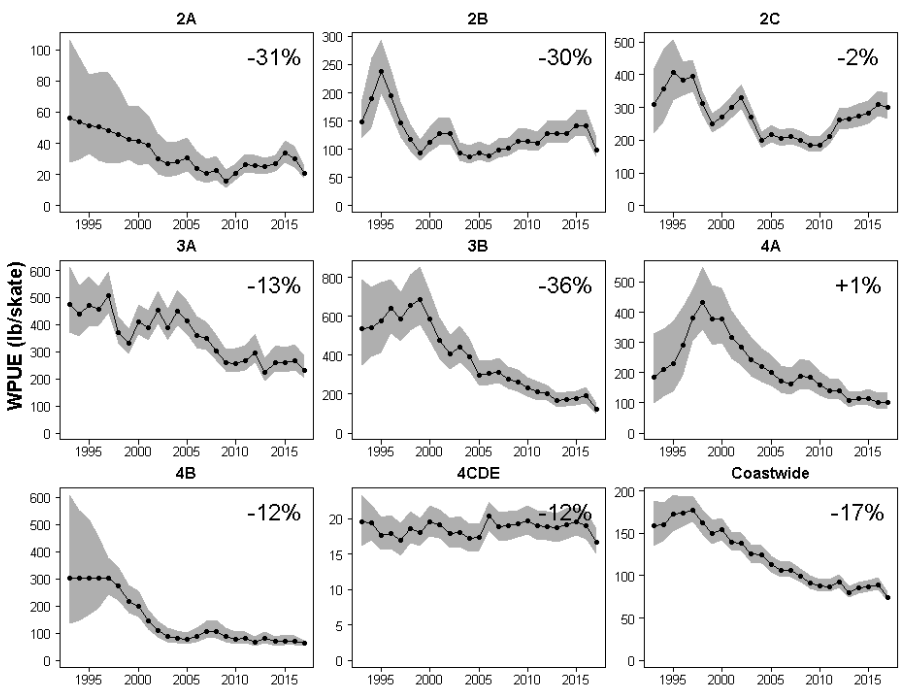

FIGURE 5. Trends in setline survey all-sizes WPUE by IPHC Regulatory Area, 1993-2017. Percentages indicate the change from 2016 to 2017. Shaded zones indicate 95% credible intervals.

The stock assessment models fit directly to the observed Numbers-Per-Unit-Effort (NPUE) from the setline survey, in order to avoid converting observed lengths to weights based on the length-weight relationship, and to provide a delineation between changes in the number of fish and changes in the size of those fish (included in the models via the mean weight-at-age; see below). Setline survey NPUE showed a more pronounced decrease from 2016 to 2017 (-24%

coastwide), with the most pronounced decrease in Region 2 (-27%; Figure 6). Region four decreased by only 10%; however, that decrease follows a seven year period of overall declines. Individual Regulatory Areas ranged from a 1% increase (Area 4A), to a 44% decrease (Area 2A), with Areas 2A, 2B, and 3B showing the largest one year declines, all of which were equal or greater than the largest single year changes observed in the estimated time-series; Figure 7).

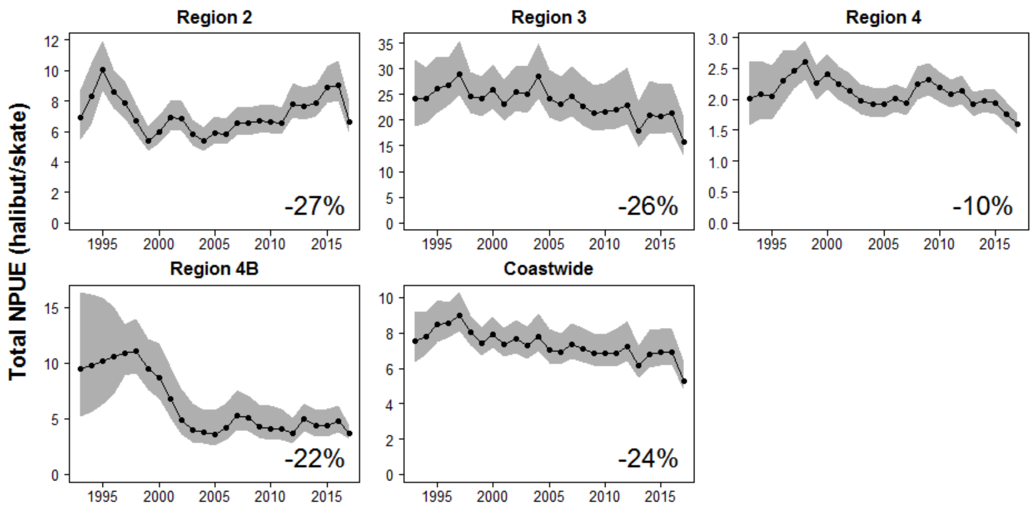

FIGURE 6. Trends in setline survey all-sizes NPUE by biological Region, 1993-2017. Percentages indicate the change from 2016 to 2017. Shaded zones indicate 95% credible intervals.

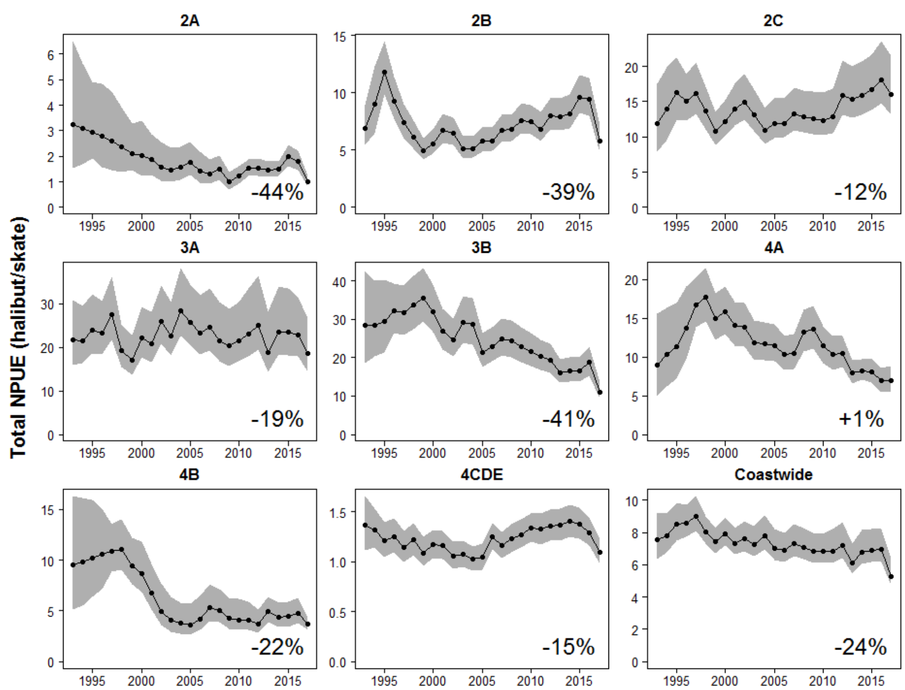

FIGURE 7. Trends in setline survey all-sizes NPUE by IPHC Regulatory Area, 1993-2017. Percentages indicate the change from 2016 to 2017. Shaded zones indicate 95% credible intervals.

Stock distribution

Setline survey WPUE (a proxy for density) estimated from the space-time model, and the geographical extent of Pacific halibut habitat, are used to estimate how the coastwide stock is distributed each year. Beginning in 2016, summaries of this information were provided both by biological Region as well as individual Regulatory Area (for use in the interim management procedure calculations). For 2017, this reporting is further expanded to include the stock distribution of all sizes, in addition to the distribution of O32 Pacific halibut considered in previous years.

Trends over the last five years indicate that population distribution, measured either via either the O32 component of the setline survey catch or all sizes has been relatively stable (Figure 8, Tables A4-A6). However, over a decadal time-period (setline survey data prior to 1993 is insufficient to provide stock distribution estimates) there has been an increasing proportion of the coastwide stock occurring in Region 2 and a decreasing proportion occurring in Region 3. It is unknown to what degree either of these periods corresponds to historical distributions from the mid-1900s or to the average distribution likely to occur in the absence of fishing mortality.

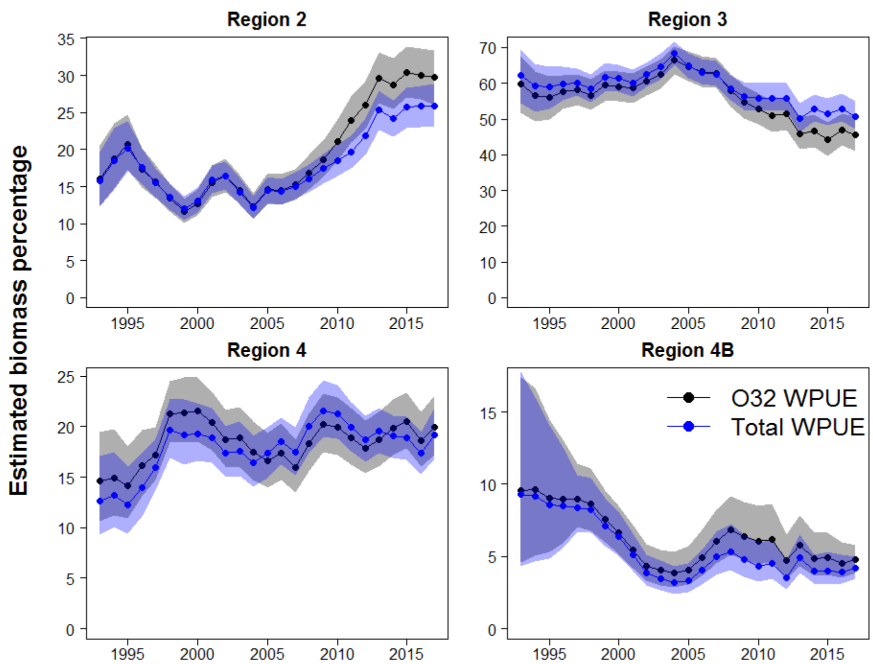

FIGURE 8. Estimated stock distribution (1993-2017) based on setline survey catch of O32 (black series) and all sizes (blue series) of Pacific halibut. Shaded zones indicate 95% credible intervals.

Regulatory Area-specific estimates using data through 2017 indicate that our understanding of the distribution of the stock has changed somewhat from last year, with a smaller percentage of the coastwide biomass estimated to occur in Regulatory Areas 2A, 2B, and 3B, and a larger percentage in all other Areas (Figure 9, Tables A4-A5). This change incorporates two factors: 1) the updated data available for 2017 added to the space-time model, and 2) the change in actual stock distribution from 2016 to 2017. As has been observed in previous years, the degree of variability is much higher among individual Regulatory Areas than among biological Regions; however, the credible intervals are overlapping between all 2016 and 2017 estimates (Figure 9).

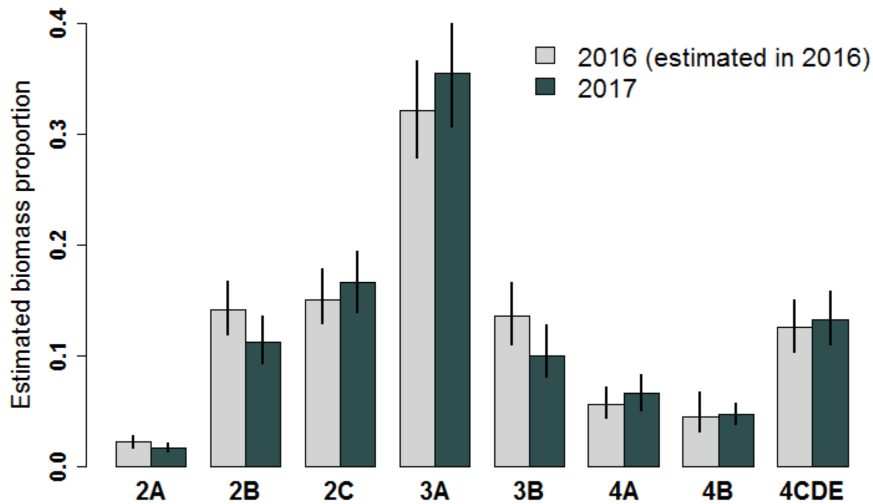

FIGURE 9. Estimated stock distribution based on setline survey catch of O32 Pacific halibut as estimated in 2016, and as estimated in 2017. Vertical lines indicate 95% credible intervals.

Setline survey age distributions

Otoliths are collected randomly from Pacific halibut captured by the setline survey, with sampling rates adjusted by Regulatory Area to achieve a similar number of samples from each area in each year. All otoliths collected during setline survey activities are read each year by IPHC age-readers. Because the setline survey catch is sampled randomly at the same rate for all stations within a given regulatory area and year, the raw frequency of ages is an appropriate estimate of the aggregate for the area. Age distributions differ between male and female Pacific halibut and among Regulatory Areas, with older fish comprised primarily of males, and with males occurring in much greater numbers in the western Regulatory Areas (3B-4B, Figure 10). Twelve-year-old Pacific halibut, corresponding to the 2005 cohort, were the most abundant in the 2017 data, following 2015 and 2016, which also showed the strength of this year-class.

In order to weight these area-specific distributions, an estimate of the number of Pacific halibut in each area is required. This is obtained via the setline survey NPUE, as the relative numbers in each Regulatory Area provide a weighting for combining the age-frequency distributions into a coastwide aggregate (Figure 11). From the late 1990s through the mid-2000s, the strength of the 1987 year class is particularly evident in these data. The age frequencies over the last five years are relatively constant, dominated by ages 8-16, with an increasing importance the 2005 year-class, consistent with observations in NMFS trawl surveys (see below), observed to be age-12 in 2017.

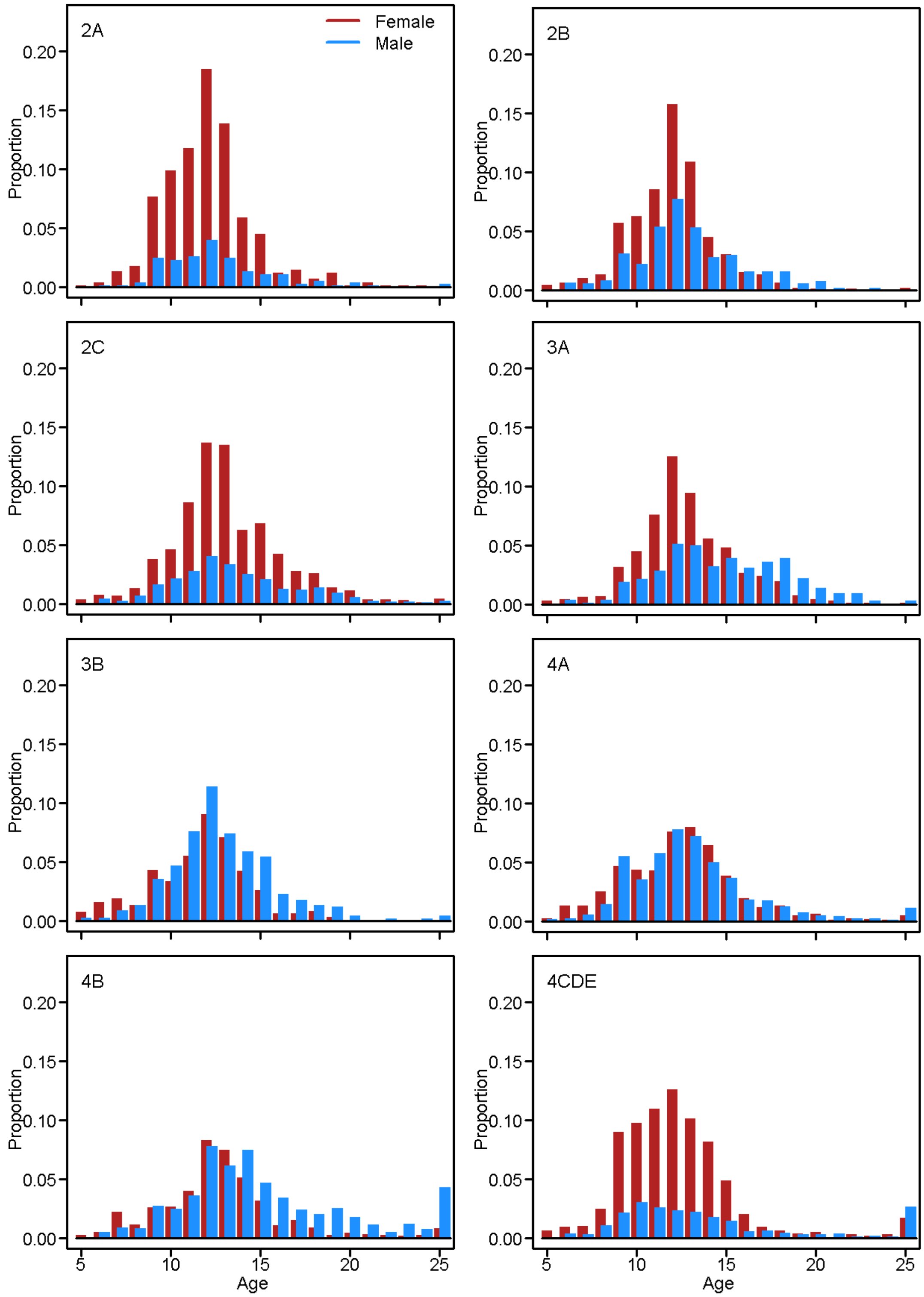

FIGURE 10. Age distributions from the 2017 setline survey by Regulatory Area. Red bars indicate the proportion of the setline survey catch comprised of females (by number), and the blue bars indicate proportions for male Pacific halibut.

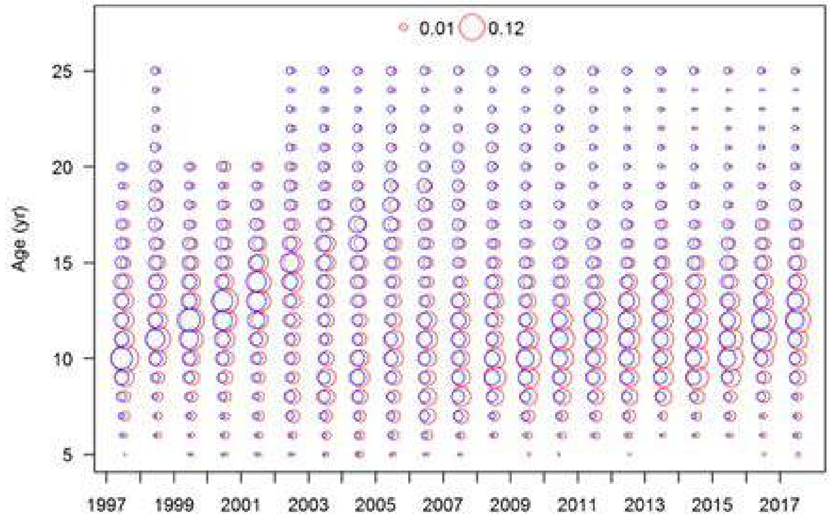

FIGURE 11. Recent coastwide proportions-at-age for females (red circles) and males (blue circles) from the setline survey. Proportions sum to 1 across both sexes within each year.

Ages have been aggregated at age-25 for all observations using the break-and-bake ageing method. This method was adopted for all Pacific halibut age-reading by the IPHC (see section on ageing bias and imprecision below) in 2002. Ages have been aggregated at age-20 (all ages-20 and older combined) for all data (setline survey and fishery) collected prior to 2002 when Most ages read prior to 2002 used surface ageing methods, except for 1998, where a randomly selected subsample of otoliths were re-aged (during 2013) and ages can now be more reliably interpreted out to age-25 (see Forsberg and Stewart 2015, Stewart 2014 for more information on these samples).

Similar to the setline survey catch-rate data, there are some sparse age data available prior to 1997. These age data represent only Areas 2B, 2C, and 3A for the years 1982-96, and only Areas 2B and 3A for the years 1980-81. These earlier data do not reveal any particularly strong cohorts, nor do the cohort strengths appear appreciably different for male and female Pacific halibut. The age data were also aggregated into biological Regions, revealing important differences in age structure (Figures 12-13). Specifically, there have been very few Pacific halibut greater than age 20 of either sex observed in Region 2, but fish of those ages, and particularly males, become more common in the western and northern portions of the stock. Region 4B shows the highest proportion of age 25+ Pacific halibut for both males and females (Figure 13).

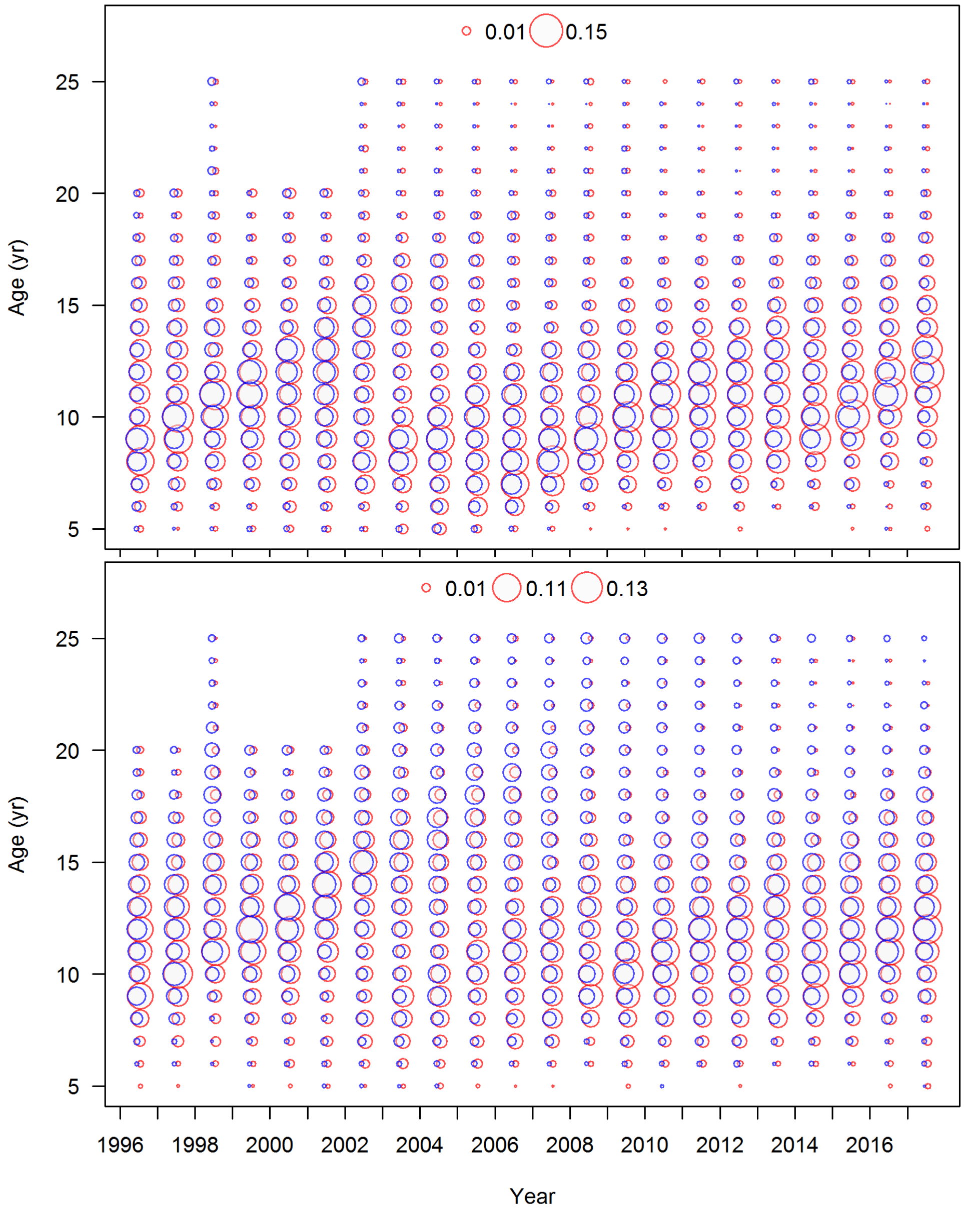

FIGURE 12. Recent proportions-at-age for female (red circles) and male (blue circles) Pacific halibut captured by the setline survey by biological Region: Region 2 (upper panel), Region 3 (lower panel). Proportions sum to 1 across both sexes within each year.

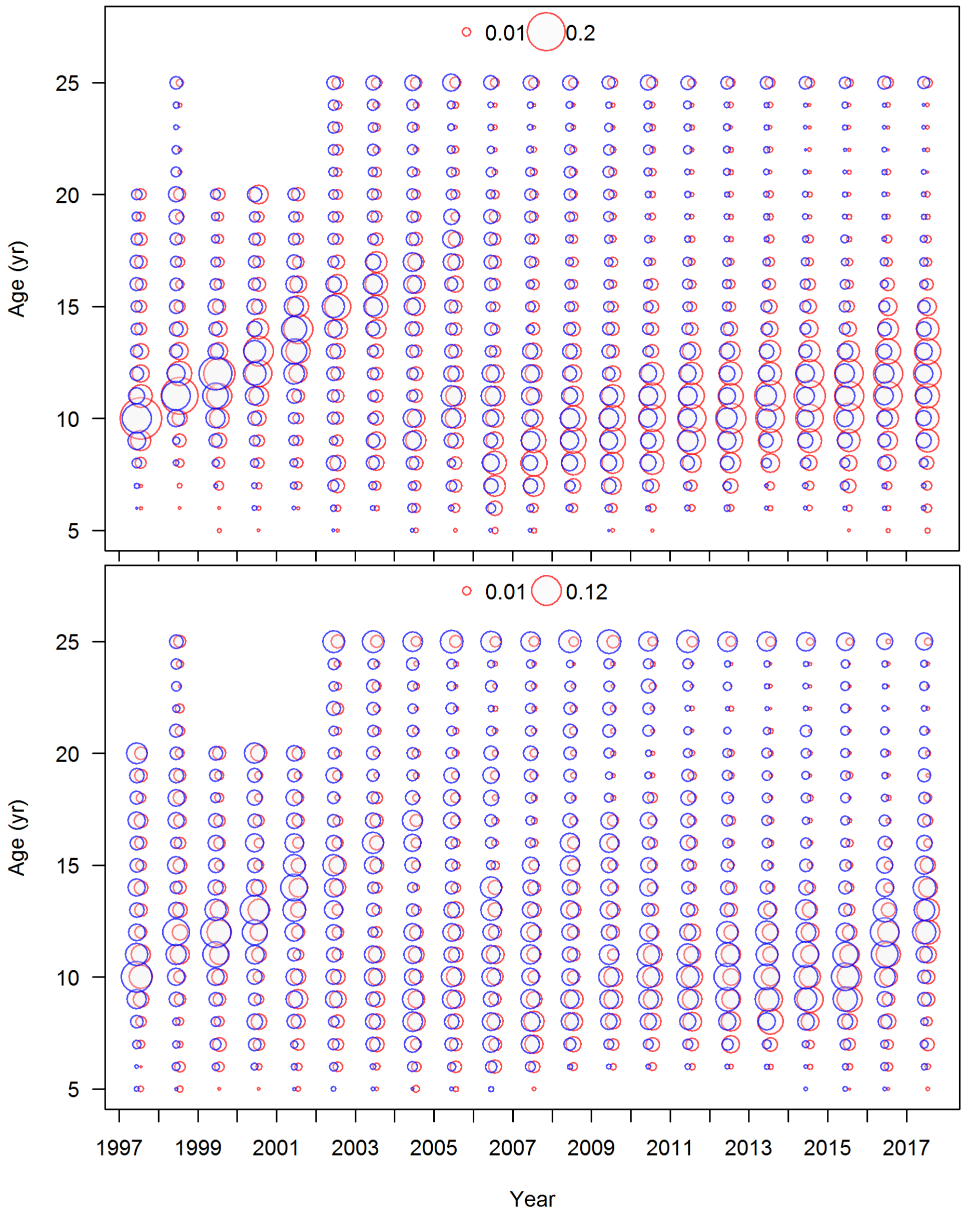

FIGURE 13. Recent proportions-at-age for female (red circles) and male (blue circles) Pacific halibut captured by the setline survey by biological Region: Region 4 (upper panel) and Region 4B (lower panel) Pacific halibut captured by the setline survey. Proportions sum to 1 across both sexes within each year.

Sublegal (U32) Setline survey age distributions

Beginning in 2015, the age-distribution of sublegal (U32) Pacific halibut captured by the setline survey was used as a means to approximate the Pacific halibut comprising commercial discard mortality associated with fish captured as part of the commercial fishery, discarded due to the minimum size limit, of which a portion are assumed to subsequently die (Stewart and Martell 2016). These data show a protracted age-distribution, particularly for males in Area 3A (Figures 14-15). The age-distribution for the two sexes also differs importantly, with sublegal females present in appreciable numbers from roughly age 7 to 11, and sublegal males from 7 to well beyond age 15 in some years. The protracted age structure of fish below the 32” minimum size-limit illustrates the effects of variability in size-at-age: some fish from each cohort reaching the minimum size limit by age-6, and others (particularly males) many years later.

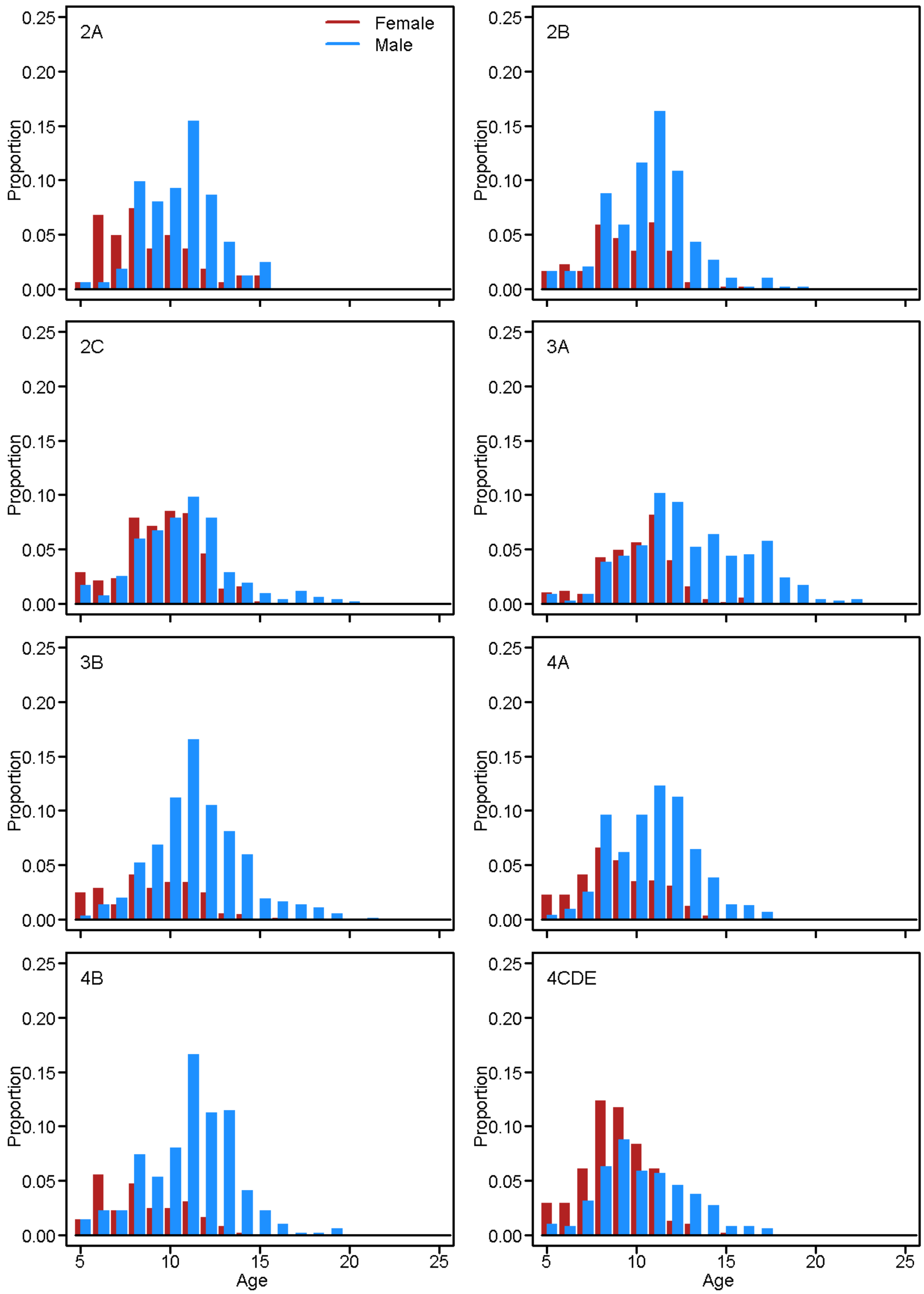

FIGURE 14. Sub-legal age distributions from the 2017 setline survey by Regulatory Area.

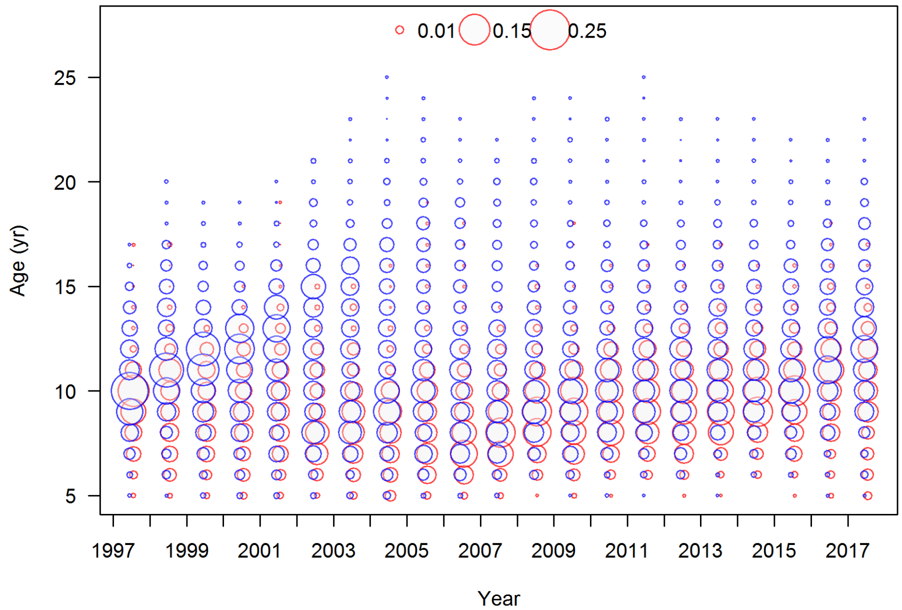

FIGURE 15. Recent coastwide proportions-at-age for sublegal females (red circles) and males (blue circles) from the setline survey. Proportions sum to 1 across both sexes within each year.

Setline survey weight-at-age

The setline survey collects individual length observations on all Pacific halibut captured, which are then converted to estimated weights via the length-weight relationship (see section below). Age estimates are also available for a random subsample of these lengths.

Ages consist of primarily surface ages prior to 2002, and exclusively break-and-bake ages from 2002 to the present. Prior analyses of weight-at-age attempted to correct for the potential bias of surface ages by converting the weights corresponding to surface ages to the 'true' weight at age given an estimated level of bias (and some assumption of the underlying age structure). Investigation of the data prior to 2002 revealed that many of the surface ages also had corresponding break-and-bake ages that were not being included in the analysis (see summary of ageing bias and precision below). Replacing all surface ages with break-and-bake ages (where available) in the weight-at-age calculations appears to adequately address the differences in the ageing methods for the recent data.

Because the sampling of ages is random within the setline survey catches for an area each year, the average weight-at-age by area, sex, and year can be calculated directly. Where there are very few individuals in the population of a particular age, the number of setline survey age samples is also small (the age samples are not length-stratified). This pattern, in combination with incomplete setline survey sampling for some areas and years, results in a small number of missing weights-at-age within area and year combinations. These are simply interpolated from adjacent years. Because the setline survey captures few fish younger than age 7 or older than age 25, all fish outside this range are aggregated to these 'minus' and 'plus' groups (but see NMFS trawl survey section below). Although there has been a very strong trend of declining weight-at-age in recent decades, there are marked differences in the magnitude of this decline among Regulatory Areas (Appendix B). There also appear to be some patterns associated with specific cohorts; e.g., females in Area 2C born in the late-1990s and mid-2000s (Figure B3, upper panel). These different trends among areas require appropriate weighting of the areas to create a coastwide time-series that represents the entire stock. The estimates of numbers of fish generated from setline survey NPUE are used to weight the individual regulatory areas. At the coastwide level, there appear to be small increases in size-at-age for both males and females over many ages in the raw data (Figure B9); however, this is also consistent with year-to-year variability observed in the past and when the observations are smoothed across years there appears to be little consistent change from 2016 to 2017 (Figure 16). A broader comparison of historical observations predicted from a mix of fishery and setline survey data (See Fishery weight-at-age section below) indicates that the declines in size-at-age for female Pacific halibut were even more pronounced from the mid-1970s to the mid-1990s than in the recent period covered by the setline survey, and that they differ by biological Region. Current size-at-age (represented by an 'average' age-12 female Pacific halibut) is estimated to be at or near historical lows for all areas and coastwide (Figure 17).

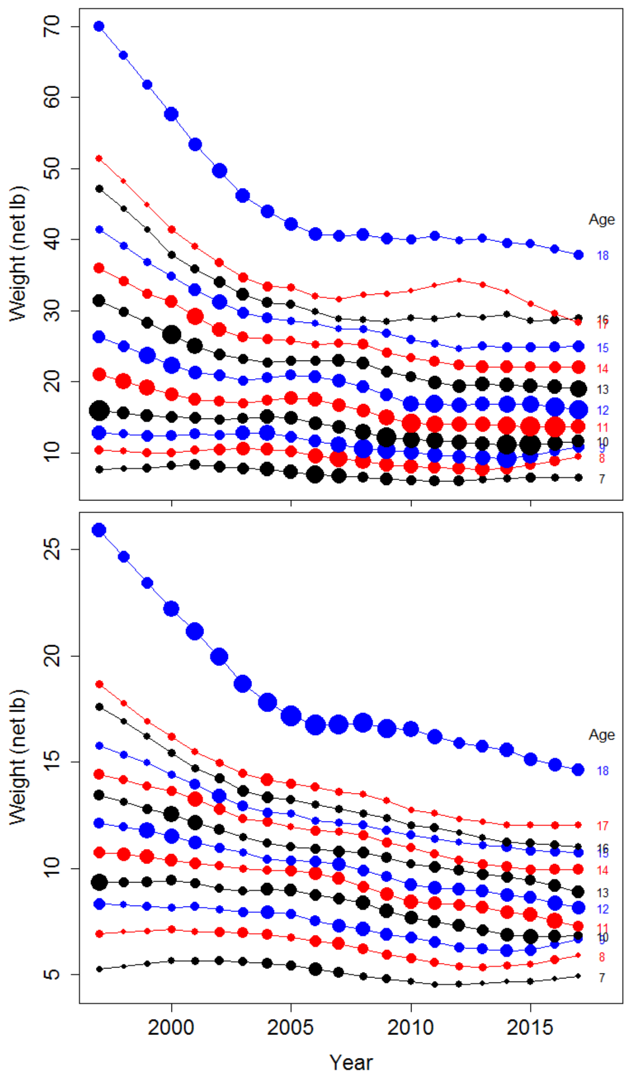

FIGURE 16. Weighted and smoothed recent coastwide trends in weight-at-age for female (upper panel), and male (lower panel) Pacific halibut from all Regulatory Areas captured by the setline survey. The size (area) of the points is proportional to the number of fish contributing to each observation; ages 18 and greater have been aggregated.

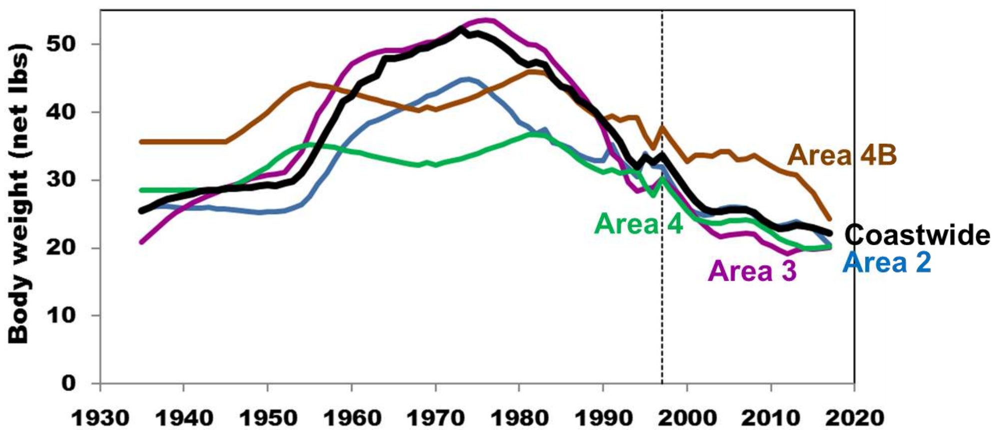

FIGURE 17. Coastwide and region-specific estimated female average weight-at-age 12 trends from setline survey and fishery data since 1935.

Spawning output-at-age

Setline survey data are also used to define the population-level weight-at-age and spawning biomass. Unlike the setline survey index calculation, where interannual sampling variability is logically included, the true population level quantities should be smoother than the raw observations. Applying a smoother across years within each age produces results more consistent with those expected for population level values; these summaries most clearly show the population-level decline in weight-at-age observed for both male and female Pacific halibut over the recent time-series available from the setline survey (Figure 16). Setline survey observations of weight-at-age might include some bias relative to the population if size-based selectivity is operating on the distribution of lengths within each age. However, the matrix of population-level weight-at-age is most important in the assessment for those ages that are mature, for Pacific halibut mainly ages 11 and higher (see Maturity section below) which are less likely to experience significant bias.

NMFS Trawl surveys in Alaska

Pacific halibut stock analyses have used various extrapolation and smoothing methods to assign weight-at-age to fish that are younger than those observed in the IPHC's setline survey, which provides the most detailed source of sex-length-age information. These calculations are not critically important to the treatment of commercial fishery or survey information, as few very young fish are observed in those data sets; however, accurate depiction of the removals from other sources, such as recreational fisheries and bycatch in non-target fisheries requires representative weight-at-age for all fish captured, particularly ages 2-6.

Otoliths are collected by IPHC samplers on board NMFS trawl surveys in Alaska each year. The average weight-at-age by year and sex was summarized from the NMFS trawl surveys; age and length data were available for all years since 1998, although mean values were somewhat variable for ages greater than 10 due to limited sample sizes (Figure 18). To reduce the effect of sampling variability (there is no easy way to account for observation error in the treatment of weight-at-age), raw values were smoothed across years within age (Figure 19). These trawl survey weights-at-age were used to augment the weight-at-age inputs calculated from ages 7+ in the setline survey and commercial fishery. For the plus group in the stock assessment input data (25+), the average age is calculated; this average age is then used to extrapolate the weight-at-age for ages 25-30. This is necessary because the average weight-at-age for all 25+ Pacific halibut combined should not be attributed to exactly age 25: the average age must be >25 unless all fish are exactly 25.

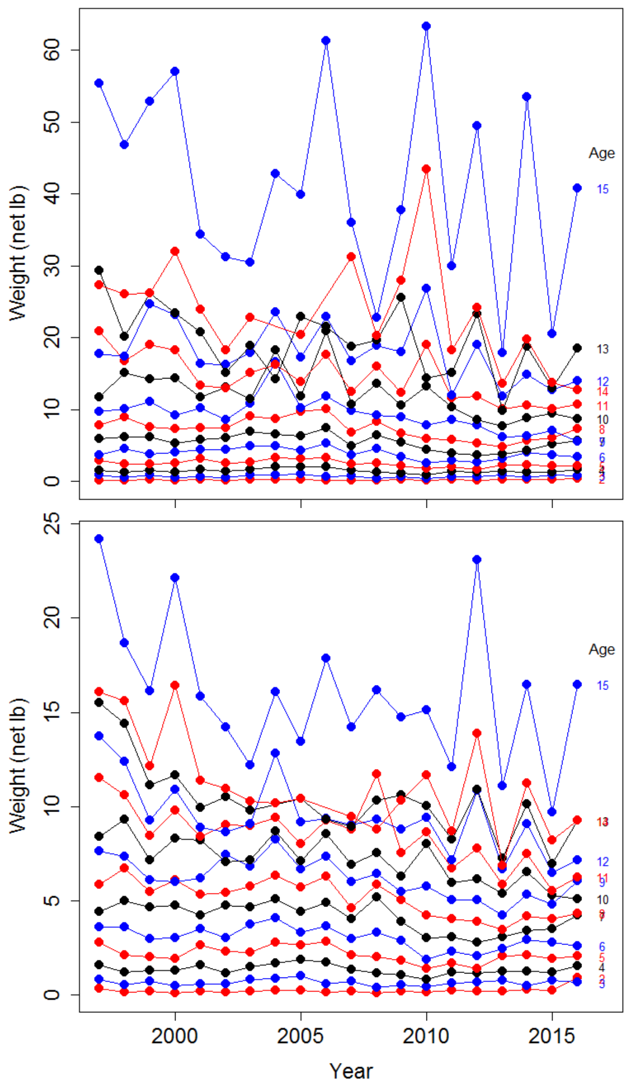

FIGURE 18. Raw trends in weight-at-age for female (upper panel), and male (lower panel) Pacific halibut from the NMFS Bering Sea trawl survey. Ages 15 and greater have been aggregated.

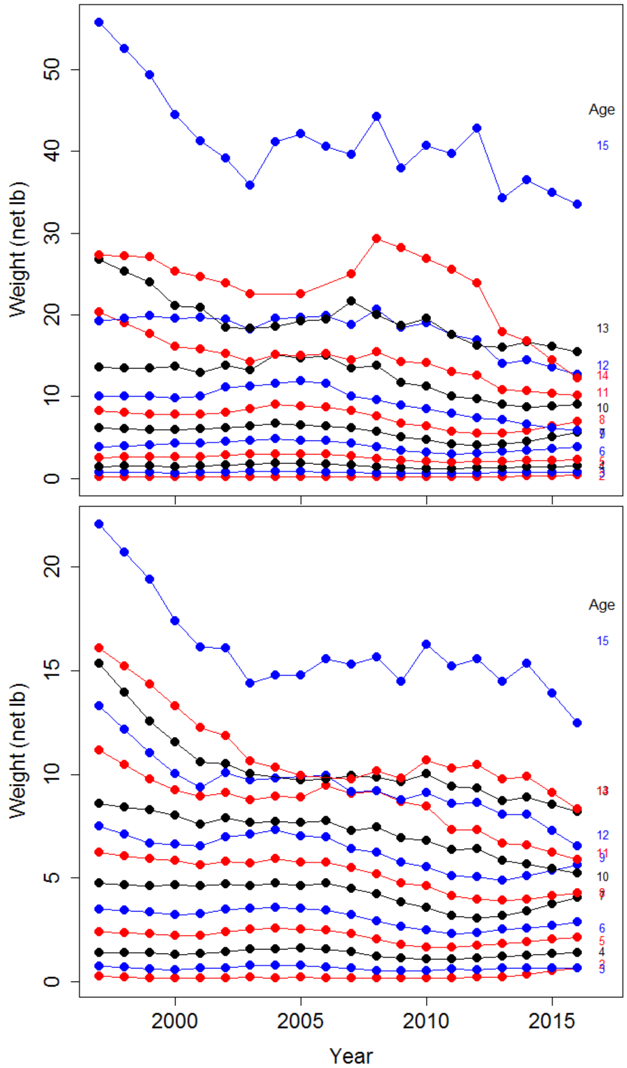

FIGURE 19. Smoothed trends in weight-at-age for female (upper panel), and male (lower panel) Pacific halibut from the NMFS Bering Sea trawl survey. Ages 15 and greater have been aggregated.

The ages observed on the NMFS trawl surveys provide year-specific information with which to estimate age distributions from that trawl survey as well as other sources that report only length frequency information, but encounter Pacific halibut of similar ages, such as bycatch. However, there are no age data available from the NMFS trawl surveys before 1998, so a global (all-years) relationship (Figure 20) must be used to interpret lengths collected in earlier years and other sources of length data (see age distribution of bycatch removals below). When this key is applied to the earlier years of the NMFS Bering Sea Trawl survey, several strong cohorts emerge (Figure 21). The 1987 year class is prominent in the age distributions observed by this survey through the late 1990s. Strong 2004 and 2005 Bering Sea cohorts can also be observed graduating through the age distribution. These year classes are consistent with the catch rates of numbers of Pacific halibut observed in that survey (Figure 22), although the relative magnitude of the 1987 and 2005 cohorts differ more appreciably in the index than in the age data. There appears to be a large proportion of 3-5 year old Pacific halibut present in the 2015-2017 data; however, these fish have yet to be observed in any other source and therefore the absolute magnitude of the year-classes remains unknown.

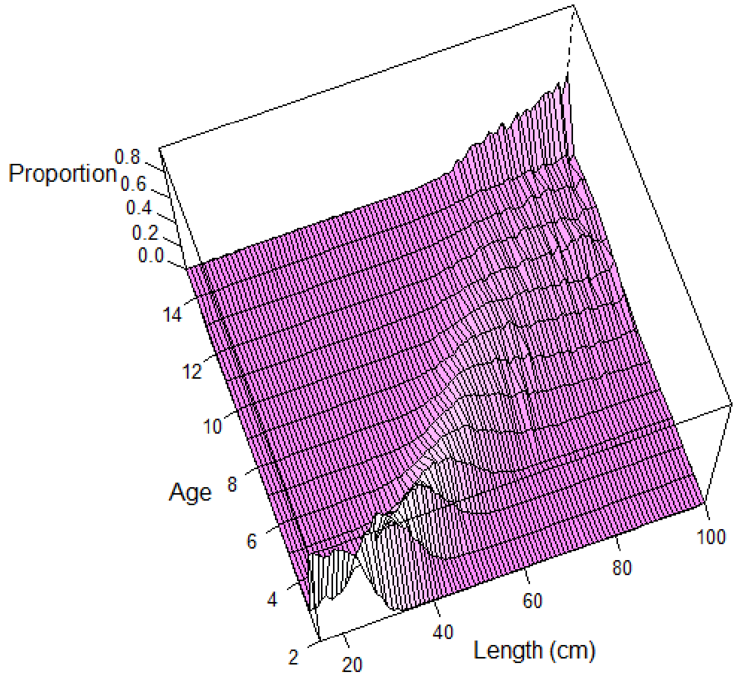

FIGURE 20. Global age-length key created from NMFS trawl surveys in Alaska. Proportions-at-age that sum to 1.0 within each length.

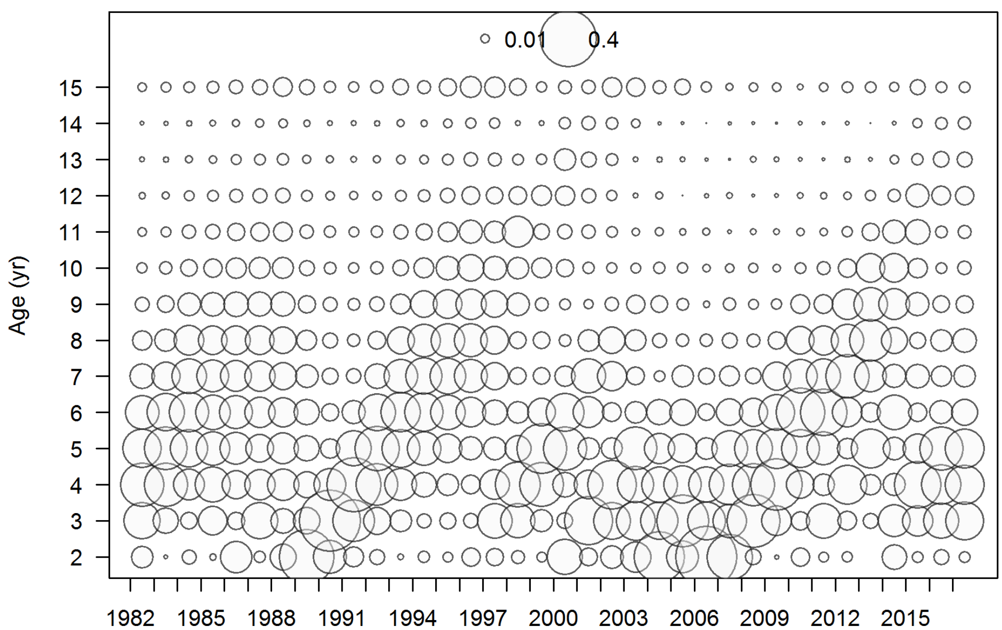

FIGURE 21. Proportions-at-age from the NMFS Bering Sea trawl survey. Ages 15 and greater have been aggregated; proportions sum to 1.0 within each year.

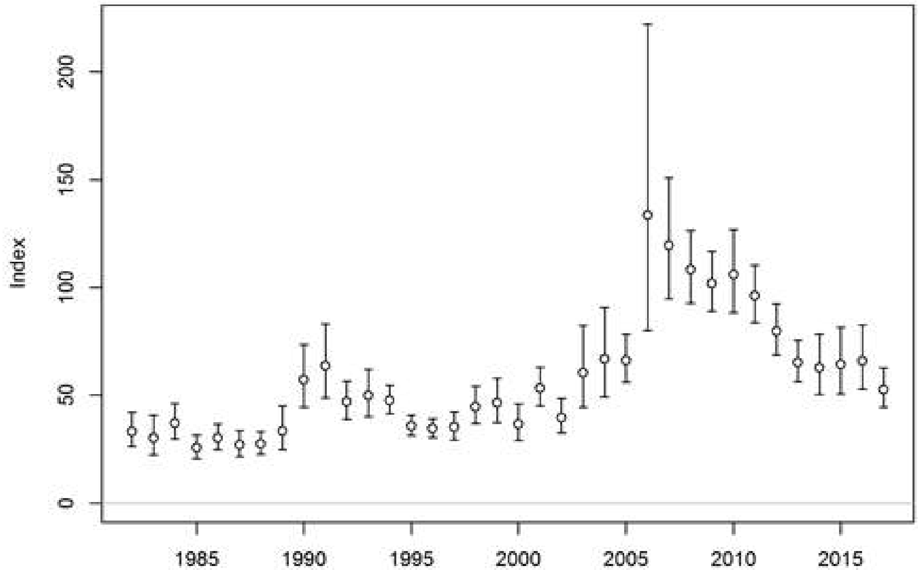

FIGURE 22. Index of abundance (millions of Pacific halibut) of Pacific halibut from the NMFS Bering Sea trawl survey.

FISHERY-INDEPENDENT DATA

Commercial fishery landings

An annual estimate of total mortality of Pacific halibut from all sources is required for all stock assessment and related analyses. Removals can be categorized into five major components: commercial fishery landings, commercial fishery discard (a combination of sub-legal and legal-sized fish), recreational, subsistence, and bycatch mortality of Pacific halibut in fisheries targeting other species (Figure 23).

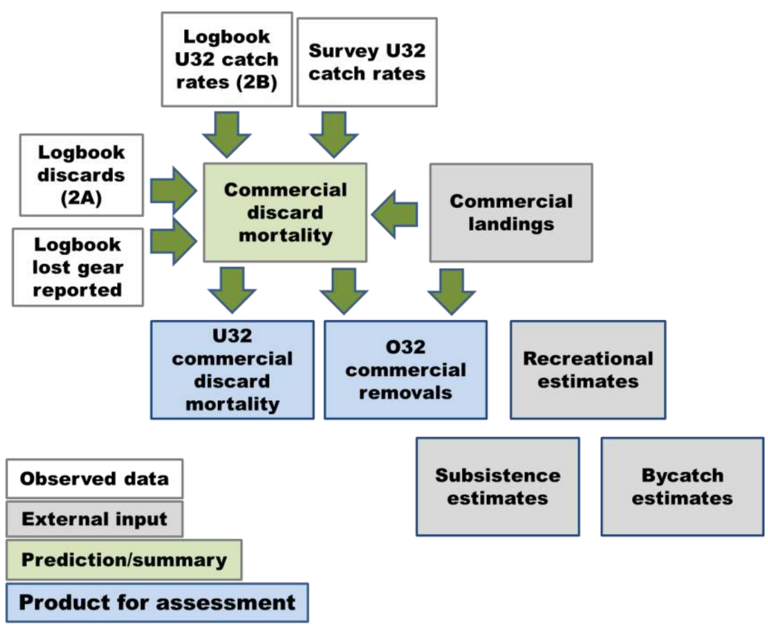

FIGURE 23. Relationships among estimates Pacific halibut mortality by source.

Landings of Pacific halibut from the directed fishery are documented through the use of commercial fish tickets, reported to the IPHC. From 1981 to the present, these landings are fully delineated by Regulatory Area (including all of the portions of Area 4; Figure 24). Notably, coastwide fishery landings increased from 2014-17, the first increases since 2003. Prior to 1981, landings are available only in aggregated form for all of Regulatory Area 4. Landings from 1935-80 are not currently included in the IPHC's database; however, previous analysts have left a number of 'flat files' which appear to correspond well with tables published in technical reports, and other IPHC documents. Because the raw data are not able to be reprocessed directly, the landings estimates prior to 1981 are more uncertain than those after 1981. Historical landings prior to 1935 were reconstructed within current regulatory areas from summaries by historical statistical areas (Bell et al. 1952). Reported landings of Pacific halibut begin in 1888; however, already over one million pounds were being landed per year at that time. The reconstruction by regulatory area of total landings included some use of ratios between Areas 2A and 2B among adjacent years for ambiguous records, therefore the area-specific distributions are therefore more uncertain than the total landings. Several patterns emerge from the longer time series of landings including: the period of substantially reduced fishing in the 1970s in all areas, and the sequential exploitation of biological Regions 2, 3, and 4 over the entire time series (Appendix C, Figure 25).

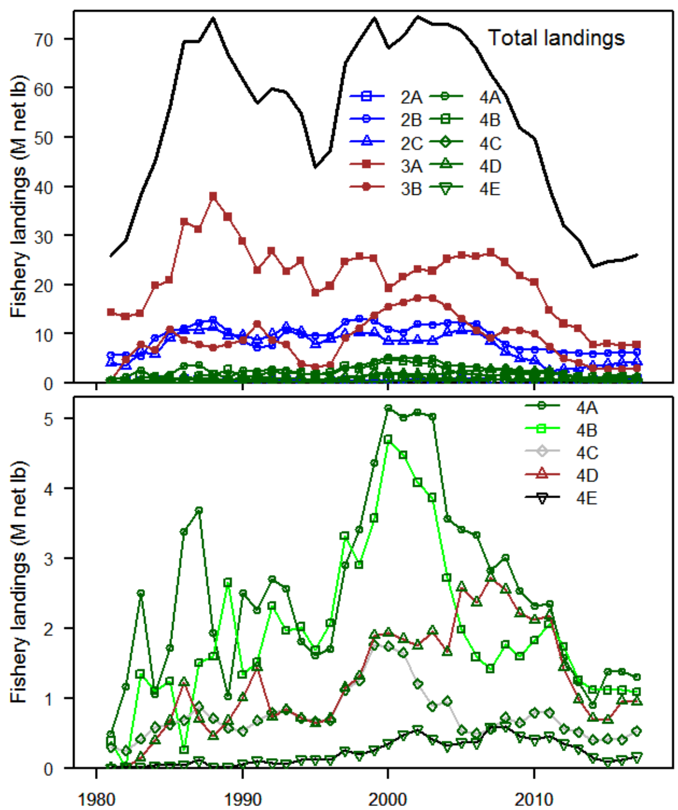

FIGURE 24. Recent landings of Pacific halibut by the directed commercial fishery by Regulatory Area (upper panel), and within Areas 4A to 4E for better resolution of the trends (lower panel).

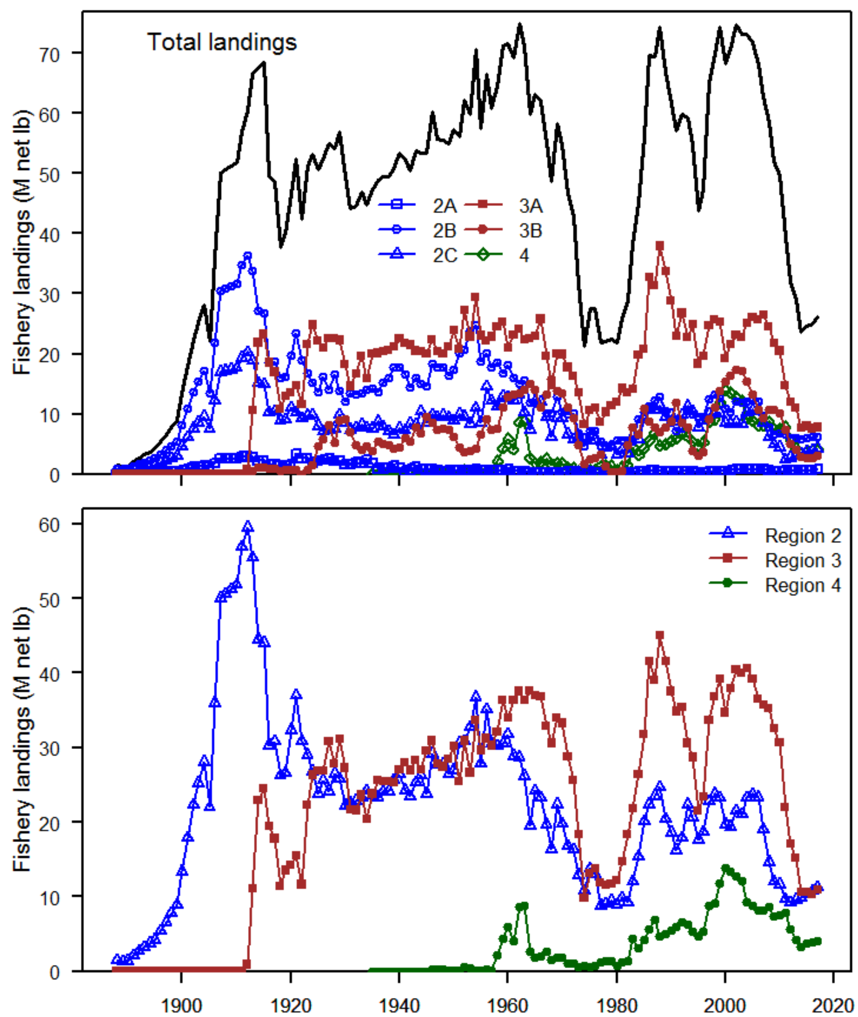

FIGURE 25. Historical landings of Pacific halibut by the directed commercial fishery by Regulatory Area (upper panel) and biological Region (lower panel).

Recreational mortality

Recreational removals are reported to the IPHC by the various agencies in charge of managing these fisheries, including Alaska Department of Fish and Game, the Department of Fisheries and Oceans Canada, and the states of Washington, Oregon, and California. The scientific basis for data collection programs, analyses, and the quality of the subsequent estimates vary considerably by year and source. In 2014, the IPHC began including estimates of the mortality of released fish in the total recreational removals. It is generally assumed that there was little recreational fishing for Pacific halibut prior to the mid-1970s. Recreational removals have grown rapidly since that time, with peak harvests estimated at over 10 million pounds annually during the mid-2000s. They were reduced after that peak, along with other sources of mortality, but have been increasing since 2012 (Figure 26). Catch sharing plans tie the removals in Areas 2A and 2B, and the charter removals in 2C and 3A to fishery catch limits set by the IPHC. Among Regulatory Areas, Area 3A represents over half of the total removals, with Areas 2C, 2B, and 2A each contributing somewhat less (in declining order).

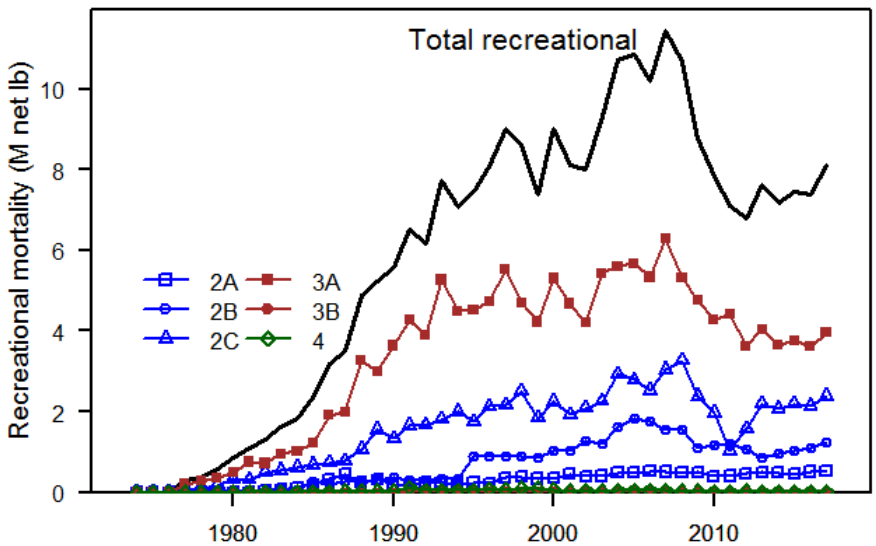

FIGURE 26. Recreational mortality of Pacific halibut by Regulatory Area.

Subsistence mortality

Subsistence harvest estimates are provided to the IPHC by the DFO and NMFS. Estimates are not generated annually in all cases, and therefore some values are applied through intervening years until the next estimate is made available. This has frequently been the case for the most recent several years. There are currently no estimates available prior to 1991. The time-series created from these estimates is relatively noisy, but occurs on a scale much smaller (< 2 million lbs; ~900 t) than other critical inputs to the analyses (Figure 27).

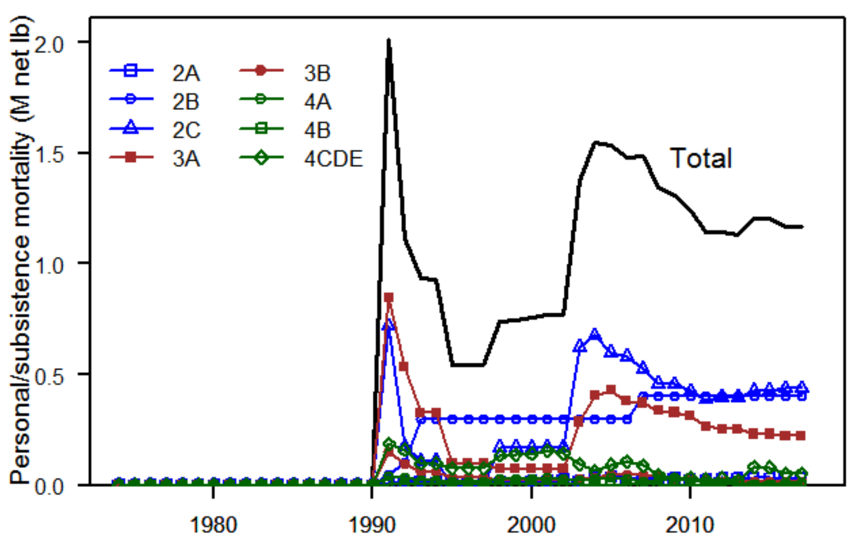

FIGURE 27. Reported subsistence mortality by Regulatory Area.

Commercial fishery discard mortality

Discard mortality includes all Pacific halibut that are captured, and subsequently estimated to die, during the directed commercial fishery but that do not become part of the landed catch.

There are three main sources of discard mortality: 1) fish that are estimated to have been captured by fishing gear that was subsequently lost during fishing operations, 2) fish that are discarded for regulatory reasons (e.g., the vessel's trip limit or harvester's IFQ limit have been exceeded), and 3) fish that are captured and discarded because they are below the legal size limit of 32 inches (81.3 cm). The methods applied to produce each of these estimates differ due to the amount and quality of information available. Based on these methods, discard mortality in the commercial fishery is estimated to have been highest in the late 1980s, subsequently declining (particularly in Area 3A in 1995 when the derby fishery was converted to a quota system), and then increasing from 1995 to 2010 as the size-at-age of Pacific halibut declined and more fish at older ages remained below the minimum size limit (Figure 28, upper panel). The estimates of discard mortality cannot be delineated within Regulatory Area 4 prior to 1981, but there is very little wastage estimated prior to that time (Figure 28, lower panel).

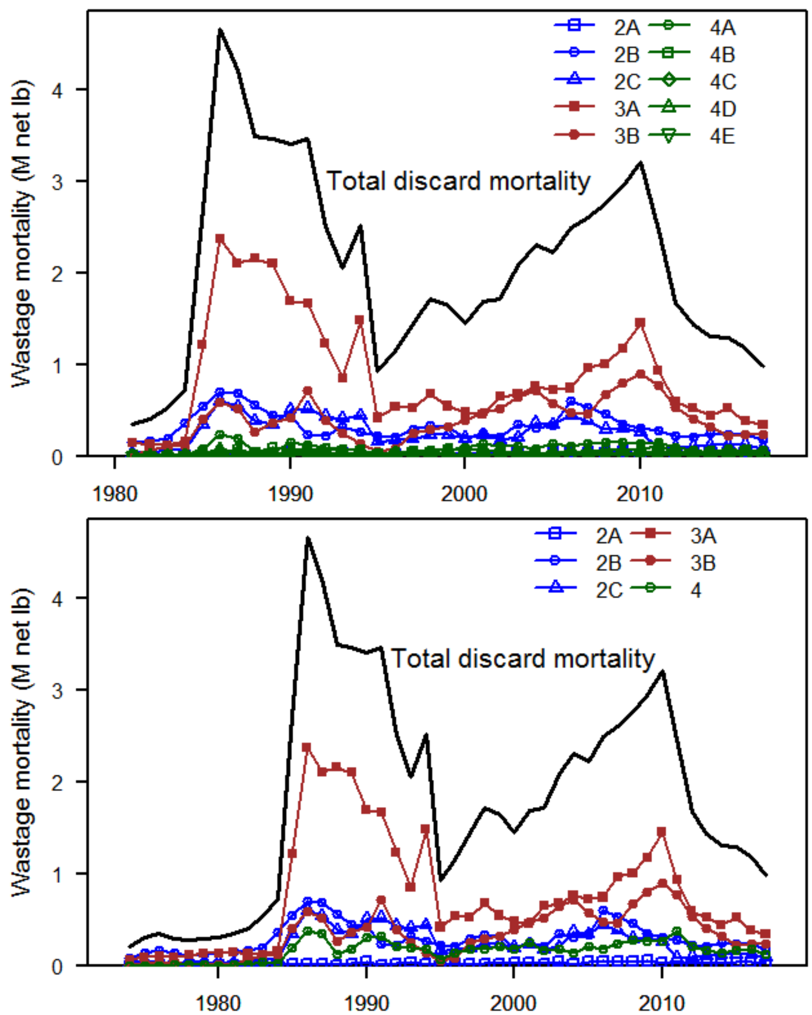

FIGURE 28. Discard mortality in the commercial fishery by Regulatory Area, 1981+ (upper panel), and 1974+, with all of Area 4 combined (lower panel).

Bycatch in non-Pacific halibut-target fisheries

The estimated bycatch from non-target fisheries where the retention of Pacific halibut is prohibited by regulatory area is reported to the IPHC by the NMFS and DFO on an annual basis. These estimates vary greatly in quality and precision depending upon year, fishery, type of estimation method, and many other factors. Bycatch has been delineated among Areas 4A, 4B, and 4CDE only from 1990 to the present, during which time it has declined from a peak of over 20 million lbs (~9,070 t) to a projected value of approximately 6.0 million lbs (~2,700 t) in 2017 (Figure 29, upper panel). This total in 2017 represents the smallest estimate since the beginning of foreign industrial fishing in Alaska in the early 1960s. Bycatch in Regulatory Areas 4CDE and 3A (the two largest sources coastwide) has decreased during both 2016 and 2017. Prior to 1991, available bycatch estimates are aggregated for all of Area 4. From the 1960s to 1990s, annual values were variable with a peak in the early 1960s corresponding to the peak of foreign fishing in (currently) Alaska waters, primarily Areas 3A and 3B. There was likely less bycatch prior to the development of the foreign fishery in U.S. waters in the early 1960s; however, bycatch estimates are only available from 1962 to the present.

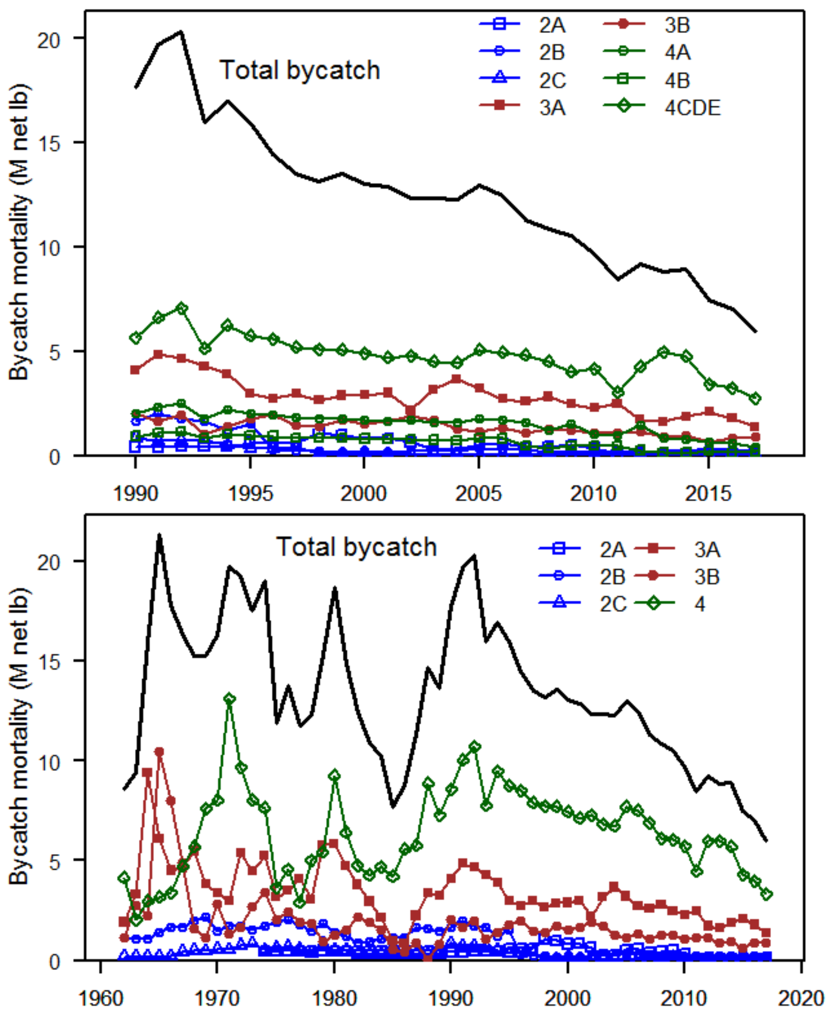

FIGURE 29. Pacific halibut bycatch estimates by Regulatory Area, 1990+ (upper panel), and 1962+, with all of Area 4 combined (lower panel).

Summary of Pacific halibut mortality from all sources

Recent aggregate total removals from all sources show that the directed commercial fishery represents the majority of the anthropogenic mortality (Figures 30-31). Removals from all sources in 2017 were estimated to be 42.4 million pounds (~19,200 t), up slightly from 41.8 million pounds in 2016 (~18,960 t). Over the period 1918-2017 removals have totaled 7.2 billion pounds (~3.2 million t), ranging annually from 34 to 100 million pounds (16,000-45,000 t) with an annual average of 63 million pounds (~29,000 t; Appendix C, Figure 32). Annual removals were above this long-term average from 1985 through 2010 and have been relatively stable near 42 million pounds (~19,000 t) since 2014. Recent total removals from all sources by regulatory area reveal that Area 3A has been the dominant contributor to total mortality throughout the last five decades, but that Area 3A and 3B represent a smaller fraction of the total in recent years than in previous decades (Appendix C, Figure 33). When the removals by source are compared among regulatory areas, there are a number of differing patterns in magnitude and distribution (Figures 34-36).

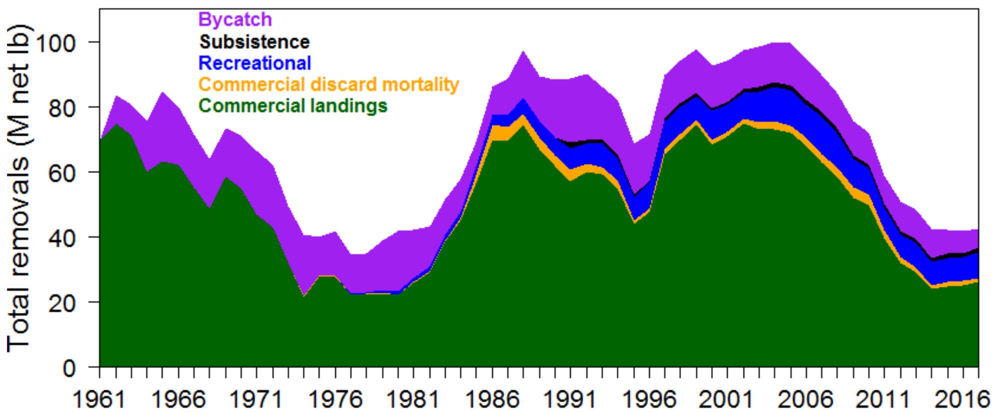

FIGURE 30. Pacific halibut mortality from all sources since 1961.

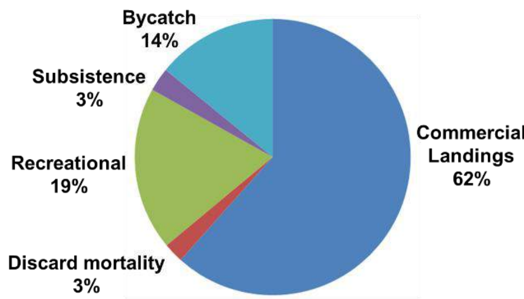

FIGURE 31. Distribution of Pacific halibut mortality by source in 2017.

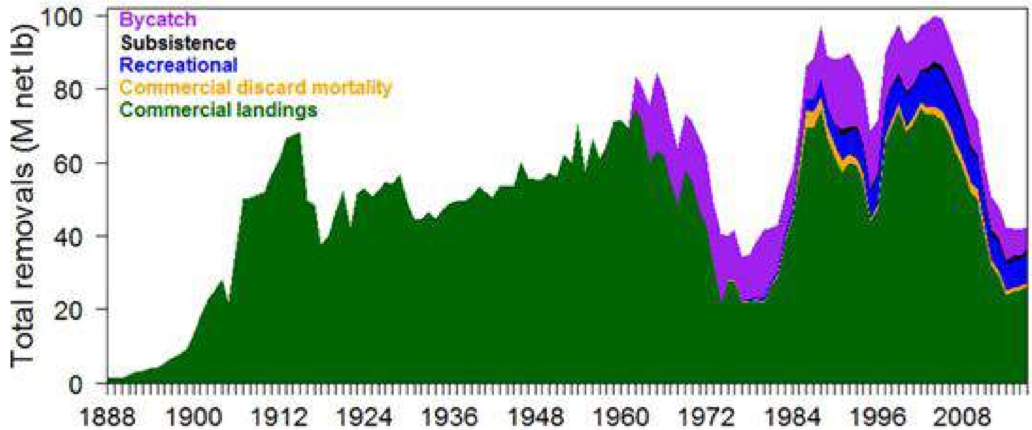

FIGURE 32. Summary of estimated historical mortality by source (colors), 1888-2017.

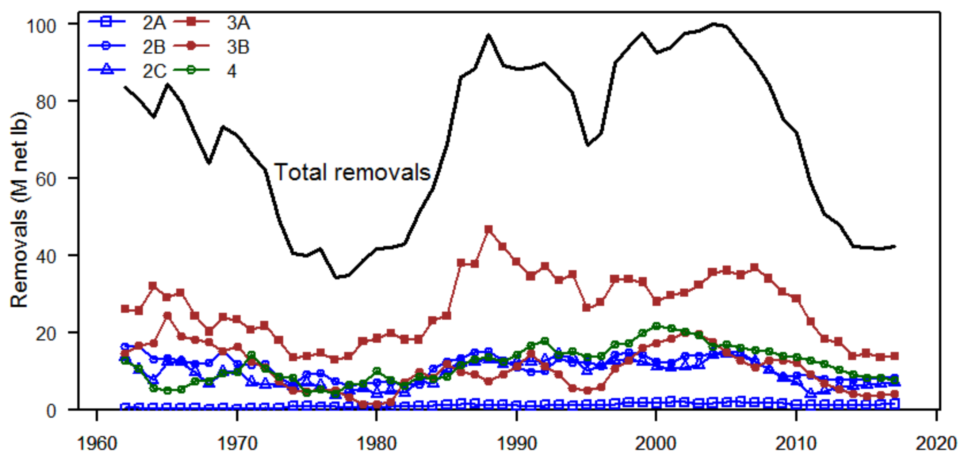

FIGURE 33. Pacific halibut mortality from all sources by Regulatory Area since 1962.

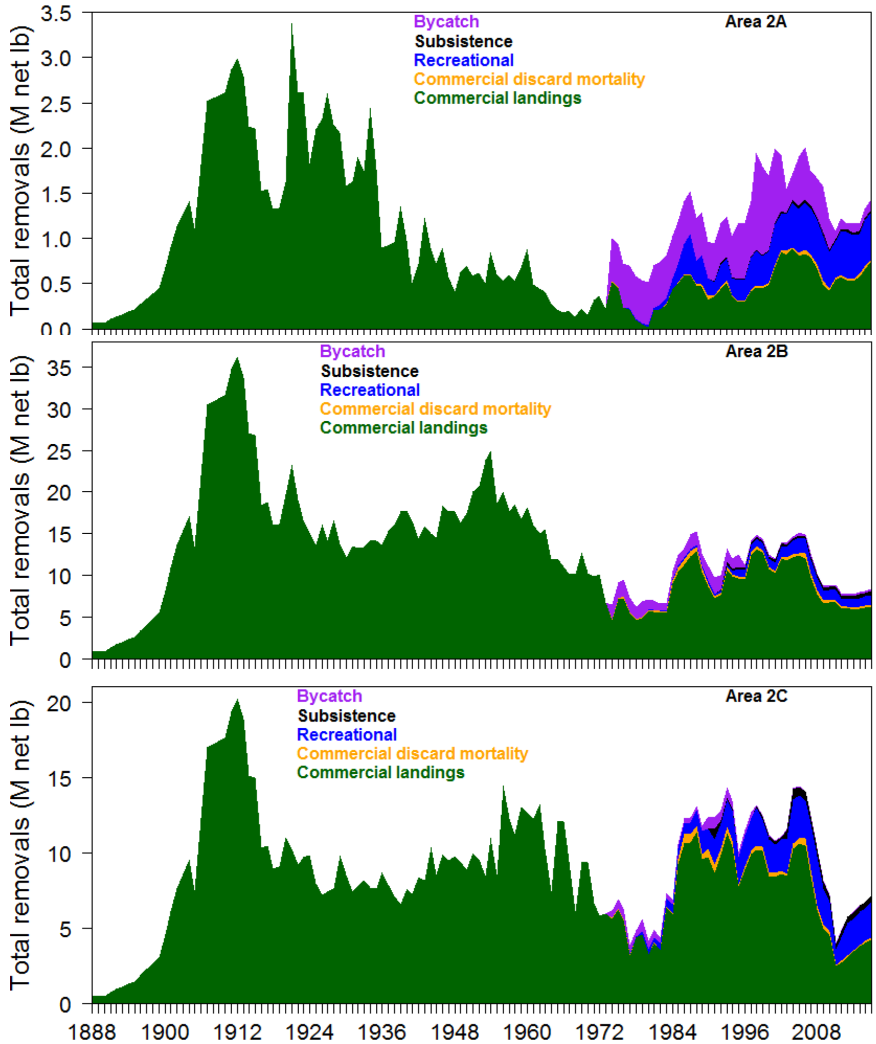

FIGURE 34. Estimated Pacific halibut mortality by source in Regulatory Areas 2A, 2B, and 2C since 1888. Note that the y-axes differ in scale.

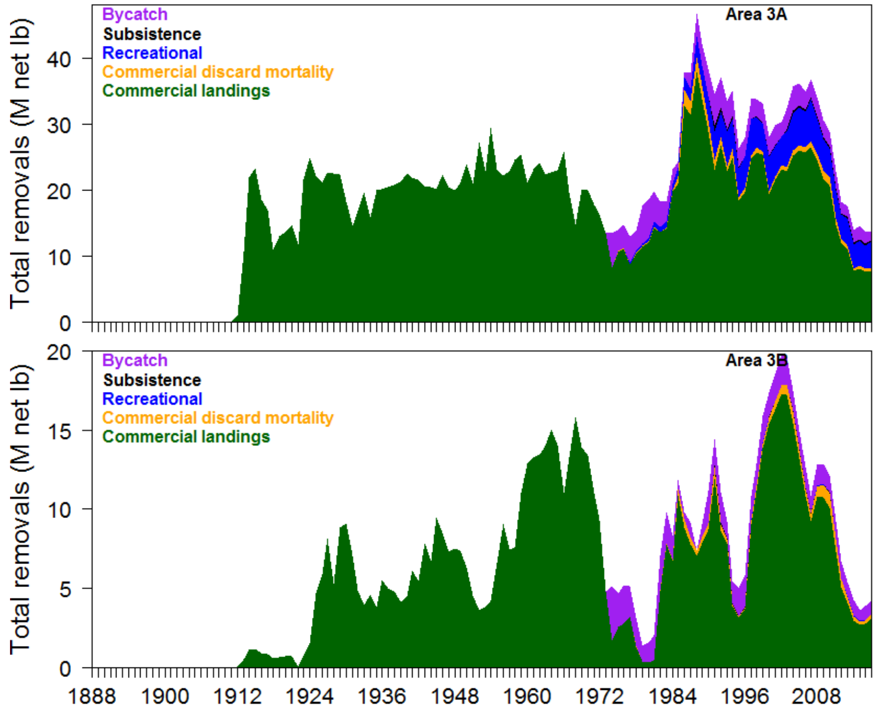

FIGURE 35. Estimated Pacific halibut mortality by source in Regulatory Areas 3A, and 3B since 1888. Note that the y-axes differ in scale.

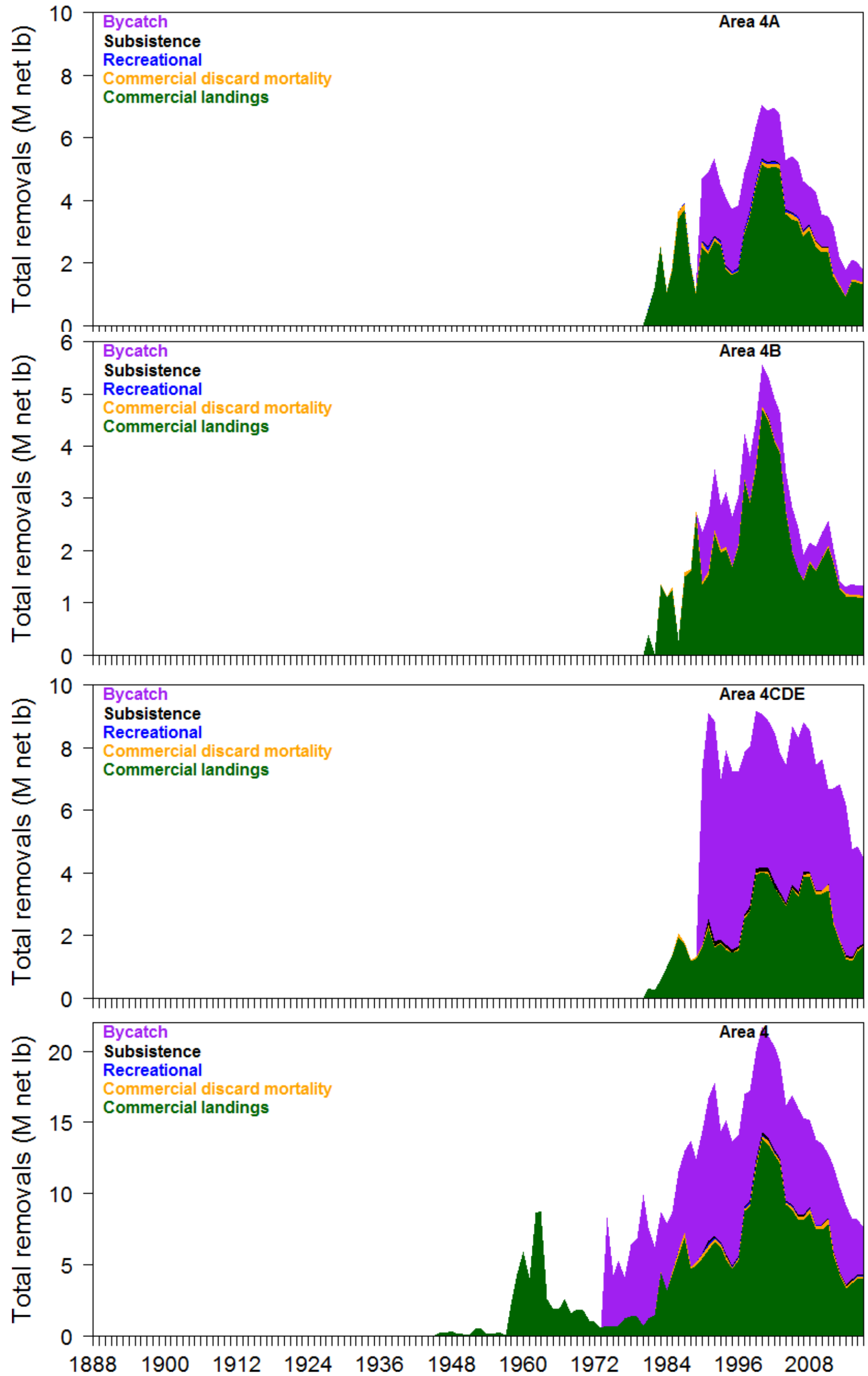

FIGURE 36. Estimated Pacific halibut mortality by source in Regulatory Areas 4A, 4B, 4CDE, and all of Area 4 combined since 1888. Note that the y-axes differ in scale.

Commercial Pacific halibut fishery WPUE and biological data

A relatively simple approach is employed to calculate the annual index of fishery WPUE and to summarize fishery-dependent biological information (Figure 37), with the most important missing component being the lack of sex-specific biological observations due to the dressing of Pacific halibut at sea. This information will be available for the 2017 and future fisheries via port sampling of genetic material.

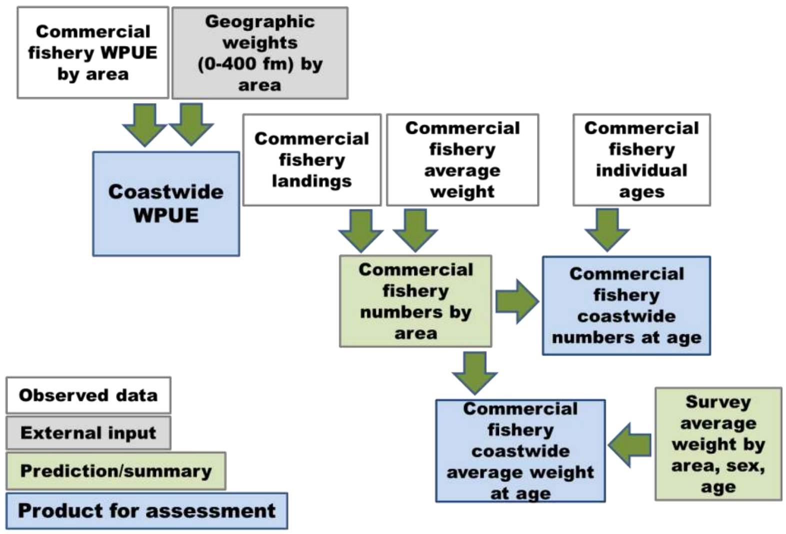

FIGURE 37. Relationships among fishery-dependent catch-rate and biological data sources.

Commercial Pacific halibut fishery WPUE

Commercial fishery logbook data is collected by port samplers, and reported directly to the IPHC by fishermen. This dataset represents a valuable source of information about many aspects of the commercial fishery, including seasonal and spatial patterns, gear usage, and other details. The data that are included in the current fishery WPUE standardization are: the Regulatory Area of fishing (regardless of the port of delivery), the type of fishing gear used (only fixed-hook data are used in Areas 2C, 3A, 3B, 4A, 4B, 4C, 4D; both fixed-hook and snap gear are used in Areas 2A and 2B), the year of fishing (some logbooks are not obtained by port samplers until the following year), the number of skates fished (excluding any gear that was lost), the spacing of the hooks, the number of hooks on each skate, and the pounds of legal-sized Pacific halibut captured and landed. Only sets specifically targeting Pacific halibut are included in the analysis and all sets with hook-spacing of less than four feet are assumed to be non-Pacific halibut targeting, except in Area 2A.

The fishery catch-rates are calculated based on the catch (in weight) relative to the amount of gear deployed at each station. Effort for each set is standardized to an effective skate (*ES*) that is 1,800 feet long, with 100 hooks (and therefore an 18-foot average spacing), based on the number of skates fished (*S*), the average number of hooks fished per skate (N_h), and the hook-spacing (H_s; Figure 38) based on the relationship given by Hamley and Skud (1978):

$$ES = S \cdot \left(\frac{N_h}{100}\right) \cdot 1.52 \cdot (1 - e^{-0.06 \cdot H_s})$$

This effective skate relationship has recently been reevaluated (Monnahan and Stewart 2017) and the results of that investigation suggest a slightly different relationship than that estimated historically. The IPHC will be considering an update to its data processing methods in the near future. The sum of the catch weight (*C*) for all sets (*s*) reported from a Regulatory Area (*a*) each year (*y*) is divided by the sum of the effective skates to obtain the total WPUE, or index (*I*):

$$\bar{I}_{a,y} = \frac{\sum_{s=1}^{Nsets} C_{s,a,y}}{\sum_{s=1}^{Nsets} ES_{s,a,y}}$$

Due to the small number of fixed-hook sets in regulatory Areas 2A and 2B, snap gear is included in the calculation for these areas. This is done by dividing the snap gear effort by a factor of 1.35 (Clark 2002). A detailed exploratory analysis of the logbook standardization data and methods was completed during 2014 (Monnahan and Stewart 2015), which suggested future analyses may be able to include all logbook records in all Regulatory Areas regardless of gear type; this research is ongoing. There are too few logs available on an annual basis from Area 4E to include that regulatory area in the WPUE calculations.

These annual area-specific mean catch-rates are then weighted by the geographic extent of suitable depths occupied by Pacific halibut within each Regulatory Area (g_a, 0-400 fathoms; 0-732 m) relative to the entire coast (Figure 39). The weighted values are then summed to generate a coast-wide index of abundance:

$$I_y = \sum_{a=1}^{Areas} \bar{I}_{a,y} * \frac{g_a}{\sum_{a=1}^{Areas} g_a}$$

This approach is consistent with the concept that the commercial WPUE is also a 'survey' of the stock and therefore the estimates are a proxy for density, but diverges from the common approach of weighting the commercial WPUE from each area by the catch in that area relative to the total. It may be preferable in the future to explore the use of catch- instead of geographic-weighting.

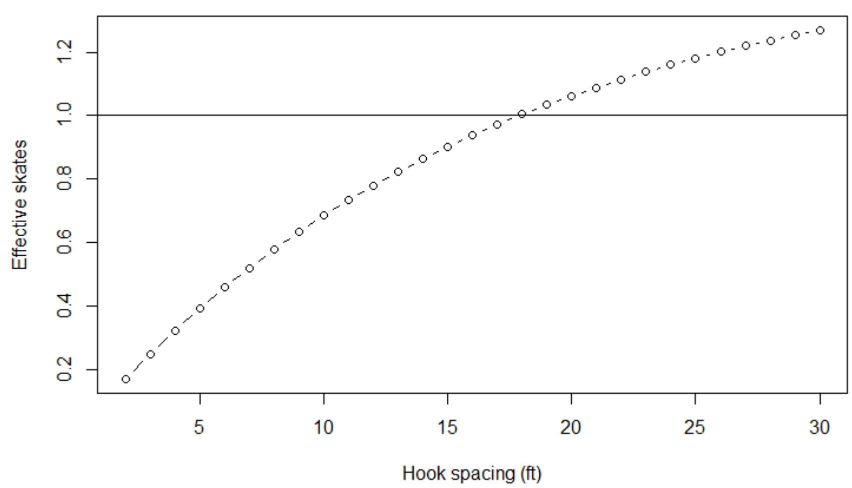

FIGURE 38. Relationship between hook spacing and the number of effective skates for setline survey and commercial fishery WPUE calculations (From: Hamley and Skud 1978).

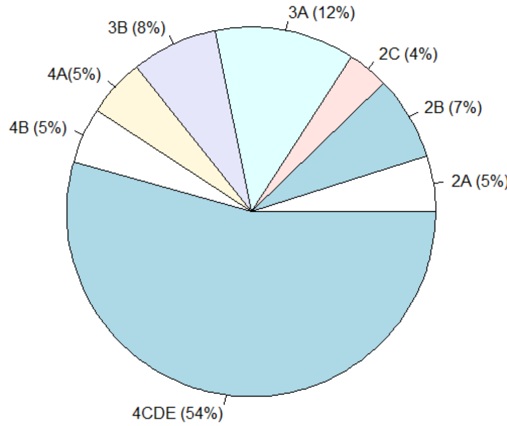

FIGURE 39. Relative spatial extent of each regulatory area.

All available information was finalized on 9 November 2017 in order to provide adequate time for analysis and modeling. As has been the case in all years, commercial fishery WPUE for 2017 remains incomplete. The final verified record of logbooks available approximately 10-12 months after the end of the annual fishing season differs from the preliminary data available in November and used in the stock assessment each year. Differences reflect the inclusion of logbooks that were not collected by port samplers during the year of fishing (and subsequently mailed in to the IPHC, or collected by port samplers during the following fishing season), as well as logbooks that had been collected but were not available for analysis (the fishing season extends until early November; the stock assessment data are shortly after). In previous years, these changes almost always led to a reduction in the index from preliminary values. Because the data are always incomplete at the time of the assessment, the variance of the terminal year of the WPUE series is inflated for use in the stock assessment by a factor of two. Based on review by the IPHC's Scientific Review Board (SRB), a bias correction for each Regulatory Area was developed using the last five years (2012-2016) of post-assessment revisions resulting from additional logbooks available after the assessment deadline in early November. By calculating the average revision to the terminal year's value, a prediction of the corrected trend is provided along with the currently observed trend (Figure 40).

Uncorrected commercial fishery WPUE in 2017 was slightly increased from 2016 (5%) at the coastwide level with mixed trends among Regulatory Areas. Applying the bias correction reduced the increase in coastwide commercial fishery WPUE to only 3% and negative trends were predicted for all Areas except Area 4D (+71%), Area 4C (+20%) and Area 3A (+6%). Tribal and non-tribal commercial fishery trends in Area 2A are reported separately this year in response to important differences in the timing and spatial extent of the two components. Tribal fishery WPUE has been increasing since 2014 in that Area, and non-tribal WPUE has been declining over the same period, although a small increase (5%) from 2016 to 2017 was observed. The very large increase in WPUE observed in Area 4D appears to be a function of much higher catch-rates around St. Matthew Island (also observed in the setline survey) and a shift of 25% of the catch previously occurring along the shelf-edge to the waters around that island in 2017.

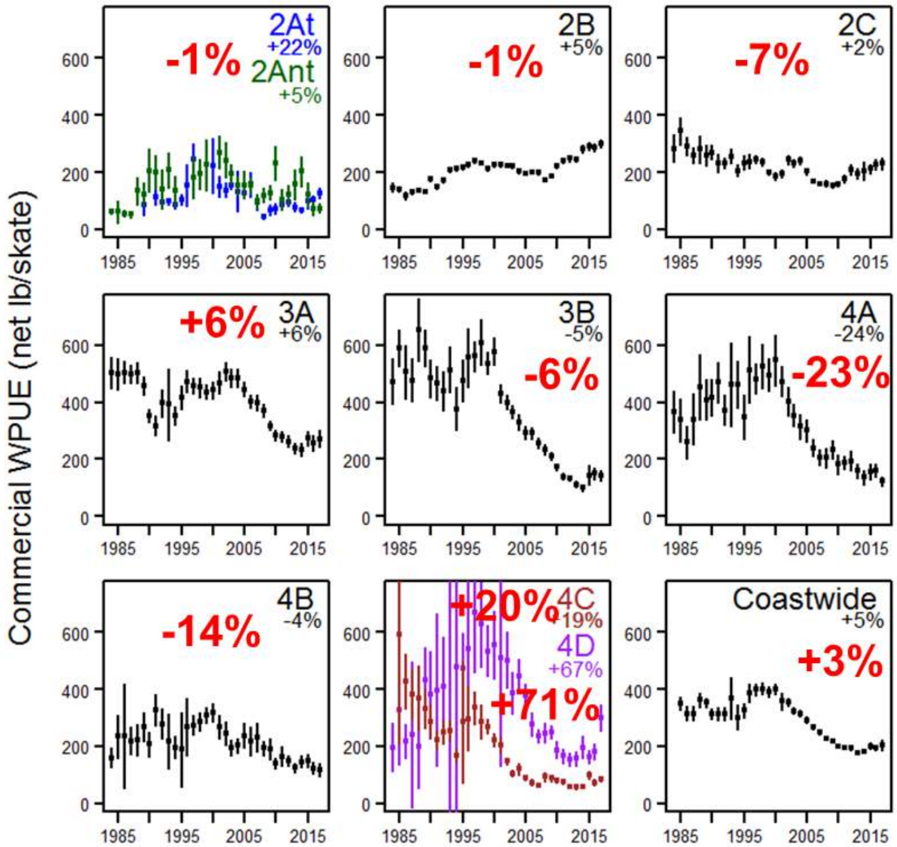

FIGURE 40. Trends in commercial fishery WPUE by Regulatory Area, 1984-2017. Percentages reported below the Regulatory Area label indicate the uncorrected change from 2016 to 2017 (see text above). Larger font percentages in each panel reflect the bias corrected percentage change anticipated when the remainder of the available logbook information is included. Vertical lines indicate approximate 95% confidence intervals.

Effort data for years prior to 1981 do not currently exist in the IPHC's database. For historical data, as is the case for other sources of information, there exist flat files from previous analysts that include effort and landed catch by regulatory area. These data have been used for other analyses, and date back to 1907. Prior to 1935, records of effort are reported in various technical and other IPHC reports, and there are a number of differing time-series available. Total catch and total effort were tabulated from Chapman et al. (1962) for the years 1921-1934, and from Thompson et al. (1931), although there are differing series in at least Skud (1975) and several others. The oldest historical records do include even earlier years, but have not been included here pending more detailed investigation. It would be preferable to access and process the historical log data directly from data stored in a database with meta-data, but this is not currently possible.

The most dramatic change in the commercial WPUE time series corresponds to the transition from "J" to circle hooks in 1984 (Appendix D; Figure 41), although there have been many other changes in the definition of effort over the time series (see synopsis in Leaman et al. 2012). Changes in catch rates prior to the 1980s also reflect the historical progression of the fishery from south to north over much of the time-series (Figure 25). Despite these caveats, it is clear that catch rates were quite low around the time of the formation of the IPHC (in fact, this was the motivation for the original convention), and again in the late 1970s (Appendix D; Figure 41). Additional uncertainty throughout the historical series is reflected by increased coefficients of variation (fixed at 0.1) for all years prior to 1984.

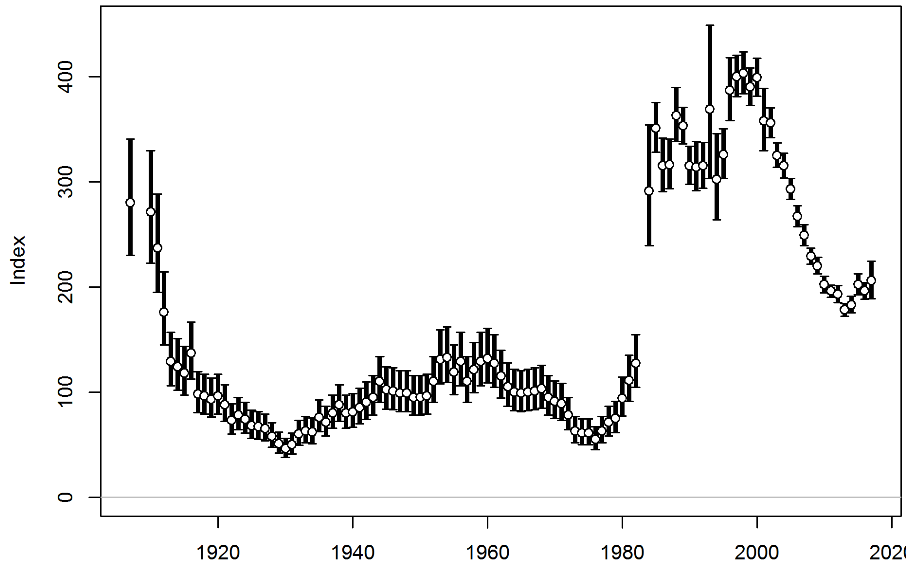

FIGURE 41. Coastwide commercial WPUE from historical records of effort and catch, as well as more recent direct logbook processing. The large change between 1982 and 1984 coincides with the adoption of circle hooks.

Commercial fishery age distributions

Recent fishery ages are created from otoliths collected by port samplers in proportion to the landings in the ports that are annually staffed by the IPHC. Because of this method, the raw ages can be directly aggregated within each area and year to estimate the age composition of the catch. Port samplers also collect individual lengths, and the average weight within each area can be estimated via the length-weight relationship. Beginning with a pilot project in 2015 and expanding to include all port samples in 2017, individual weights are now measured for each fish sampled for length and age from the commercial fishery. These measured weights were included in the data analysis for the stock assessment for the first time in 2017. Dividing the total commercial catch for each regulatory area and year by the average fish weight gives an estimate of the number of fish captured. To aggregate the proportions-at-age from each area into a coastwide or regional total, each regulatory area is weighted by the numbers of fish in the catch relative to the total number of fish captured over all areas. For the period included in recent stock assessments, the coastwide age distribution displays a very similar pattern to that of the setline survey ages: a very strong 1987 cohort moving through the stock (Figure 42), followed by catches comprised primarily of 9 to 18 year-old Pacific halibut (that age range has comprised 86% of the landed catch since 1996). Age distributions in 2017 show a 2005 cohort somewhat stronger than those in adjacent years, and weak recruitments from 2006 onward.

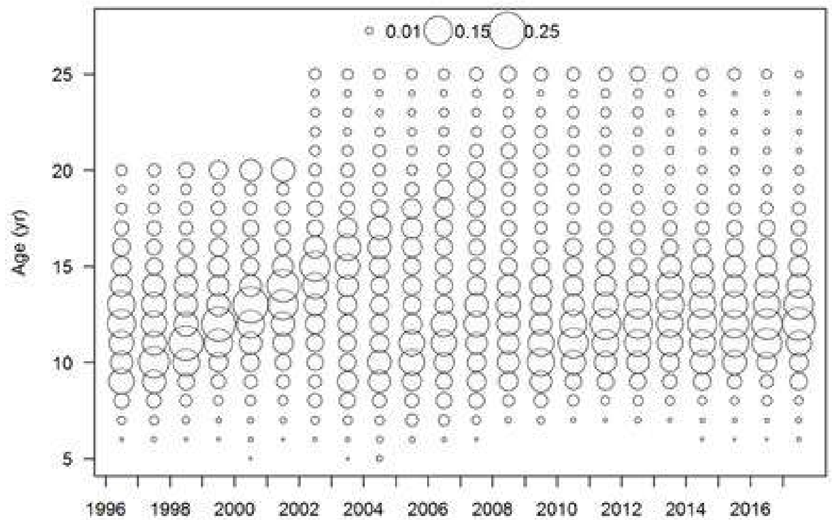

FIGURE 42. Estimates of recent commercial fishery numbers-at-age. Circles represent proportions that sum to 1.0 within each year.

Commercial fishery ages prior to 1991 have been summarized by several previous analysts, in some cases processed originally by one analyst and then subsequently by another (Clark et al. 2000). For this summary, a file produced for the analysis by Clark et al. (2000) was obtained, which included proportions at age by regulatory area from 1935 to 1990. Additional work could be done to verify which of these proportions can and can't be recreated from the current IPHC database. Weighting of the area-specific proportions followed the method applied to the more recent data, first obtaining an average individual weight (in this case by multiplying the proportions at age by the estimated average weight at age from the historical records), and then dividing the total landings by that weight to get an estimate of the number of fish in the landings by year and area. Again following the setline survey analysis methodology, the numbers in the landings by area were used to weight the proportions-at-age for a coastwide total.

The resultant fishery age-frequency distributions reveal that Pacific halibut in the commercial landings from the 1930s to 1973 (when the current minimum size limit was implemented) have been predominantly age 6 to 15 (Figure 43). Several strong cohorts can be observed in the data, but none more conspicuous or persisting longer than the 1987 cohort. When the fishery age data are aggregated by biological Region, a similar pattern emerges to that seen in the setline survey data: a greater proportion of older Pacific halibut in Region 4 and Region 4B than in Regions 2 and 3, but a similar overall age over which much of the catch has been taken and clear evidence that the 1987 cohort was very strong across the entire range of the population (Figures 44-46).

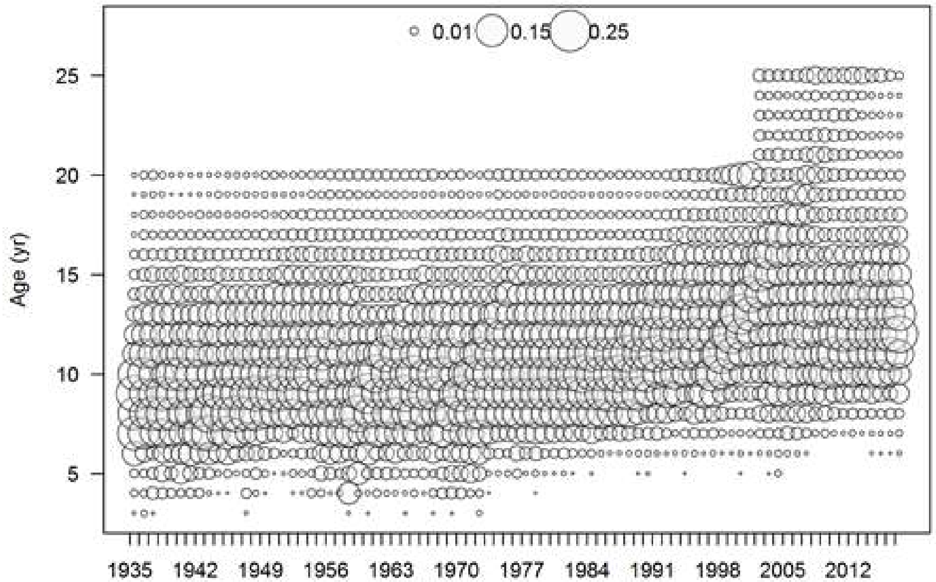

FIGURE 43. Coastwide commercial fishery proportions-at-age from the retained catch (male and female Pacific halibut combined). Note that the current 32 inch minimum size limit was implemented in 1973. Circles represent proportions that sum to 1.0 within each year.

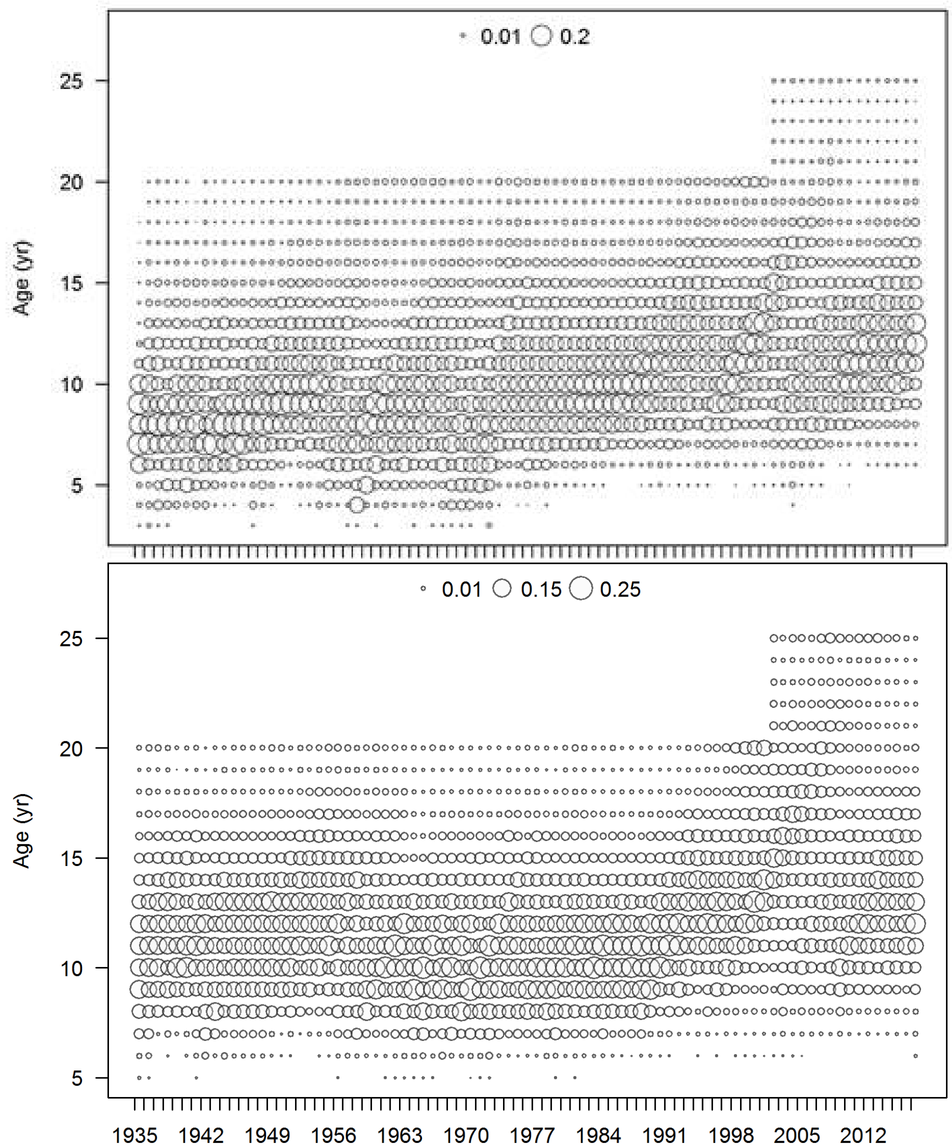

FIGURE 44. Commercial fishery proportions-at-age in the retained catch (male and female Pacific halibut combined) by biological Region: Region 2 (top panel), and Region 3 (bottom panel). Circles represent proportions that sum to 1.0 within each year.

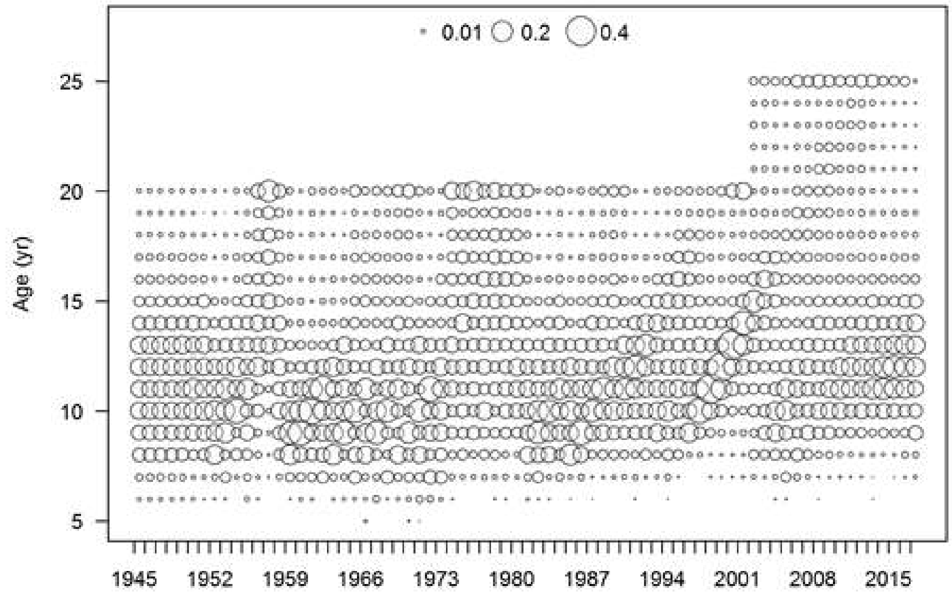

FIGURE 45. Commercial fishery proportions-at-age in the retained catch (male and female Pacific halibut combined) for biological Region 4. Circles represent proportions that sum to 1.0 within each year.

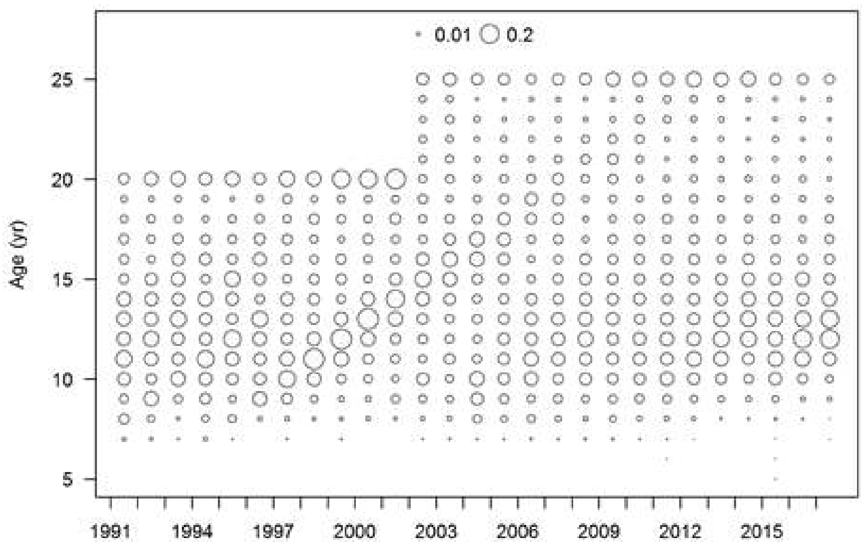

FIGURE 46. Commercial fishery proportions-at-age in the retained catch (male and female Pacific halibut combined) for biological Region 4B. Circles represent proportions that sum to 1.0 within each year.

Commercial fishery weight-at-age

Lengths, weights, and otoliths are collected from the landed catch by port samplers each year. At present, no sex-specific information is available from port samples; however, progress toward a marking program is ongoing. The recent average weight of a landed Pacific halibut has been the highest (around 30+ lbs, 13.6 kg) in Area 2C, has been reasonably flat since 2011 in Area 3A and increasing in the last three years in Area 3B (Figure 47). The coastwide trend remains lower than the last several decades. These observations accurately reflect the fishery landings, but combine the relative influences of weight-at-age, age- and sex-structure, as well as selectivity relative to the underlying population.

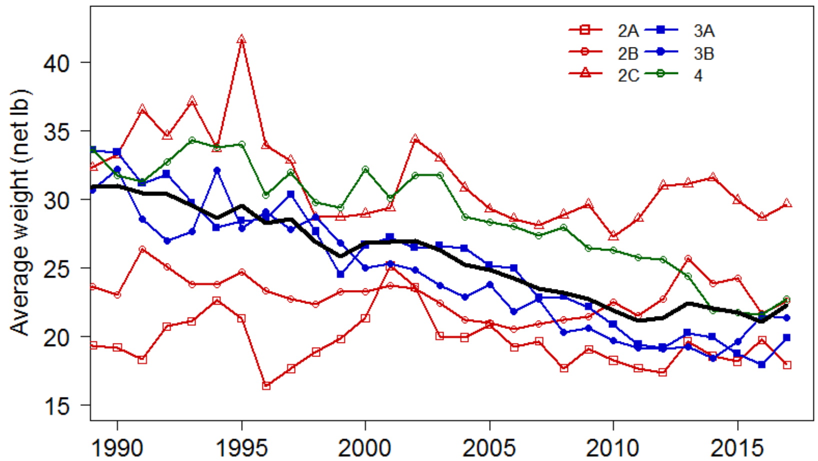

FIGURE 47. Recent average Pacific halibut weight by regulatory area in the directed fishery landings; thick black line indicates the coastwide average.

Historical observations of average weight are more problematic. Specifically, from 1963-1990 the IPHC did not collect individual lengths from the commercial landings. It was thought at the time that otoliths measurements could be used to adequately estimate the body size of the fish (Southward 1962), and therefore the weight. Subsequent investigation of the relationship between otolith measurements and individual length (Clark 1992) resulted in the resumption of length sampling in 1991. For this reason, the weights-at-age for most of the historical period should be considered much more uncertain than recent observations. Despite these considerations, there is a clear pattern of increasing fish size in the landings estimated from the 1930s through the 1970s, followed by a subsequent decline to the present (Figure 48). Also clearly visible is the effect of the implementation of the 32 inch minimum size limit in 1973.

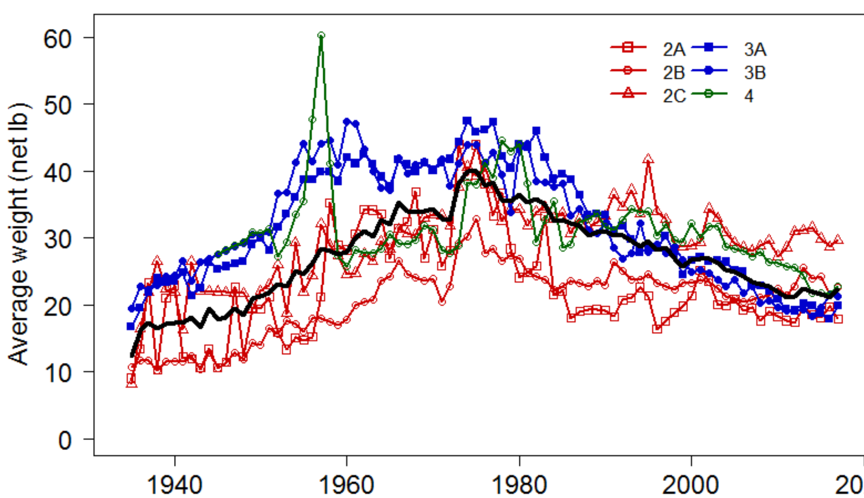

FIGURE 48. Historical trends in average individual Pacific halibut weight in the commercial fishery landings; thick black line indicates the coastwide average. The current 32 inch (81.3 cm) minimum size limit went into effect in 1974.

Following the same method applied to the age-composition data (weighting the historical weight-at-age for each regulatory area by the number of fish in the landings for that area), a coastwide weight-at-age can be constructed for the entire time-series. Unfortunately, this series is not sex-specific due to the dressing of fish at sea prior to sampling by port samplers. However, there are similar trends for the best represented ages (8-16) over the historical period. One way to investigate these patterns is to divide the time series of weight-at-age for each age relative to the first year in which we have a coastwide estimate from setline survey data (1997). Only legal-sized fish from the setline survey catch are included in these weights-at-age in order to make them comparable to fishery landings. These deviations show very similar temporal patterns, despite expected differences on an absolute scale (Figure 49). As a proxy for sex-specific weights-at-age for the entire time-series, the setline survey weights-at-age from 1997 are scaled by the time series of annual deviations calculated from the fishery data. This implicitly assumes that male and female Pacific halibut have experienced similar trends in size-at-age, and recent data that are available by sex support this assumption. The resulting reconstructed coastwide mean weights-at-age clearly show an increase in the late 1970s and subsequent decrease toward present estimates (Figure 50).

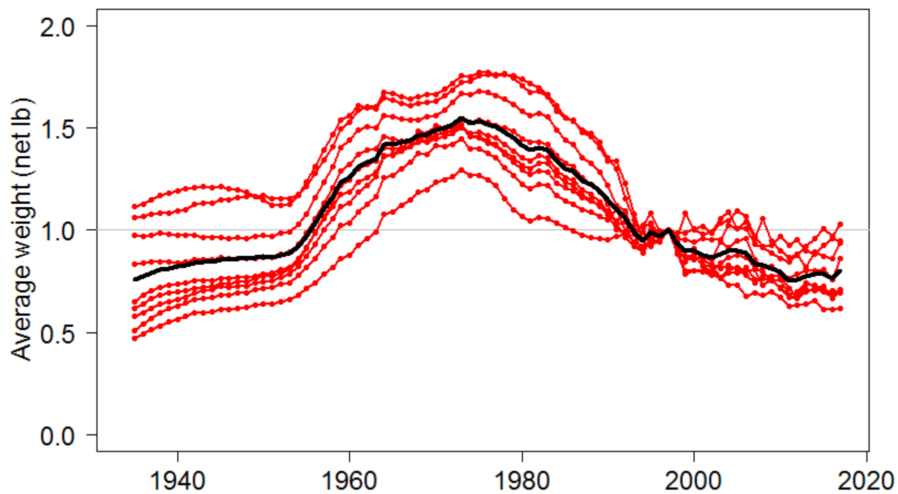

FIGURE 49. Trends in coastwide average individual Pacific halibut weight as deviations from 1997 in the commercial fishery landings for Pacific halibut aged 8-16 years old (red lines). The black line represents the average trend among the nine ages included.

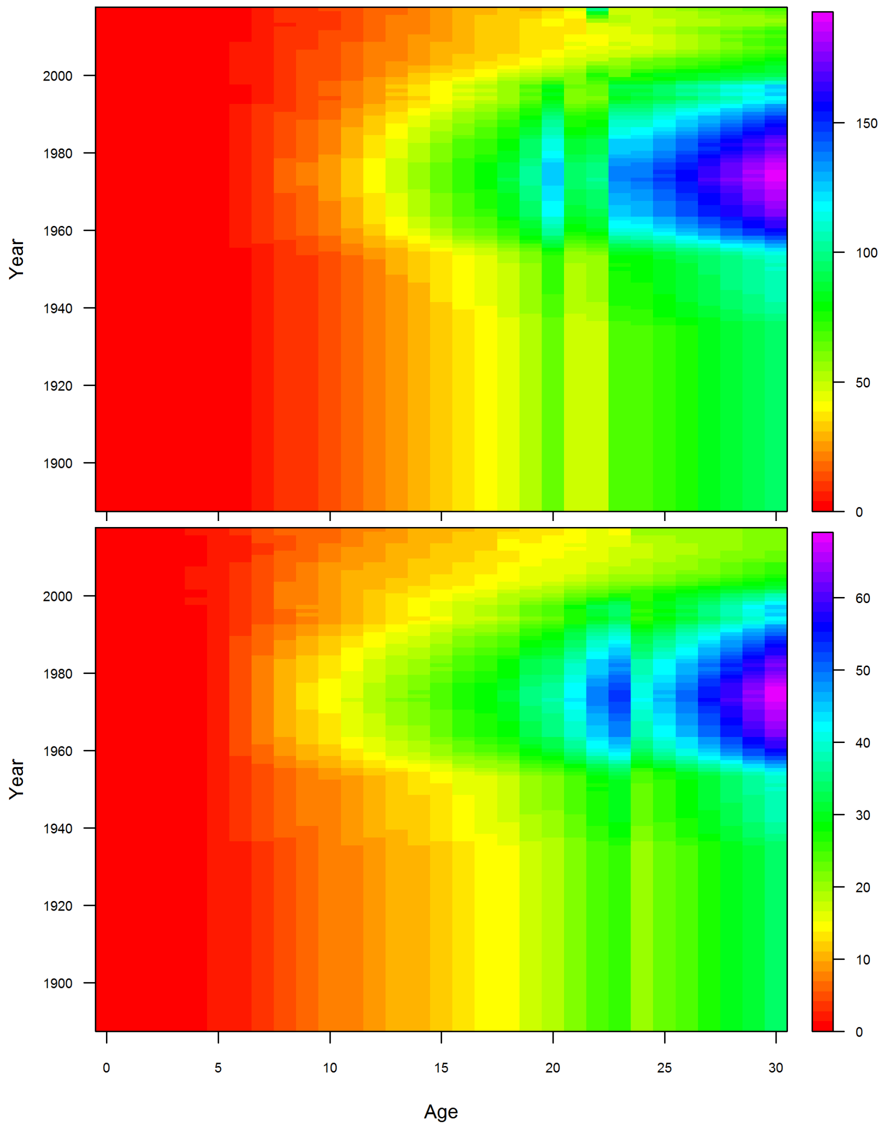

FIGURE 50. Time series of coastwide weight-at-age (net lb) for female (upper panel), and male (lower panel) Pacific halibut from all regulatory areas (note that the scale differs between panels).

The same methods were also used to estimate trends in weight-at-age separated by biological Regions. The results indicate that changes in Region 2 have been less pronounced than the very large decrease in fish size observed for Region 3 from the 1950s through the 1990s and that Region 4 has shown a much more muted historical pattern (Figure 51). The relative scalar for Region 4 is only slightly above a value of one for most of the historical period, and the smallest values occur in the most recent years. No historical data predating the setline survey were available from the commercial fishery in Region 4B. The Region 4 weight-at-age arrays were therefore used as input for both Region 4 and Region 4B.

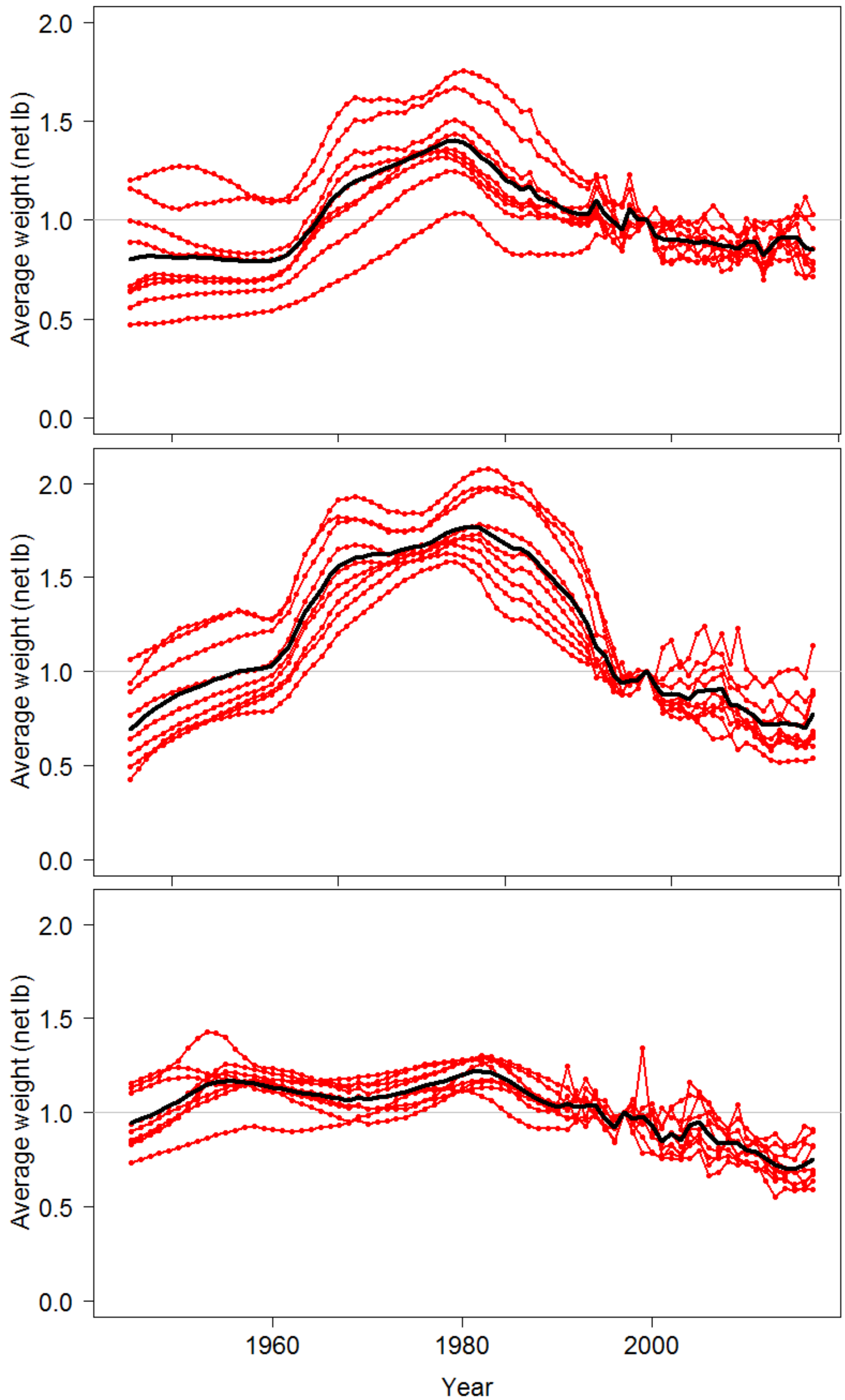

FIGURE 51. Trends in specific average individual Pacific halibut weight as deviations from 1997 in the commercial fishery landings for Pacific halibut aged 8-16 years old (red lines) from Region 2 (upper panel), Region 3 (middle panel), and Region 4 (lower panel). The black lines represent the average trend among the nine ages included.

Recreational fishery age distributions

Age distributions sampled from the recreational catch were included in the stock assessment models for the first time in 2015. Otoliths from recreationally caught Pacific halibut in regulatory Area 3A have been routinely collected by ADF&G, and the ages read by IPHC staff. Estimated numbers-at-age for the years 1994-2013 were weighted by port within Area 3A, and summarized by Scott Meyer (ADFG, pers. comm.). These data showed a variable but generally larger proportion at ages younger than age 5, and smaller proportion greater than age 15 (Figure 52) compared to the coastwide setline survey over a similar time-period (Figure 11). The recreational data also contained a few Pacific halibut at ages 2-3, younger than any observed in the setline survey. The observation of extremely young Pacific halibut differs from the setline survey, as trends in size-at-age indicate that some of the smallest fish for their age across the coast are currently observed in Area 3A, so that area might be expected to have fewer very young fish in the recreational harvest if selectivity were similar to that of the setline survey. These data are not geographically comprehensive; however, recreational removals from Area 3A represent around half of the coastwide recreational total in recent years. Currently, there are no additional age data from the recreational fisheries in other Regulatory Areas, but such data could be included with those from Area 3A if they become available (or are created via age-length keys from creel sampling) in the future.

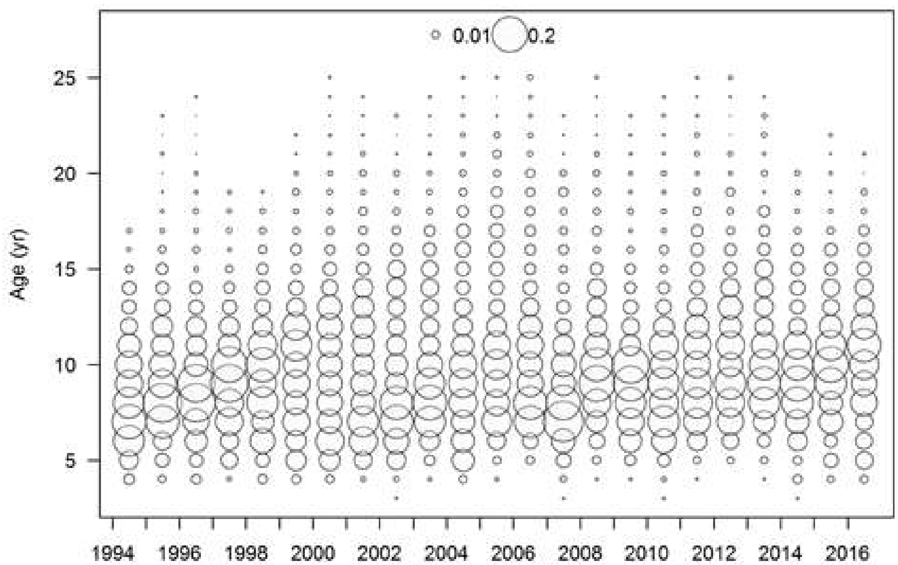

FIGURE 52. Proportions-at-age from the recreational fishery in Area 3A (male and female Pacific halibut combined). Circles represent proportions that sum to 1.0 within each year.

Age distributions from Pacific halibut bycatch

The length-distribution of Pacific halibut caught as bycatch in fisheries targeting other species is reported to the IPHC each year by the National Marine Fisheries Service (NMFS; for Alaska and Washington-Oregon-California) and Fisheries and Oceans Canada (DFO; for British Columbia). Historically, the raw length frequencies are summarized by target fishery within gear type (i.e., trawl, hook-and-line, and pot), then aggregated in order to better represent the differing contributions and sampling rates for each fishery. Weighted length-frequencies of the estimated bycatch are used in the annual harvest policy calculations and catch tables specifically to delineate O26 and U26 removals. In order to evaluate these data directly in the context of the stock assessment, they first need to be converted to age-distributions. Annual age-length keys were produced from the NMFS survey data for the years 1998-2016, and the global key used for prior years and 2017. Coastwide aggregate bycatch lengths were summarized into predicted ages via these annual age-length keys. Estimated bycatch ages showed a mode (or modes) between age-3 and age-10, with up to one-third of the total age distributions represented by Pacific halibut age-4 or less in some years (Figure 53). Consistent with the NMFS Bering Sea trawl survey data, both the 1987 year-class and the strong 2004-05 year classes are also present in the estimated distributions for the coastwide bycatch.

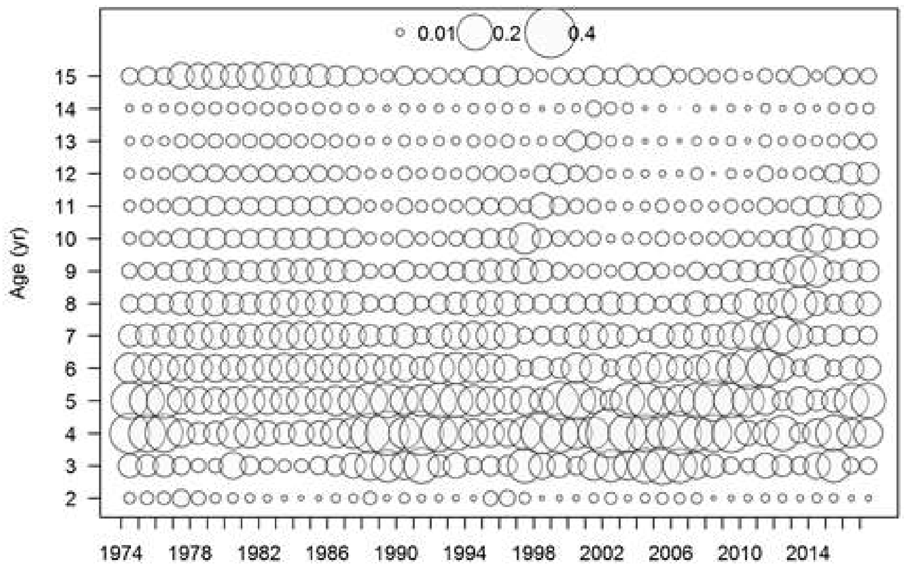

FIGURE 53. Coastwide proportions-at-age from the aggregate bycatch fisheries (male and female Pacific halibut combined). Circles represent proportions that sum to 1.0 within each year.

AUXILIARY SOURCES OF INFORMATION

Several additional sources of information are evaluated directly, included in the stock assessment or related analyses and treated as data, even though they represent the products of analyses themselves. These are briefly summarized here but considerable additional background material exists.

Weight-length relationship

The weight-length relationship for Pacific halibut was developed in 1926, re-evaluated in 1991 (Clark), and has been applied as standard practice for al years of IPHC management. The relationship between fork length (L_f), and individual net (headed and gutted) weights (W_n) is given by:

$$W_n = 0.00000692 \cdot {L_f}^{3.24}$$

This relationship reflects the slightly greater than cubic increase in weight with increasing length (Figure 54). In 2013, the IPHC staff initiated a program to begin sampling individual weights during port sampling. Since 2015 this program has included data collection on survey vessels and during routine port sampling in almost all ports; recent results are reported in

Webster and Erikson (2017). Over the next several years these data should allow for a reanalysis of the length-weight relationship, as well as an improved understanding of the differences in measurements collected on freshly dead fish, fish that have been stored on ice, as well as the relative contributions of head-weights, ice and slime on standardization to net weight.

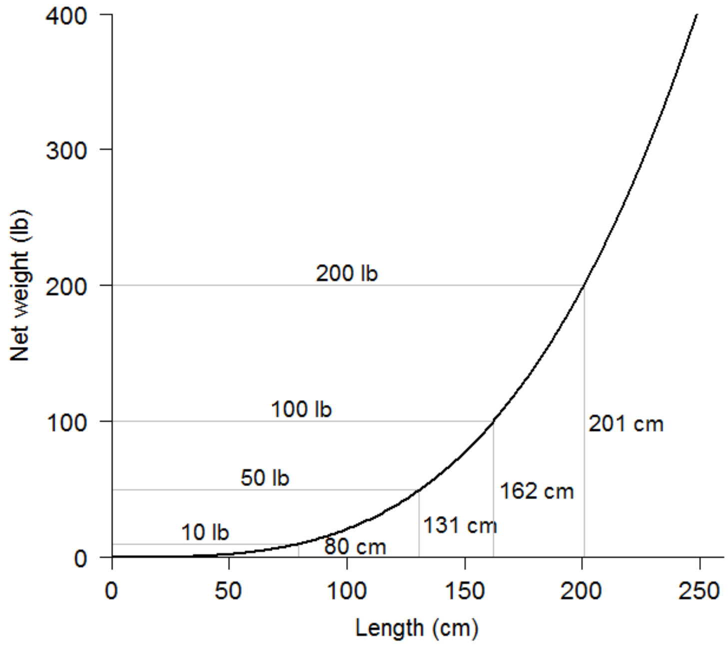

FIGURE 54. The conversion relationship for length in centimeters to net weight in pounds.

Maturity schedule

The maturity schedule for Pacific halibut has been investigated several times historically, and maturity-at-age found to be very stable despite long-term changes in length- and weight-at-age (Clark and Hare 2006). Estimates of the age at which 50% of female Pacific halibut are sexually mature average 11.6 years among regulatory areas, with very few fish mature at ages less than five and nearly all fish mature by about age 17. The maturity schedule used for stock assessment has not been updated in recent years, and it is represented by a logistic fit that is truncated below age 8 (Figure 55). A research program to evaluate the current maturity schedule is ongoing in 2017.

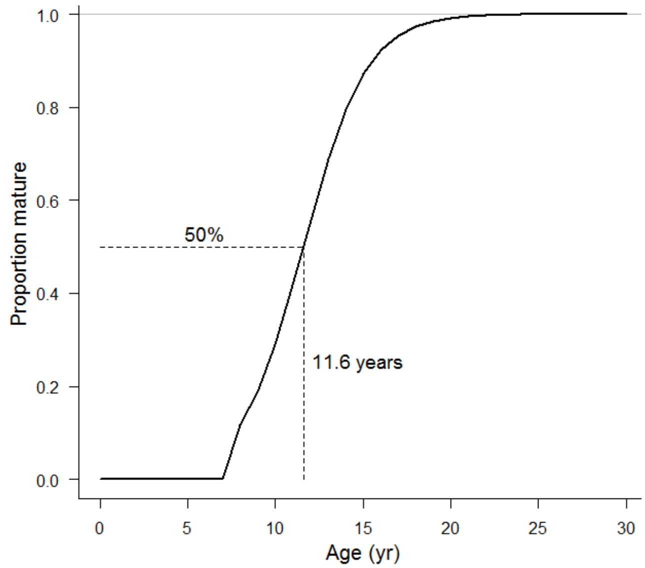

FIGURE 55. The maturity ogive used in recent Pacific halibut assessments. Note that this is a logistic curve, trimmed to be equal to zero below age-8.

Ageing bias and imprecision

Ages are often treated and referred to as 'data', however they represent estimates of age based (most commonly) on the counting the rings formed annually on otoliths. These estimates are therefore subject to both bias and imprecision depending on the method employed to obtain them. Pacific halibut tend to be relatively easy to age (compared to longer-lived groundfish), and historical estimates of the imprecision of the standard method of 'break-and-bake' ageing showed that the method was very precise (Clark 2004a, b, Clark and Hare 2006). Validation of the method relative to actual age has been performed via analysis of radiocarbon levels observed in known-age otoliths, and the relationship has since been used as the standard for North Pacific groundfish species (Piner and Wischnioski 2004).

Prior to 2002, surface ageing was employed as the primary tool for ageing Pacific halibut, and this method is known to be biased for older individuals and less precise than other methods when applied to many marine species. Estimates of bias and imprecision for break-and-bake and surface ages were updated in 2013 based on re-aging of setline survey samples from 1998 (Stewart 2014). Analysis of surface ages from each decade back to the 1920s also corroborated those results (Forsberg and Stewart 2015).

Movement rates among biological Regions

Development of spatially explicit stock assessment and Management Strategy Evaluation (MSE) operating models requires an understanding of the rates of movement among geographic regions. Current understanding of adult movement rates for most areas is reasonably well understood, based on extensive historical and more recent PIT tagging studies (Valero and Webster 2012). However, previous summary of these data has been conducted by specific regulatory area, and detailed analysis of these data was originally based on the length of the tagged Pacific halibut (Webster et al. 2013). Webster (2015a; and extended analysis) has provided these rates as a function of age and by geographic region. For Pacific halibut less than age-5, most of the available data come from historical studies that used trawl gear (rather than longline gear) to capture fish for tagging (Valero and Webster 2012). Hilborn et al. (1995) used data from studies conducted in the 1980s to estimate movement parameters for juveniles among specific regulatory areas within biological Regions 2 and 3. These data suggest relatively high rates of 'downstream' movement to the east and south. Similar results are unavailable for Regions 4 or 4B, although raw recovery rates from juvenile Pacific halibut tagged in the Bering Sea and Aleutians suggest appreciable movement to all other regulatory areas over 5-10 years of life (Webster 2015b). The lack of data from Region 4 is particularly problematic, given that this is the area where the greatest abundance of 2-4 year old Pacific halibut are observed, and therefore assumptions about movement rates will be most important.

In 2015, this varied information was assembled into a single framework representing the IPHC's current working hypothesis regarding movement-at-age among regions. Key assumptions in constructing this hypothesis included: ages 0-1 do not move, most of the young Pacific halibut reported in Hilborn et al. (1995) were aged 2-4, movement generally increases from ages 2-4, age 2 Pacific halibut cannot move from Region 4 to Region 2 in a single year, and that relative movement rates of Pacific halibut age 2-4 to/from Region 4 are similar to those observed for 2-4 year-old Pacific halibut compared to older Pacific halibut in Region 3. Based on these assumptions, appreciable emigration is estimated to occur from Region 4, decreasing with age. Pacific halibut age-2 to age-4 move from Region 3 to Region 2 and from Region 4B to Regions 3 and 2, and some movement of older Pacific halibut is estimated to occur from Region 2 back to Region 3 (Figure 56).

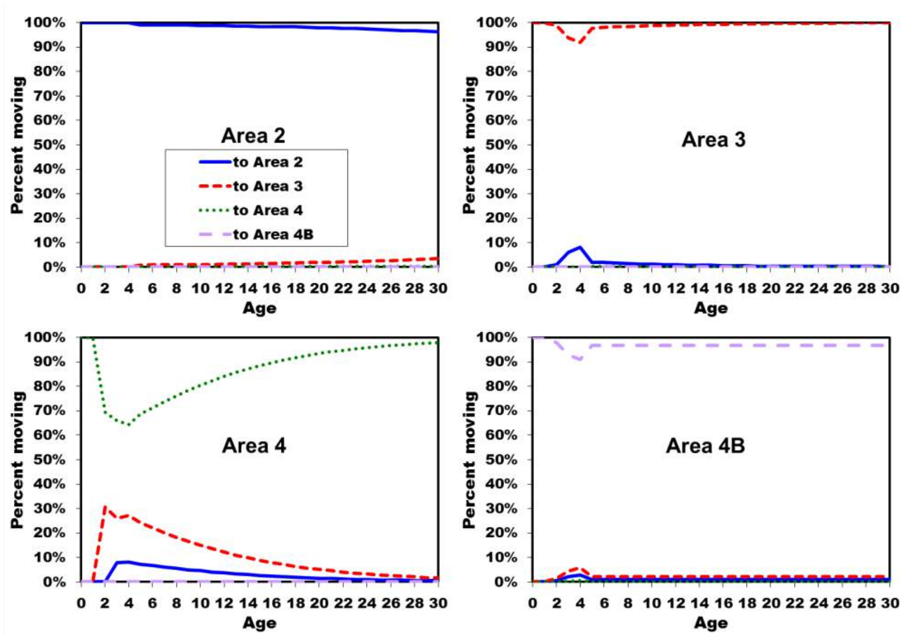

FIGURE 56. Hypothesized annual movement rates by age among biological Regions.

Ecosystem conditions

Previous research identified a strong correlation between the environmental conditions in the northeast Pacific Ocean, specifically the Pacific Decadal Oscillation (PDO; Mantua et al. 1997) and recruitment of Pacific halibut to the commercial fishery during the 1900s. A description of ongoing PDO research as well as access to the time-series of estimates can be found at:

http://jisao.washington.edu/pdo/. For Pacific halibut, the positive 'phase' of the PDO (years up to and including 1947 and 1977-2006) and subsequent recruitment of juveniles into the commercial fishery appears to be correlated (Clark and Hare 2002, Clark et al. 1999). Recent reinvestigation of this analysis revealed that the correlation still appears strong using all available data (Stewart and Martell 2016). It is therefore worthwhile to monitor the recent trends in the PDO time series for qualitative purposes, as this represents some of the only information available related to juvenile Pacific halibut abundance prior to their entry into the survey and fishery around age-8-10. Inspection of the most recent PDO values indicates that deviations from 2006-2013 were negative, representing the longest period of negative annual values observed since the late 1970s. Highly positive values were observed over 2014-17 (Figure 57); however, these values should be interpreted cautiously, as many other environmental indicators were highly anomalous, and it is very unclear whether these years represent comparable conditions to previous PDO observations.

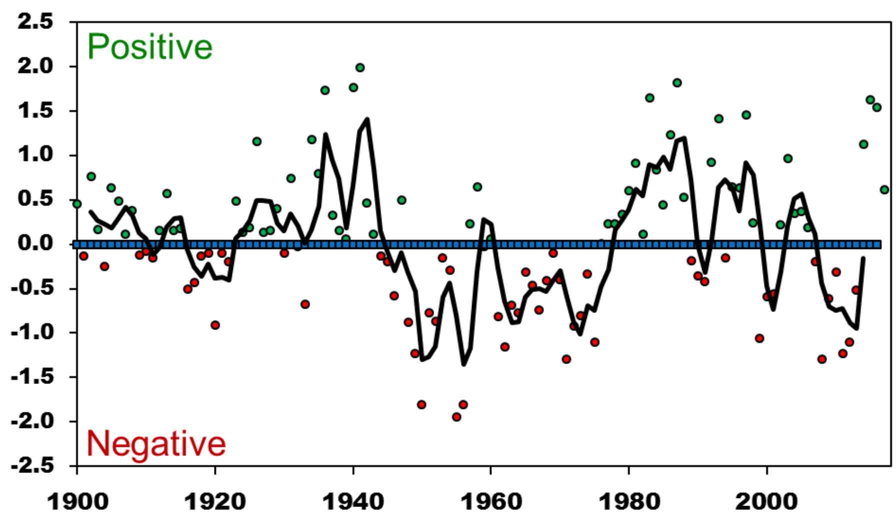

FIGURE 57. Time series of annual average PDO conditions (deviations from the long-term mean). Monthly means were obtained from (http://jisao.washington.edu/pdo/).

Broadly, across the Gulf of Alaska, anomalous conditions during 2014-2016 have led to several relevant ecosystem observations. Warmer than normal water temperatures (even over deeper shelf depths) appear to be correlated with seabird and marine mammal mortality events (Zador and Yasumiishi 2017) and other conditions that suggest historical patterns of productivity related to the PDO may not be relevant to the most recent few years. Of particular concern was the apparently large mortality event observed in the Pacific cod (*Gadus macrocephalus*) stock in the Gulf of Alaska, and associated declines in biomass (Barbeaux et al. 2017). However, this same time period also appears to have produced a very large 2014 year class for the sablefish (*Anoplopoma fimbria*) stock (Hanselman et al. 2017). The effects of these ecosystem conditions on Pacific halibut in the Gulf of Alaska may take several years to become apparent, as the primary sources of comprehensive data used for stock assessment contain few Pacific halibut less than 5-7 years of age.

Empirical harvest rates

Given that the interim management procedure is under development via the MSE process, an option for evaluating relative harvest rates based solely on data (rather than stock assessment output) is presented here, similar to that provided last year (Stewart 2017). Consider that we are interested in an empirical measure of exploitation (*U*) in each year (*y*) and area (*a*). A desirable metric is proportional to the O26 catch (*C*) and some measure of the biomass (*B*):

$$U_{y,a} \sim \frac{C_{y,a}}{B_{y,a}}$$

The measure biomass is a function of the observed survey index (*I*) and an unknown catchability parameter (*q*):

$$B_{y,a} = q_{y,a} \cdot I_{y,a}$$

Finally, the survey index is a function of the observed WPUE of all sizes of Pacific halibut, and the geographic extent (*A*) of each Area:

$$I_{y,a} = WPUE_{y,a} \cdot A_a$$

In this calculation it is assumed that the catchability parameter is constant (or at least non-trending) across years and constant among areas (note that the survey timing and hook competition are already accounted for in the space-time modelling of WPUE). Given this approximation, and an unknown constant value for catchability, the absolute scale of the exploitation intensity is unknown. Therefore, to compare across years all *U*s were scaled relative to the average over the period 2014-2016, providing a relative metric of exploitation rates.

Much higher *U*s are estimated historically for Region 2, than in other biological regions; however, all Regions experienced peak harvest rates between 2003 and 2009 (Figure 58). The harvest rates in all Regions were generally lower than most historical values over the period 2012 -2014, but increased in all Regions during 2017.

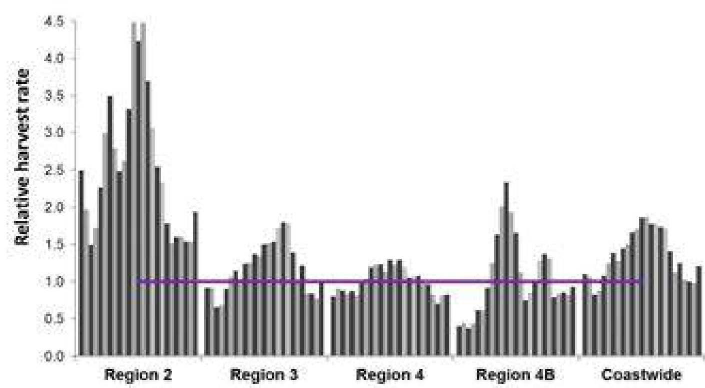

FIGURE 58. Empirical harvest rates from 1993-2017. Horizontal line indicates the average coastwide harvest rate over the period 2014-2016.

CONCLUSIONS

Despite the heterogeneous nature of the various datasets, there is a considerable quantity of historical data available for Pacific halibut, perhaps more than for any other single groundfish species in the region. The IPHC has the benefit of an extremely long time-series of data collection, a high degree of cooperation from the commercial fleet, and therefore a unique resource for historical fishery and biological patterns in the northeast Pacific Ocean. The data themselves, after accounting for important known changes in fishery and survey activities, are remarkably coherent and potentially highly informative for stock assessment, harvest policy, and MSE analyses.

Summary of improvements for 2017

This document does not attempt to describe all relevant detail in processing data for use in the stock assessment, MSE and harvest policy analyses. It is intended to provide an overview of what might be considered current 'best practices', relying on previous documents to identify the development of sources and methods. Important changes are noted each year; for 2017 these were reviewed by the SRB during the June meeting (except where noted):

- Addition of age data collected during setline survey expansions 2014-2017.
- Incorporation of logbooks describing historical fishing activity prior to 2016 (previously this data source was 'closed' in the spring of each following year).
- Use of directly measured individual fish weights collected from port samples for 2015-2017.
- Extension of the setline survey time-series analyzed in the space-time model to include 1993-1997 (available in October, so the results not reviewed in June).
- Standard updating of preliminary values from 2016 and available information at the beginning of November 2017.

Data sources for potential future analyses and relevant research projects

Research priorities for technical development of the stock assessment are reported in that document. The IPHC's research program (Planas 2017) is actively addressing the most important gaps in current biological understanding of Pacific halibut. This section represents a list of potential projects relating specifically to existing and new data sources that could benefit the Pacific halibut stock assessment and related analyses in the future. It is not a prioritized list, nor is it fully comprehensive; there are other datasets not listed here but available for analysis that may be added in the future.

- The work of Monnahan and Stewart (2015) modelling commercial fishery catch rates has been extended to include spatial effects, and will be reevaluated in the future for comparison with the WPUE calculations currently used in the stock assessment models. A revised hook spacing relationship (Monnahan and Stewart 2017) will be investigated for inclusion into IPHC database processing algorithms.
- Reevaluation of the historical length-weight relationship to determine whether recent changes in length-at-age are also accompanied by changes in weight-at-length and how this may change estimates of removals over time is ongoing.
- A historical investigation on the factors influencing observed size-at-age, and ageing of additional samples from key periods and areas to support this analysis is ongoing at the IPHC.

- There is the potential that trawl surveys, particularly the Bering Sea trawl survey, could provide information on recruitment strengths for Pacific halibut several years prior to currently available sources of data. Analyses of these data are ongoing in the context of spatially explicit models.
- There is a vast quantity of archived historical data that is currently inaccessible until organized, keypunched and formatted into the IPHC's database with appropriate meta-data. Information on historical fishery landings, effort, and age samples would provide a much clearer (and more reproducible) perception of the historical period.
- Additional efforts could be made to reconstruct estimates of subsistence harvest prior to 1991.
- NMFS observer data from the directed Pacific halibut fleet in Alaska could be evaluated for use in updating DMRs and the age-distributions for discard mortality.
- Historical bycatch length frequencies and mortality estimates need to be reanalyzed accounting for sampling rates in target fisheries and evaluating data quality over the historical period. This work is ongoing at the IPHC.

RECOMMENDATION/S

That the Commission:

NOTE paper IPHC-2018-AM094-09 which provides an overview of the data sources available for the Pacific halibut (*Hippoglossus stenolepis*) stock assessment, harvest policy, Management Strategy Evaluation (MSE) and other related analyses.

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APPENDICES

<u>Appendix A</u>: Time series' of setline survey trend and distribution information.

<u>Appendix B</u>: Detailed weight-at-age estimates by Regulatory Area.

<u>Appendix C</u>: Time series' of removals information.

<u>Appendix D</u>: Time series of fishery catch-rates.

APPENDIX A

Time series' of setline survey trend and distribution information

TABLE A1. Time-series of O32 setline survey WPUE by regulatory Area (net lb/skate). Years prior to 1984 are based on surveys conducted with "J" hooks, years prior to 1993 on mean catch-rate, and years 1993+ on the space-time model.

Year	2A	2B	2C	3A	3B	4A	4B	4CDE	Total
1977	NA	13.7	NA	58.4	NA	NA	NA	NA	NA
1978	NA	19.1	NA	26.9	NA	NA	NA	NA	NA
1979	NA	NA	NA	41.0	NA	NA	NA	NA	NA
1980	NA	25.5	NA	76.2	NA	NA	NA	NA	NA
1981	NA	16.5	NA	131.4	NA	NA	NA	NA	NA
1982	NA	20.6	113.7	130.3	NA	NA	NA	NA	NA
1983	NA	18.0	142.2	119.0	NA	NA	NA	NA	NA
1984	NA	57.4	259.6	361.2	NA	NA	NA	NA	NA
1985	NA	41.7	260.5	377.5	NA	NA	NA	NA	NA
1986	NA	37.8	282.6	305.1	NA	NA	NA	NA	NA
1987	NA	NA	NA	NA	NA	NA	NA	NA	NA
1988	NA	NA	NA	NA	NA	NA	NA	NA	NA
1989	NA	NA	NA	NA	NA	NA	NA	NA	NA
1990	NA	NA	NA	NA	NA	NA	NA	NA	NA
1991	NA	NA	NA	NA	NA	NA	NA	NA	NA
1992	NA	NA	NA	NA	NA	NA	NA	NA	NA
1993	45.2	134.6	293.3	409.7	470.5	259.9	280.1	14.3	143.0
1994	43.1	168.6	341.8	371.0	475.0	275.1	282.8	13.9	143.4
1995	41.3	208.0	395.1	390.0	506.7	276.8	283.8	14.3	153.3
1996	41.7	167.4	342.5	379.5	559.6	307.8	282.3	17.2	154.1
1997	41.5	128.2	350.1	420.9	506.9	334.2	282.6	18.0	154.4
1998	40.6	100.7	275.9	318.1	568.7	391.0	254.2	20.2	144.3
1999	39.1	80.9	217.5	287.7	601.3	358.7	208.8	20.2	135.6
2000	38.2	97.4	233.8	345.6	515.7	354.5	186.5	21.7	137.5
2001	36.4	111.2	257.8	334.5	420.1	276.3	137.6	20.9	124.0
2002	27.5	109.2	281.6	380.2	341.2	246.4	105.4	18.2	119.4
2003	24.4	77.9	227.5	323.0	342.0	209.7	85.8	16.8	104.4
2004	25.8	70.4	158.5	366.5	281.8	181.9	78.0	15.1	99.6
2005	27.2	73.0	174.7	335.9	218.7	160.0	74.2	12.3	89.1
2006	21.3	68.0	158.8	284.0	220.4	134.2	81.9	13.6	81.4
2007	18.4	71.4	156.8	267.4	213.9	119.1	96.0	11.8	77.8
2008	18.7	75.0	149.1	228.2	171.4	128.0	98.2	11.8	70.4
2009	14.4	84.5	131.7	182.8	161.2	118.0	81.9	12.5	63.0
2010	18.8	87.8	134.4	171.0	129.5	99.8	71.8	12.1	58.1
2011	23.4	89.3	165.9	169.6	112.4	92.7	72.7	11.4	57.4
2012	22.1	102.4	211.7	195.6	111.0	91.9	60.1	12.1	62.7
2013	21.4	100.7	217.0	148.0	95.1	74.6	64.7	12.0	55.1
2014	23.0	98.3	219.7	158.6	92.5	79.2	56.3	13.4	56.7
2015	28.5	110.1	223.9	147.2	100.8	78.7	58.3	14.6	58.0
2016	25.3	109.5	253.5	168.3	108.3	73.5	57.0	14.2	61.5
2017	19.6	84.0	255.5	160.2	73.3	72.6	53.5	13.5	55.1

TABLE A2. Time-series of all-sizes setline survey WPUE by regulatory Area (net lb/skate) based on the space-time model.

Year	2A	2B	2C	3A	3B	4A	4B	4CDE	Total
1993	56.5	148.4	308.2	476.4	535.2	185.8	303.8	19.6	158.5
1994	53.8	190.1	355.5	439.9	542.6	210.7	302.9	19.3	160.3
1995	51.2	237.3	407.6	472.5	577.5	228.9	302.6	17.6	172.2
1996	50.3	194.1	382.8	456.7	638.8	289.4	302.6	17.9	173.9
1997	48.4	147.1	393.7	508.7	586.9	379.9	301.5	16.9	177.1
1998	45.6	116.7	311.8	371.0	656.6	431.7	272.7	18.6	162.3
1999	42.2	94.0	250.1	330.9	686.2	376.6	217.8	18.0	149.8
2000	41.0	112.3	270.9	408.9	586.8	378.2	199.3	19.6	153.9
2001	38.7	127.3	299.0	387.6	477.8	316.2	145.4	19.1	139.1
2002	30.0	127.1	328.7	453.6	406.6	284.2	109.1	17.9	138.3
2003	26.7	92.9	269.7	388.3	442.5	243.2	88.9	18.0	125.3
2004	28.2	87.4	199.2	450.2	390.7	218.9	80.3	17.2	124.0
2005	30.6	93.9	217.8	412.3	296.8	200.6	76.2	17.3	112.5
2006	23.7	89.1	206.3	359.4	305.2	172.2	87.2	20.3	106.2
2007	20.9	99.0	210.4	348.4	311.5	163.3	107.0	18.8	105.8
2008	22.7	102.8	200.9	304.0	276.9	189.3	107.7	19.0	99.2
2009	16.0	114.3	185.1	259.1	261.2	184.2	88.9	19.3	91.5
2010	20.8	114.8	186.2	257.8	231.1	157.5	76.8	19.7	87.7
2011	26.6	110.4	212.3	266.4	211.1	139.9	79.9	19.0	87.0
2012	25.8	127.6	262.8	297.3	201.7	139.3	66.7	18.9	92.4
2013	25.1	127.4	264.9	223.0	167.2	108.7	80.1	18.7	79.7
2014	26.8	127.7	272.7	261.5	170.4	114.5	68.8	19.2	85.0
2015	33.8	142.4	282.9	258.5	174.9	115.3	71.1	19.6	87.2
2016	30.3	142.4	308.1	267.0	191.5	102.3	71.9	19.1	89.3
2017	21.0	99.4	301.6	231.2	123.3	102.9	63.0	16.7	74.2

TABLE A3. Time-series of O32 setline survey NPUE by regulatory Area (net lb/skate). Years prior to 1984 are based on surveys conducted with “J” hooks, years prior to 1993 on mean catch-rate, and years 1993+ on the space-time model.

Year	2A	2B	2C	3A	3B	4A	4B	4CDE	Total
1977	NA	0.60	NA	2.00	NA	NA	NA	NA	NA
1978	NA	0.80	NA	1.30	NA	NA	NA	NA	NA
1979	NA	NA	NA	1.90	NA	NA	NA	NA	NA
1980	NA	1.20	NA	2.50	NA	NA	NA	NA	NA
1981	NA	0.80	NA	3.80	NA	NA	NA	NA	NA
1982	NA	1.00	3.60	3.80	NA	NA	NA	NA	NA
1983	NA	1.30	4.40	3.40	NA	NA	NA	NA	NA
1984	NA	4.70	11.00	11.60	NA	NA	NA	NA	NA
1985	NA	3.80	9.50	11.90	NA	NA	NA	NA	NA
1986	NA	2.40	9.00	7.80	NA	NA	NA	NA	NA
1987	NA	NA	NA	NA	NA	NA	NA	NA	NA
1988	NA	NA	NA	NA	NA	NA	NA	NA	NA
1989	NA	NA	NA	NA	NA	NA	NA	NA	NA
1990	NA	NA	NA	NA	NA	NA	NA	NA	NA
1991	NA	NA	NA	NA	NA	NA	NA	NA	NA
1992	NA	NA	NA	NA	NA	NA	NA	NA	NA
1993	3.25	6.87	11.84	21.68	28.41	8.96	9.51	1.36	7.55
1994	3.09	9.00	13.89	21.51	28.40	10.32	9.83	1.32	7.82
1995	2.92	11.76	16.34	24.04	29.42	11.26	10.25	1.21	8.49
1996	2.79	9.30	15.10	23.42	32.20	13.68	10.57	1.25	8.55
1997	2.61	7.37	16.18	27.50	31.58	16.72	10.85	1.14	9.00
1998	2.38	6.13	13.67	19.20	33.69	17.65	11.08	1.22	8.05
1999	2.12	4.94	10.83	17.05	35.60	15.00	9.46	1.09	7.44
2000	2.02	5.56	12.20	22.09	31.95	15.78	8.69	1.17	7.92
2001	1.87	6.73	14.00	20.84	26.86	14.03	6.75	1.16	7.34
2002	1.57	6.44	14.94	25.93	24.62	13.83	4.91	1.05	7.64
2003	1.47	5.11	13.12	22.61	29.11	11.88	4.04	1.07	7.27
2004	1.56	5.15	10.92	28.44	28.56	11.68	3.76	1.02	7.82
2005	1.76	5.78	11.86	25.83	21.38	11.43	3.64	1.04	7.04
2006	1.42	5.80	11.96	23.34	22.87	10.29	4.20	1.25	6.92
2007	1.29	6.71	13.26	24.63	24.87	10.41	5.28	1.16	7.35
2008	1.48	6.77	12.86	21.63	24.35	13.16	5.06	1.23	7.10
2009	0.99	7.60	12.53	20.42	22.77	13.55	4.32	1.27	6.87
2010	1.23	7.45	12.37	21.51	21.49	11.43	4.13	1.33	6.82
2011	1.52	6.83	12.80	23.16	20.31	10.26	4.11	1.33	6.85
2012	1.54	7.99	15.88	25.17	19.30	10.49	3.66	1.36	7.23
2013	1.47	7.92	15.37	18.92	16.11	7.90	4.96	1.37	6.13
2014	1.49	8.15	15.88	23.47	16.60	8.22	4.37	1.40	6.77
2015	1.99	9.61	16.68	23.43	16.54	8.10	4.43	1.38	6.90
2016	1.80	9.42	18.16	22.88	18.69	6.90	4.80	1.29	6.94
2017	1.02	5.78	15.98	18.53	11.06	6.94	3.73	1.10	5.29

TABLE A4. Time-series of stock distribution based on O32 setline survey WPUE by regulatory Area (net lb/skate).

Year	2A	2B	2C	3A	3B	4A	4B	4CDE	Total
1993	1.6%	7.0%	7.4%	35.1%	24.7%	9.1%	9.5%	5.5%	100.0%
1994	1.5%	8.8%	8.6%	31.7%	25.0%	9.6%	9.6%	5.3%	100.0%
1995	1.3%	10.1%	9.3%	31.2%	24.9%	9.1%	9.0%	5.1%	100.0%
1996	1.3%	8.1%	8.0%	30.2%	27.4%	10.0%	9.0%	6.1%	100.0%
1997	1.3%	6.2%	8.1%	33.4%	24.8%	10.9%	9.0%	6.3%	100.0%
1998	1.4%	5.2%	6.9%	27.0%	29.7%	13.6%	8.6%	7.6%	100.0%
1999	1.4%	4.4%	5.8%	26.0%	33.4%	13.3%	7.5%	8.1%	100.0%
2000	1.4%	5.3%	6.1%	30.8%	28.3%	13.0%	6.6%	8.6%	100.0%
2001	1.4%	6.7%	7.5%	33.0%	25.6%	11.2%	5.4%	9.2%	100.0%
2002	1.1%	6.8%	8.5%	39.0%	21.6%	10.4%	4.3%	8.3%	100.0%
2003	1.1%	5.5%	7.8%	37.9%	24.7%	10.1%	4.0%	8.8%	100.0%
2004	1.3%	5.3%	5.7%	45.0%	21.4%	9.2%	3.8%	8.3%	100.0%
2005	1.5%	6.1%	7.1%	46.1%	18.6%	9.0%	4.1%	7.5%	100.0%
2006	1.3%	6.2%	7.0%	42.7%	20.5%	8.3%	4.9%	9.1%	100.0%
2007	1.2%	6.8%	7.2%	42.0%	20.8%	7.7%	6.0%	8.2%	100.0%
2008	1.3%	7.9%	7.6%	39.6%	18.4%	9.1%	6.8%	9.2%	100.0%
2009	1.1%	10.0%	7.5%	35.5%	19.3%	9.4%	6.4%	10.8%	100.0%
2010	1.6%	11.2%	8.3%	36.0%	16.8%	8.6%	6.1%	11.3%	100.0%
2011	2.0%	11.6%	10.4%	36.1%	14.8%	8.1%	6.2%	10.8%	100.0%
2012	1.7%	12.1%	12.1%	38.1%	13.4%	7.4%	4.7%	10.5%	100.0%
2013	1.9%	13.6%	14.2%	32.9%	13.0%	6.8%	5.8%	11.9%	100.0%
2014	2.0%	12.9%	13.9%	34.2%	12.3%	7.0%	4.9%	12.8%	100.0%
2015	2.4%	14.1%	13.9%	31.1%	13.1%	6.8%	4.9%	13.7%	100.0%
2016	2.0%	13.2%	14.8%	33.5%	13.3%	6.0%	4.5%	12.6%	100.0%
2017	1.7%	11.3%	16.6%	35.6%	10.0%	6.6%	4.8%	13.3%	100.0%

TABLE A5. Time-series of stock distribution based on all-sizes setline survey WPUE by regulatory Area (net lb/skate).

Year	2A	2B	2C	3A	3B	4A	4B	4CDE	Total
1993	1.7%	7.0%	7.0%	36.9%	25.4%	5.9%	9.3%	6.8%	100.0%
1994	1.6%	8.8%	8.0%	33.7%	25.5%	6.6%	9.2%	6.6%	100.0%
1995	1.5%	10.3%	8.5%	33.7%	25.3%	6.7%	8.6%	5.6%	100.0%
1996	1.4%	8.3%	7.9%	32.2%	27.7%	8.3%	8.5%	5.6%	100.0%
1997	1.3%	6.2%	8.0%	35.2%	25.0%	10.8%	8.3%	5.2%	100.0%
1998	1.4%	5.3%	6.9%	28.0%	30.5%	13.4%	8.2%	6.3%	100.0%
1999	1.4%	4.7%	6.0%	27.1%	34.5%	12.6%	7.1%	6.5%	100.0%
2000	1.3%	5.4%	6.3%	32.6%	28.7%	12.3%	6.3%	6.9%	100.0%
2001	1.4%	6.8%	7.7%	34.2%	25.9%	11.4%	5.1%	7.5%	100.0%
2002	1.1%	6.8%	8.5%	40.2%	22.2%	10.3%	3.9%	7.0%	100.0%
2003	1.0%	5.5%	7.7%	38.0%	26.6%	9.8%	3.5%	7.8%	100.0%
2004	1.1%	5.2%	5.8%	44.5%	23.8%	8.9%	3.2%	7.5%	100.0%
2005	1.3%	6.2%	7.0%	44.9%	19.9%	9.0%	3.3%	8.4%	100.0%
2006	1.1%	6.2%	7.0%	41.4%	21.7%	8.1%	4.0%	10.4%	100.0%
2007	1.0%	7.0%	7.1%	40.3%	22.2%	7.8%	5.0%	9.7%	100.0%
2008	1.1%	7.7%	7.3%	37.5%	21.1%	9.6%	5.3%	10.4%	100.0%
2009	0.9%	9.3%	7.3%	34.7%	21.5%	10.1%	4.8%	11.5%	100.0%
2010	1.2%	9.7%	7.6%	36.0%	19.9%	9.0%	4.3%	12.3%	100.0%
2011	1.5%	9.4%	8.8%	37.5%	18.3%	8.1%	4.5%	11.9%	100.0%
2012	1.4%	10.3%	10.2%	39.4%	16.5%	7.6%	3.5%	11.1%	100.0%
2013	1.5%	11.9%	11.9%	34.3%	15.8%	6.9%	4.9%	12.8%	100.0%
2014	1.5%	11.2%	11.5%	37.6%	15.1%	6.8%	4.0%	12.3%	100.0%
2015	1.9%	12.1%	11.7%	36.3%	15.1%	6.6%	4.0%	12.2%	100.0%
2016	1.7%	11.8%	12.4%	36.6%	16.2%	5.8%	3.9%	11.6%	100.0%
2017	1.4%	9.9%	14.6%	38.1%	12.6%	7.0%	4.2%	12.3%	100.0%

TABLE A6. Regional stock distribution estimates based on modelling of the fishery independent setline survey.

	O32 stock distribution				All sizes stock distribution			
Year	**Region 2 (2A, 2B, 2C)**	**Region 3 (3A, 3B)**	**Region 4 (4A, 4CDE)**	**Region 4B**	**Region 2 (2A, 2B, 2C)**	**Region 3 (3A, 3B)**	**Region 4 (4A, 4CDE)**	**Region 4B**
1993	16.0%	59.9%	14.6%	9.5%	15.8%	62.3%	12.7%	9.3%
1994	18.8%	56.7%	14.9%	9.6%	18.4%	59.2%	13.2%	9.2%
1995	20.7%	56.1%	14.2%	9.0%	20.2%	58.9%	12.3%	8.6%
1996	17.4%	57.6%	16.1%	9.0%	17.6%	59.9%	14.0%	8.5%
1997	15.6%	58.2%	17.2%	9.0%	15.5%	60.2%	16.0%	8.3%
1998	13.4%	56.7%	21.2%	8.6%	13.6%	58.5%	19.6%	8.2%
1999	11.6%	59.4%	21.4%	7.5%	12.0%	61.6%	19.2%	7.1%
2000	12.7%	59.1%	21.6%	6.6%	13.0%	61.3%	19.3%	6.3%
2001	15.6%	58.6%	20.4%	5.4%	15.9%	60.1%	18.9%	5.1%
2002	16.4%	60.6%	18.7%	4.3%	16.4%	62.4%	17.4%	3.9%
2003	14.5%	62.6%	18.9%	4.0%	14.3%	64.6%	17.6%	3.5%
2004	12.3%	66.4%	17.5%	3.8%	12.1%	68.3%	16.4%	3.2%
2005	14.6%	64.7%	16.6%	4.1%	14.5%	64.8%	17.4%	3.3%
2006	14.5%	63.2%	17.4%	4.9%	14.3%	63.1%	18.6%	4.0%
2007	15.2%	62.8%	15.9%	6.0%	15.1%	62.5%	17.4%	5.0%
2008	16.8%	58.0%	18.3%	6.8%	16.1%	58.6%	20.0%	5.3%
2009	18.6%	54.8%	20.2%	6.4%	17.4%	56.2%	21.6%	4.8%
2010	21.1%	52.9%	20.0%	6.1%	18.5%	55.9%	21.3%	4.3%
2011	23.9%	50.9%	18.9%	6.2%	19.7%	55.8%	20.0%	4.5%
2012	26.0%	51.5%	17.8%	4.7%	21.9%	55.9%	18.7%	3.5%
2013	29.6%	45.9%	18.7%	5.8%	25.4%	50.1%	19.6%	4.9%
2014	28.8%	46.5%	19.8%	4.9%	24.2%	52.8%	19.1%	4.0%
2015	30.4%	44.2%	20.5%	4.9%	25.7%	51.4%	18.9%	4.0%
2016	30.0%	46.8%	18.6%	4.5%	25.9%	52.8%	17.4%	3.9%
2017	29.7%	45.6%	20.0%	4.8%	25.9%	50.7%	19.2%	4.2%

APPENDIX B
Detailed weight-at-age estimates by Regulatory Area

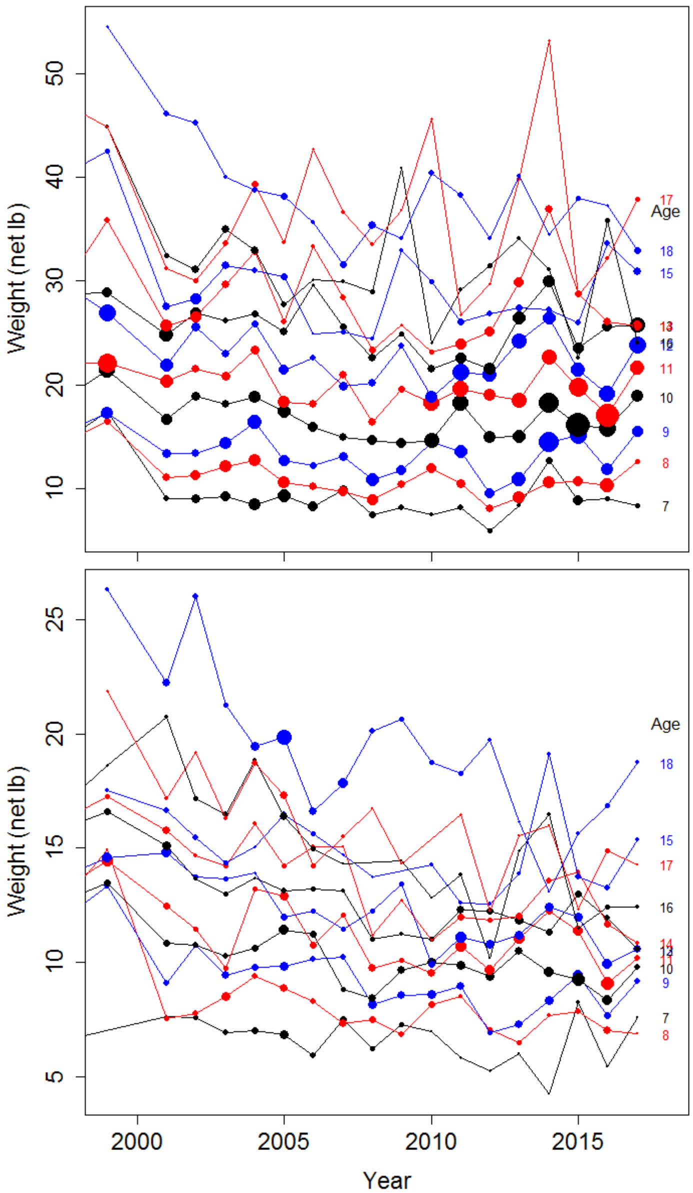

FIGURE B1. Trends in weight-at-age for female (upper panel), and male (lower panel) Pacific halibut from Regulatory Area 2A captured by the setline survey. The size (area) of the points is proportional to the number of fish contributing to each observation; ages 18 and greater have been aggregated for clarity.

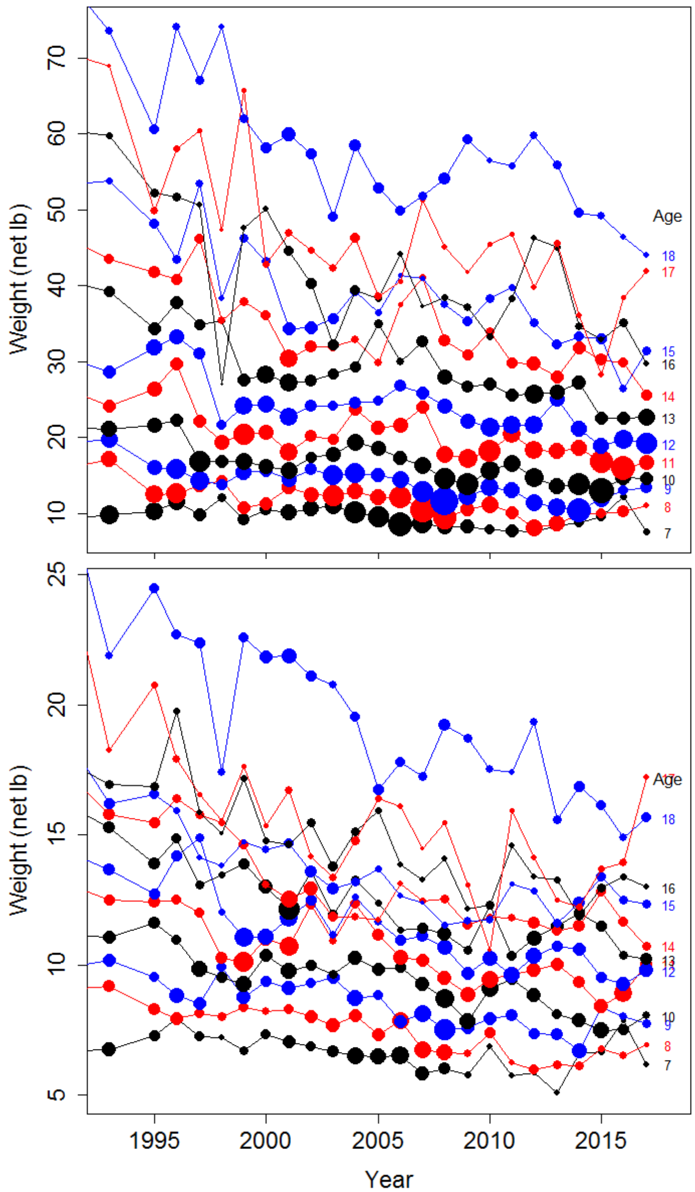

FIGURE B2. Trends in weight-at-age for female (upper panel), and male (lower panel) Pacific halibut from Regulatory Area 2B captured by the setline survey. The size (area) of the points is proportional to the number of fish contributing to each observation; ages 18 and greater have been aggregated for clarity.

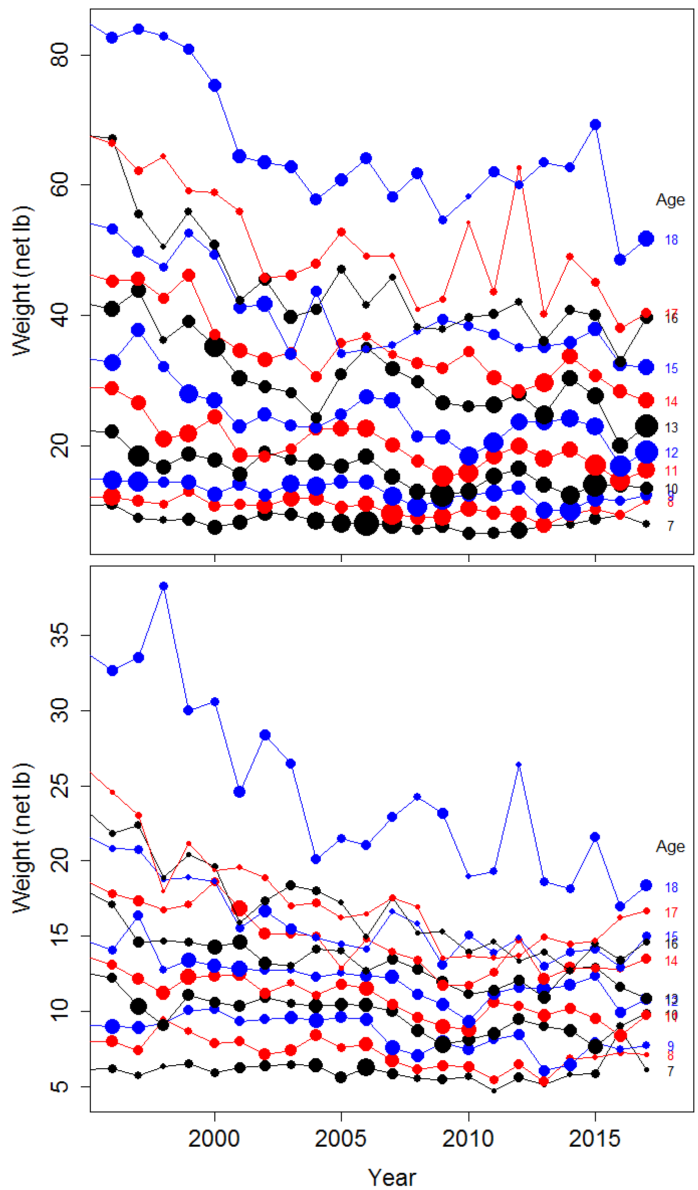

FIGURE B3. Trends in weight-at-age for female (upper panel), and male (lower panel) Pacific halibut from Regulatory Area 2C captured by the setline survey. The size (area) of the points is proportional to the number of fish contributing to each observation; ages 18 and greater have been aggregated for clarity.

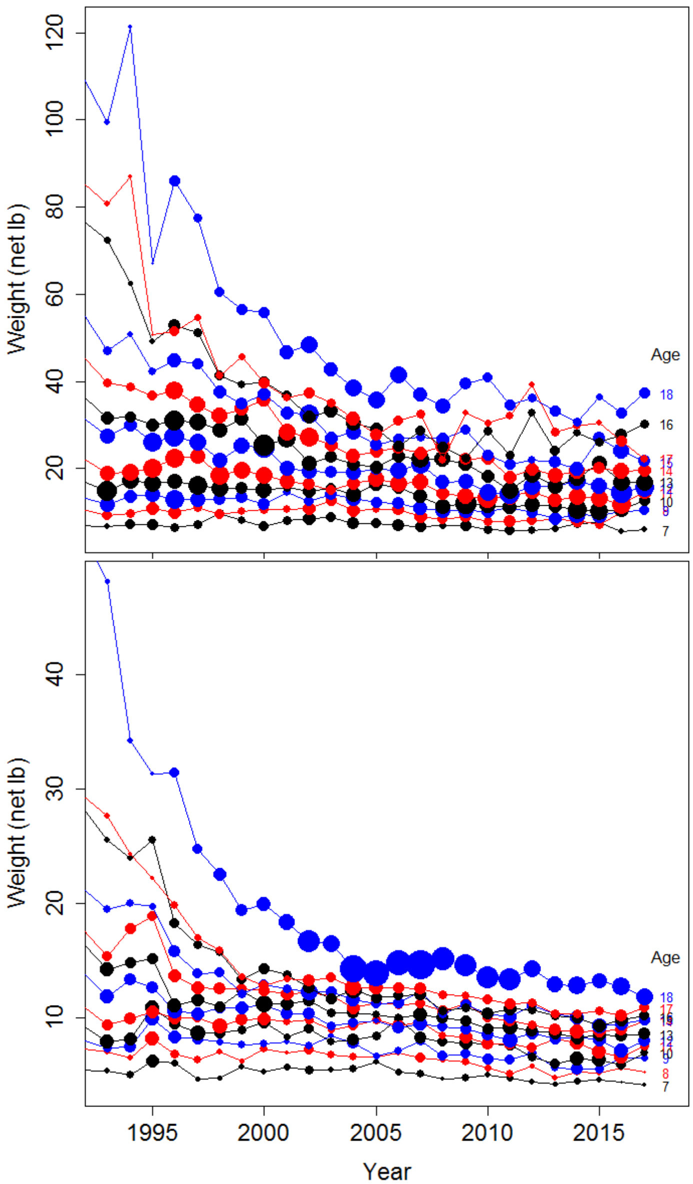

FIGURE B4. Trends in weight-at-age for female (upper panel), and male (lower panel) Pacific halibut from Regulatory Area 3A captured by the setline survey. The size (area) of the points is proportional to the number of fish contributing to each observation; ages 18 and greater have been aggregated for clarity.

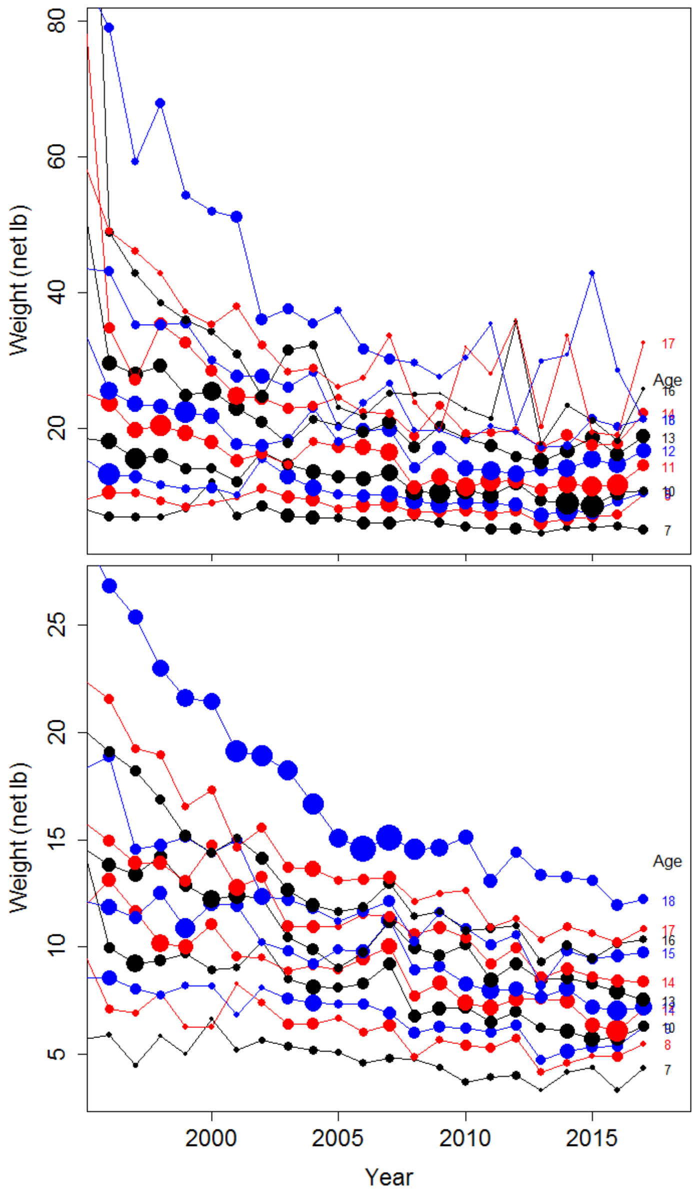

FIGURE B5. Trends in weight-at-age for female (upper panel), and male (lower panel) Pacific halibut from Regulatory Area 3B captured by the setline survey. The size (area) of the points is proportional to the number of fish contributing to each observation; ages 18 and greater have been aggregated for clarity.

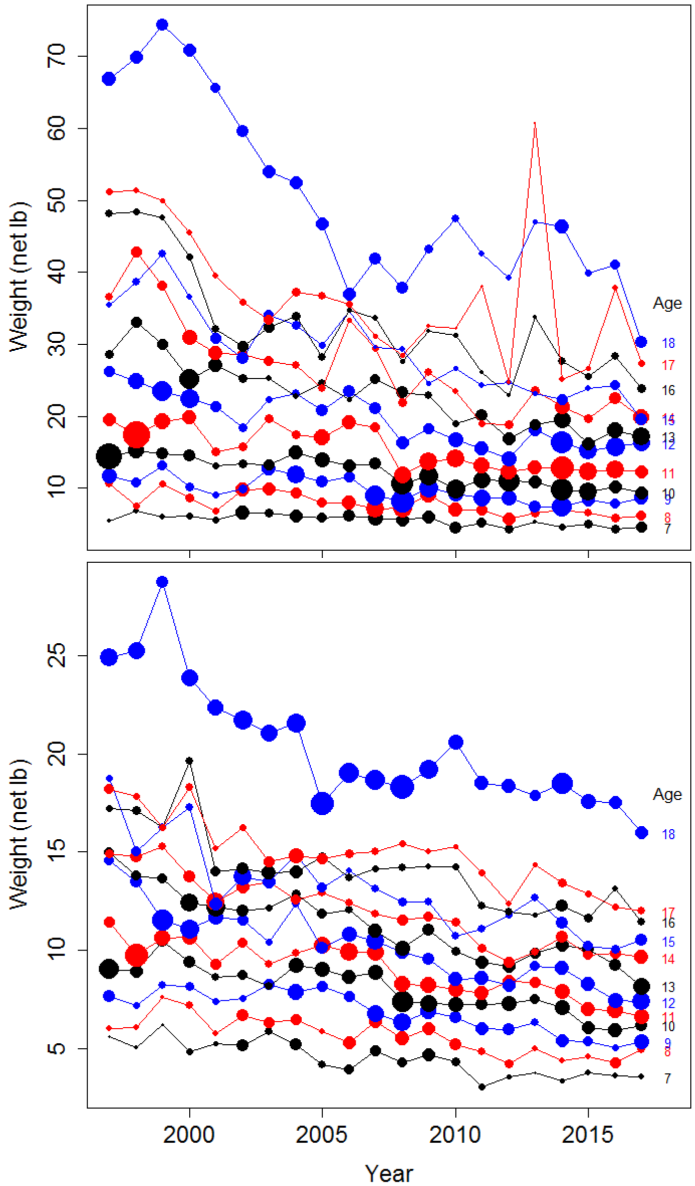

FIGURE B6. Trends in weight-at-age for female (upper panel), and male (lower panel) Pacific halibut from Regulatory Area 4A captured by the setline survey. The size (area) of the points is proportional to the number of fish contributing to each observation; ages 18 and greater have been aggregated for clarity.

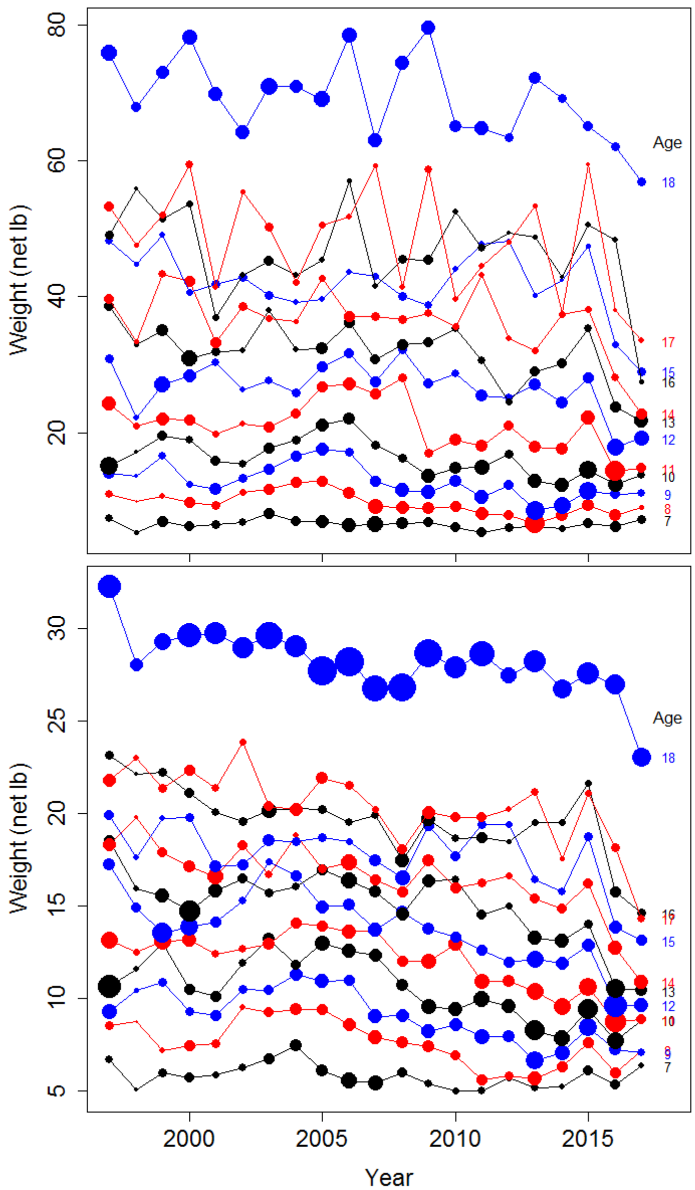

FIGURE B7. Trends in weight-at-age for female (upper panel), and male (lower panel) Pacific halibut from Regulatory Area 4B captured by the setline survey. The size (area) of the points is proportional to the number of fish contributing to each observation; ages 18 and greater have been aggregated for clarity.

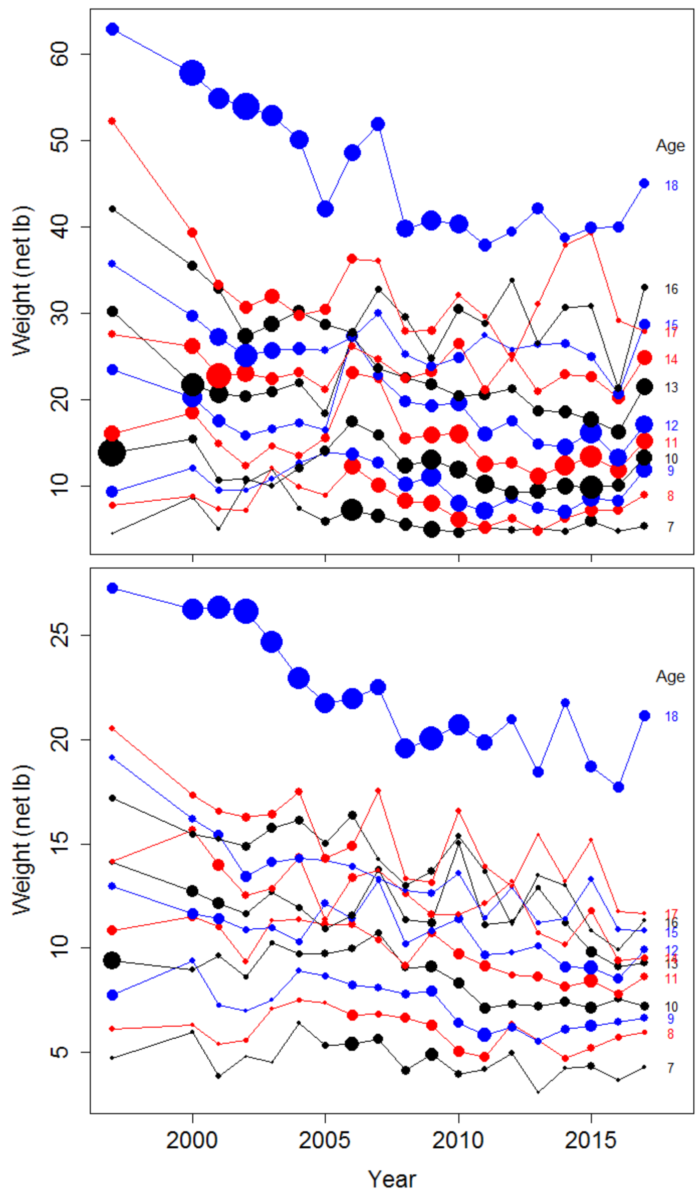

FIGURE B8. Trends in weight-at-age for female (upper panel), and male (lower panel) Pacific halibut from Regulatory Area 4CDE captured by the setline survey. The size (area) of the points is proportional to the number of fish contributing to each observation; ages 18 and greater have been aggregated for clarity.

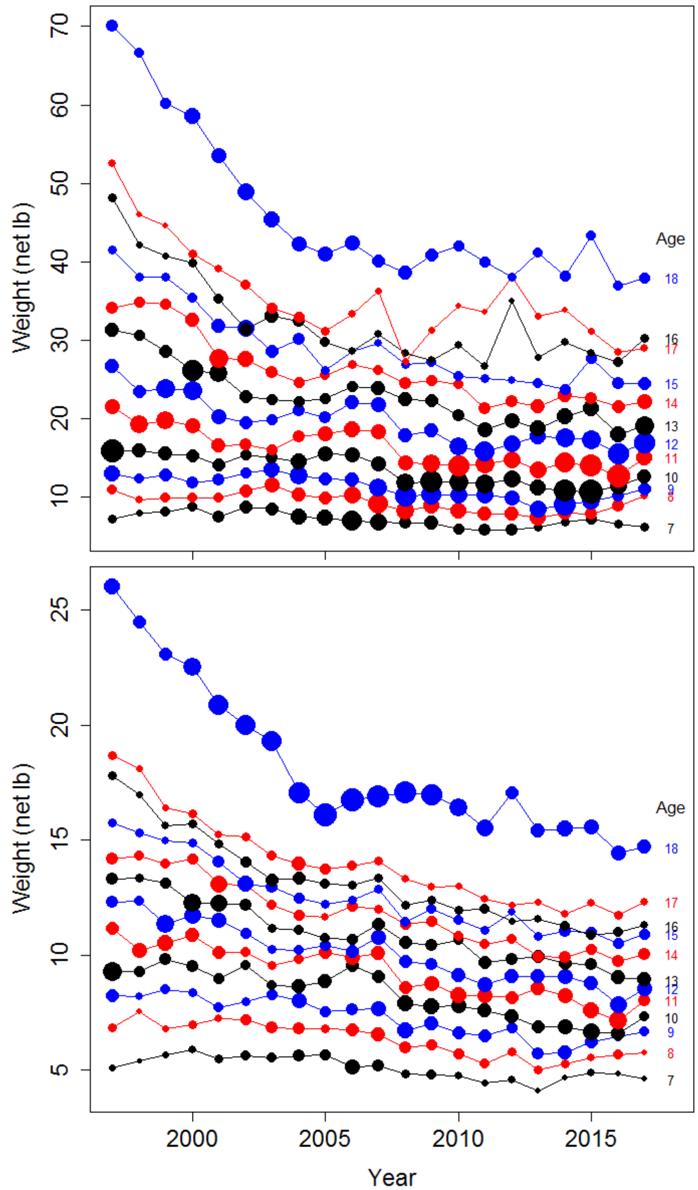

FIGURE B9. Weighted coastwide trends in weight-at-age for female (upper panel), and male (lower panel) Pacific halibut from all Regulatory Areas captured by the setline survey. The size (area) of the points is proportional to the number of fish contributing to each observation; ages 18 and greater have been aggregated for clarity.

APPENDIX C

Time series' of removals information

TABLE C1. Time-series of fishery landings by regulatory Area (million lb, net wt.).

Year	2A	2B	2C	3A	3B	4	4A	4B	4CDE	Total
1888	0.07	0.89	0.50	0.00	0.00	0.00	NA	NA	NA	1.47
1889	0.07	0.79	0.44	0.00	0.00	0.00	NA	NA	NA	1.29
1890	0.07	0.84	0.47	0.00	0.00	0.00	NA	NA	NA	1.37
1891	0.11	1.30	0.73	0.00	0.00	0.00	NA	NA	NA	2.13
1892	0.14	1.69	0.94	0.00	0.00	0.00	NA	NA	NA	2.77
1893	0.16	1.96	1.09	0.00	0.00	0.00	NA	NA	NA	3.22
1894	0.19	2.29	1.28	0.00	0.00	0.00	NA	NA	NA	3.76
1895	0.21	2.59	1.45	0.00	0.00	0.00	NA	NA	NA	4.25
1896	0.27	3.31	1.84	0.00	0.00	0.00	NA	NA	NA	5.42
1897	0.33	4.02	2.24	0.00	0.00	0.00	NA	NA	NA	6.59
1898	0.39	4.73	2.64	0.00	0.00	0.00	NA	NA	NA	7.77
1899	0.45	5.45	3.04	0.00	0.00	0.00	NA	NA	NA	8.94
1900	0.68	8.17	4.56	0.00	0.00	0.00	NA	NA	NA	13.41
1901	0.90	10.90	6.08	0.00	0.00	0.00	NA	NA	NA	17.87
1902	1.13	13.62	7.60	0.00	0.00	0.00	NA	NA	NA	22.34
1903	1.27	15.37	8.57	0.00	0.00	0.00	NA	NA	NA	25.21
1904	1.41	17.12	9.55	0.00	0.00	0.00	NA	NA	NA	28.08
1905	1.11	13.41	7.48	0.00	0.00	0.00	NA	NA	NA	22.00
1906	1.81	21.95	12.24	0.00	0.00	0.00	NA	NA	NA	36.00
1907	2.52	30.48	17.00	0.00	0.00	0.00	NA	NA	NA	50.00
1908	2.55	30.86	17.21	0.00	0.00	0.00	NA	NA	NA	50.62
1909	2.58	31.23	17.42	0.00	0.00	0.00	NA	NA	NA	51.23
1910	2.61	31.61	17.63	0.00	0.00	0.00	NA	NA	NA	51.85
1911	2.87	34.71	19.36	0.00	0.00	0.00	NA	NA	NA	56.93
1912	3.00	36.29	20.24	0.86	0.04	0.00	NA	NA	NA	60.43
1913	2.79	33.80	18.85	10.58	0.52	0.00	NA	NA	NA	66.54
1914	2.24	27.11	15.12	21.87	1.08	0.00	NA	NA	NA	67.43
1915	2.22	26.84	14.97	23.31	1.15	0.00	NA	NA	NA	68.48
1916	1.53	18.46	10.30	18.56	0.92	0.00	NA	NA	NA	49.76
1917	1.55	18.78	10.47	16.96	0.84	0.00	NA	NA	NA	48.60
1918	1.32	16.02	8.93	10.88	0.54	0.00	NA	NA	NA	37.69
1919	1.34	16.22	9.05	12.90	0.64	0.00	NA	NA	NA	40.14
1920	1.62	19.73	11.01	13.59	0.67	0.00	NA	NA	NA	46.62
1921	3.39	23.37	10.22	14.75	0.73	0.00	NA	NA	NA	52.46
1922	2.61	19.02	9.22	11.63	0.02	0.00	NA	NA	NA	42.49
1923	2.62	16.71	9.72	21.60	0.67	0.00	NA	NA	NA	51.32
1924	1.82	15.14	9.86	24.82	1.50	0.00	NA	NA	NA	53.14
1925	2.20	13.65	7.99	22.16	4.66	0.00	NA	NA	NA	50.66
1926	2.32	16.12	7.17	21.01	5.85	0.00	NA	NA	NA	52.47
1927	2.62	14.09	7.42	22.62	8.20	0.00	NA	NA	NA	54.95
1928	2.27	16.63	7.58	22.54	5.25	0.00	NA	NA	NA	54.26
1929	2.18	13.77	9.85	22.27	8.86	0.00	NA	NA	NA	56.92
1930	1.58	12.12	8.53	18.19	9.09	0.00	NA	NA	NA	49.51
1931	1.63	13.53	7.39	14.61	7.06	0.00	NA	NA	NA	44.22
1932	1.90	13.25	7.74	16.71	4.89	0.00	NA	NA	NA	44.49
1933	1.75	13.37	8.15	19.67	3.97	0.00	NA	NA	NA	46.91
1934	2.45	14.12	7.68	15.88	4.58	0.00	NA	NA	NA	44.72
1935	1.77	14.21	7.58	19.96	3.82	0.00	NA	NA	NA	47.34
1936	0.90	13.67	8.75	20.09	5.52	0.00	NA	NA	NA	48.92
1937	0.92	15.29	7.87	20.47	5.00	0.00	NA	NA	NA	49.54
1938	0.95	16.00	7.15	20.66	4.79	0.00	NA	NA	NA	49.55
1939	1.36	17.67	6.56	21.16	4.15	0.00	NA	NA	NA	50.90
1940	0.98	17.81	7.62	22.50	4.48	0.00	NA	NA	NA	53.38

TABLE C1. Continued.

Year	2A	2B	2C	3A	3B	4	4A	4B	4CDE	Total
1941	0.51	16.53	7.25	21.84	6.10	0.00	NA	NA	NA	52.23
1942	0.72	14.37	8.35	21.50	5.46	0.00	NA	NA	NA	50.39
1943	1.24	15.97	8.15	20.51	7.83	0.00	NA	NA	NA	53.70
1944	0.90	15.07	10.38	20.36	6.73	0.00	NA	NA	NA	53.44
1945	0.73	14.58	8.49	20.07	9.52	0.01	NA	NA	NA	53.40
1946	0.90	18.37	9.90	22.40	8.50	0.20	NA	NA	NA	60.27
1947	0.57	17.67	9.50	20.44	7.33	0.19	NA	NA	NA	55.70
1948	0.41	17.67	9.75	19.93	7.50	0.30	NA	NA	NA	55.56
1949	0.62	16.34	9.45	21.12	7.38	0.12	NA	NA	NA	55.03
1950	0.70	17.46	8.84	23.86	6.30	0.08	NA	NA	NA	57.23
1951	0.59	20.04	9.97	20.86	4.54	0.05	NA	NA	NA	56.05
1952	0.62	20.63	9.56	27.27	3.62	0.56	NA	NA	NA	62.26
1953	0.50	23.80	8.41	22.84	3.81	0.48	NA	NA	NA	59.84
1954	0.85	24.90	11.04	29.46	4.21	0.13	NA	NA	NA	70.58
1955	0.61	18.65	8.54	23.06	6.57	0.09	NA	NA	NA	57.52
1956	0.53	20.06	14.51	22.11	9.12	0.26	NA	NA	NA	66.59
1957	0.60	17.69	12.25	22.85	7.43	0.04	NA	NA	NA	60.85
1958	0.52	18.49	11.20	24.52	7.60	2.18	NA	NA	NA	64.51
1959	0.67	16.83	13.03	25.36	11.00	4.31	NA	NA	NA	71.20
1960	0.89	18.16	12.72	21.05	12.90	5.90	NA	NA	NA	71.61
1961	0.50	16.08	12.29	23.07	13.28	4.07	NA	NA	NA	69.27
1962	0.45	15.03	13.24	24.04	13.48	8.62	NA	NA	NA	74.86
1963	0.41	15.52	10.24	22.31	13.98	8.77	NA	NA	NA	71.24
1964	0.28	11.86	7.43	22.56	15.04	2.62	NA	NA	NA	59.78
1965	0.21	11.97	12.07	22.98	14.07	1.88	NA	NA	NA	63.18
1966	0.18	11.04	12.04	25.77	11.05	1.94	NA	NA	NA	62.02
1967	0.20	10.11	9.41	19.66	13.26	2.58	NA	NA	NA	55.22
1968	0.14	10.15	6.11	14.77	15.83	1.60	NA	NA	NA	48.59
1969	0.23	12.82	9.33	20.08	13.92	1.90	NA	NA	NA	58.27
1970	0.16	10.26	9.37	19.91	13.37	1.78	NA	NA	NA	54.84
1971	0.32	9.85	6.61	17.76	11.04	1.08	NA	NA	NA	46.65
1972	0.37	10.13	5.78	16.30	9.28	1.02	NA	NA	NA	42.88
1973	0.23	6.73	5.98	13.50	4.79	0.52	NA	NA	NA	31.74
1974	0.52	4.62	5.60	8.19	1.67	0.71	NA	NA	NA	21.31
1975	0.46	7.13	6.24	10.60	2.56	0.63	NA	NA	NA	27.62
1976	0.24	7.28	5.53	11.04	2.73	0.72	NA	NA	NA	27.54
1977	0.21	5.43	3.19	8.64	3.19	1.22	NA	NA	NA	21.88
1978	0.10	4.61	4.32	10.30	1.32	1.35	NA	NA	NA	22.00
1979	0.05	4.86	4.53	11.34	0.39	1.37	NA	NA	NA	22.54
1980	0.02	5.65	3.24	11.97	0.28	0.71	NA	NA	NA	21.87
1981	0.20	5.66	4.01	14.23	0.45	NA	0.49	0.39	0.31	25.74
1982	0.21	5.54	3.50	13.52	4.80	NA	1.17	0.01	0.25	29.01
1983	0.27	5.44	6.38	14.13	7.76	NA	2.50	1.34	0.58	38.39
1984	0.43	9.05	5.87	19.77	6.69	NA	1.05	1.10	1.01	44.97
1985	0.49	10.39	9.21	20.84	10.89	NA	1.72	1.24	1.33	56.10
1986	0.58	11.23	10.61	32.80	8.82	NA	3.38	0.26	1.95	69.63
1987	0.59	12.25	10.69	31.31	7.76	NA	3.69	1.50	1.69	69.47
1988	0.49	12.86	11.36	37.91	7.08	NA	1.93	1.59	1.17	74.39
1989	0.47	10.43	9.53	33.74	7.84	NA	1.03	2.65	1.26	66.95
1990	0.33	8.57	9.73	28.85	8.69	NA	2.50	1.33	1.59	61.60
1991	0.36	7.19	8.69	22.93	11.93	NA	2.26	1.51	2.22	57.08
1992	0.44	7.63	9.82	26.78	8.62	NA	2.70	2.32	1.59	59.89
1993	0.50	10.63	11.29	22.74	7.86	NA	2.56	1.96	1.73	59.27

TABLE C1. Continued.

Year	2A	2B	2C	3A	3B	4	4A	4B	4CDE	Total
1994	0.37	9.91	10.38	24.84	3.86	NA	1.80	2.02	1.55	54.73
1995	0.30	9.62	7.77	18.34	3.13	NA	1.62	1.68	1.44	43.88
1996	0.30	9.55	8.87	19.69	3.66	NA	1.70	2.07	1.51	47.34
1997	0.41	12.42	9.92	24.64	9.06	NA	2.91	3.32	2.52	65.20
1998	0.46	13.17	10.20	25.70	11.16	NA	3.42	2.90	2.75	69.76
1999	0.45	12.71	10.14	25.32	13.84	NA	4.37	3.57	3.92	74.31
2000	0.48	10.81	8.45	19.27	15.41	NA	5.16	4.69	4.02	68.29
2001	0.68	10.29	8.40	21.54	16.34	NA	5.02	4.47	3.97	70.70
2002	0.85	12.07	8.60	23.13	17.31	NA	5.09	4.08	3.52	74.66
2003	0.82	11.79	8.41	22.75	17.22	NA	5.02	3.86	3.26	73.14
2004	0.88	12.16	10.23	25.17	15.46	NA	3.56	2.72	2.92	73.11
2005	0.80	12.33	10.63	26.03	13.17	NA	3.40	1.98	3.48	71.82
2006	0.83	12.01	10.49	25.71	10.79	NA	3.33	1.59	3.23	67.98
2007	0.79	9.77	8.47	26.49	9.25	NA	2.83	1.42	3.85	62.87
2008	0.68	7.76	6.21	24.52	10.75	NA	3.02	1.76	3.88	58.57
2009	0.49	6.64	4.96	21.76	10.78	NA	2.53	1.59	3.31	52.05
2010	0.42	6.73	4.49	20.50	10.11	NA	2.33	1.83	3.32	49.72
2011	0.54	6.69	2.45	14.67	7.32	NA	2.35	2.05	3.43	39.51
2012	0.57	5.98	2.69	12.03	5.05	NA	1.58	1.74	2.34	31.99
2013	0.54	6.04	3.03	11.08	4.09	NA	1.23	1.25	1.77	29.04
2014	0.53	5.88	3.42	7.66	2.92	NA	0.91	1.12	1.26	23.70
2015	0.57	5.99	3.77	7.97	2.70	NA	1.37	1.11	1.19	24.67
2016	0.65	6.14	4.00	7.57	2.72	NA	1.38	1.11	1.48	25.05
2017	0.75	6.26	4.23	7.79	3.09	NA	1.30	1.09	1.64	26.16

TABLE C2. Time-series of removals from all sources by regulatory Area (million lb, net wt.).

Year	2A	2B	2C	3A	3B	4	Total
1888	0.07	0.89	0.50	0.00	0.00	0.00	1.47
1889	0.07	0.79	0.44	0.00	0.00	0.00	1.29
1890	0.07	0.84	0.47	0.00	0.00	0.00	1.37
1891	0.11	1.30	0.73	0.00	0.00	0.00	2.13
1892	0.14	1.69	0.94	0.00	0.00	0.00	2.77
1893	0.16	1.96	1.09	0.00	0.00	0.00	3.22
1894	0.19	2.29	1.28	0.00	0.00	0.00	3.76
1895	0.21	2.59	1.45	0.00	0.00	0.00	4.25
1896	0.27	3.31	1.84	0.00	0.00	0.00	5.42
1897	0.33	4.02	2.24	0.00	0.00	0.00	6.59
1898	0.39	4.73	2.64	0.00	0.00	0.00	7.77
1899	0.45	5.45	3.04	0.00	0.00	0.00	8.94
1900	0.68	8.17	4.56	0.00	0.00	0.00	13.41
1901	0.90	10.90	6.08	0.00	0.00	0.00	17.87
1902	1.13	13.62	7.60	0.00	0.00	0.00	22.34
1903	1.27	15.37	8.57	0.00	0.00	0.00	25.21
1904	1.41	17.12	9.55	0.00	0.00	0.00	28.08
1905	1.11	13.41	7.48	0.00	0.00	0.00	22.00
1906	1.81	21.95	12.24	0.00	0.00	0.00	36.00
1907	2.52	30.48	17.00	0.00	0.00	0.00	50.00
1908	2.55	30.86	17.21	0.00	0.00	0.00	50.62
1909	2.58	31.23	17.42	0.00	0.00	0.00	51.23
1910	2.61	31.61	17.63	0.00	0.00	0.00	51.85
1911	2.87	34.71	19.36	0.00	0.00	0.00	56.93
1912	3.00	36.29	20.24	0.86	0.04	0.00	60.43
1913	2.79	33.80	18.85	10.58	0.52	0.00	66.54
1914	2.24	27.11	15.12	21.87	1.08	0.00	67.43
1915	2.22	26.84	14.97	23.31	1.15	0.00	68.48
1916	1.53	18.46	10.30	18.56	0.92	0.00	49.76
1917	1.55	18.78	10.47	16.96	0.84	0.00	48.60
1918	1.32	16.02	8.93	10.88	0.54	0.00	37.69
1919	1.34	16.22	9.05	12.90	0.64	0.00	40.14
1920	1.62	19.73	11.01	13.59	0.67	0.00	46.62
1921	3.39	23.37	10.22	14.75	0.73	0.00	52.46
1922	2.61	19.02	9.22	11.63	0.02	0.00	42.50
1923	2.62	16.71	9.72	21.60	0.67	0.00	51.32
1924	1.82	15.14	9.86	24.82	1.50	0.00	53.14
1925	2.20	13.65	7.99	22.16	4.66	0.00	50.66
1926	2.32	16.12	7.17	21.01	5.85	0.00	52.47
1927	2.62	14.09	7.42	22.62	8.20	0.00	54.95
1928	2.27	16.63	7.58	22.54	5.25	0.00	54.26
1929	2.18	13.77	9.85	22.27	8.86	0.00	56.93
1930	1.58	12.12	8.53	18.19	9.09	0.00	49.51
1931	1.63	13.53	7.39	14.61	7.06	0.00	44.22
1932	1.90	13.25	7.74	16.71	4.89	0.00	44.49
1933	1.75	13.37	8.15	19.67	3.97	0.00	46.91
1934	2.45	14.12	7.68	15.88	4.58	0.00	44.72
1935	1.77	14.21	7.58	19.96	3.82	0.00	47.34
1936	0.90	13.67	8.75	20.09	5.52	0.00	48.92
1937	0.92	15.29	7.87	20.47	5.00	0.00	49.54
1938	0.95	16.00	7.15	20.66	4.79	0.00	49.55
1939	1.36	17.67	6.56	21.16	4.15	0.00	50.90
1940	0.98	17.81	7.62	22.50	4.48	0.00	53.38

TABLE C2. Continued.

Year	2A	2B	2C	3A	3B	4	Total
1941	0.51	16.53	7.25	21.84	6.10	0.00	52.23
1942	0.72	14.37	8.35	21.50	5.46	0.00	50.39
1943	1.24	15.97	8.15	20.51	7.83	0.00	53.70
1944	0.90	15.07	10.38	20.36	6.73	0.00	53.44
1945	0.73	14.58	8.49	20.07	9.52	0.01	53.40
1946	0.90	18.37	9.90	22.40	8.50	0.20	60.27
1947	0.57	17.67	9.50	20.44	7.33	0.19	55.70
1948	0.41	17.67	9.75	19.93	7.50	0.30	55.56
1949	0.62	16.34	9.45	21.12	7.38	0.12	55.03
1950	0.70	17.46	8.84	23.86	6.30	0.08	57.23
1951	0.59	20.04	9.97	20.86	4.54	0.05	56.05
1952	0.62	20.63	9.56	27.27	3.62	0.56	62.26
1953	0.50	23.80	8.41	22.84	3.81	0.48	59.84
1954	0.85	24.90	11.04	29.46	4.21	0.13	70.58
1955	0.61	18.65	8.54	23.06	6.57	0.09	57.52
1956	0.53	20.06	14.51	22.11	9.12	0.26	66.59
1957	0.60	17.69	12.25	22.85	7.43	0.04	60.85
1958	0.52	18.49	11.20	24.52	7.60	2.18	64.51
1959	0.67	16.83	13.03	25.36	11.00	4.31	71.20
1960	0.89	18.16	12.72	21.05	12.90	5.90	71.61
1961	0.50	16.08	12.29	23.07	13.28	4.07	69.27
1962	0.45	16.21	13.45	25.96	14.65	12.76	83.47
1963	0.41	16.60	10.45	25.62	16.77	10.81	80.66
1964	0.28	12.96	7.64	31.93	17.30	5.59	75.70
1965	0.21	13.40	12.27	29.08	24.51	5.06	84.54
1966	0.18	12.70	12.25	30.28	19.03	5.34	79.79
1967	0.20	11.76	9.85	24.29	18.16	7.30	71.56
1968	0.14	12.11	6.63	20.25	17.41	7.28	63.81
1969	0.23	15.00	9.79	23.89	15.09	9.50	73.50
1970	0.16	11.73	9.93	23.30	16.21	9.80	71.13
1971	0.32	11.59	7.15	20.74	12.40	14.18	66.37
1972	0.37	11.88	6.54	21.71	10.98	10.69	62.16
1973	0.23	8.24	6.82	17.95	7.49	8.55	49.27
1974	1.00	6.43	6.17	13.50	5.10	8.33	40.54
1975	0.94	9.18	6.93	13.85	4.65	4.28	39.84
1976	0.72	9.51	6.28	14.64	5.20	5.29	41.63
1977	0.70	7.39	3.87	13.02	5.12	4.14	34.24
1978	0.59	6.20	4.82	13.75	3.17	6.38	34.90
1979	0.54	6.84	5.56	17.62	1.33	6.79	38.68
1980	0.52	7.16	4.12	18.44	1.53	9.95	41.72
1981	0.70	7.01	4.87	19.85	2.02	7.62	42.06
1982	0.74	6.60	4.33	18.16	7.04	6.21	43.08
1983	0.81	6.63	7.30	18.15	9.80	8.72	51.41
1984	1.03	10.55	6.86	23.10	8.30	7.89	57.73
1985	1.17	12.33	10.53	24.26	11.86	8.70	68.86
1986	1.41	13.27	12.25	37.92	9.82	11.56	86.23
1987	1.53	14.85	12.31	37.64	9.14	13.00	88.47
1988	1.22	15.28	13.13	46.69	7.40	13.70	97.42
1989	1.30	12.69	11.75	42.11	9.03	12.43	89.29
1990	0.97	11.07	12.42	38.29	11.15	14.36	88.27
1991	0.94	9.76	12.31	34.55	14.48	16.69	88.74
1992	1.16	9.98	12.83	37.11	11.12	17.78	89.98
1993	1.24	13.24	14.36	33.48	9.24	14.39	85.95

TABLE C2. Continued.

Year	2A	2B	2C	3A	3B	4	Total
1994	1.02	12.03	13.46	35.04	5.46	15.18	82.19
1995	1.17	12.56	10.02	26.33	5.00	13.67	68.75
1996	1.16	11.24	11.52	27.81	5.76	14.09	71.59
1997	1.41	14.12	12.67	33.74	10.82	16.97	89.72
1998	1.95	14.90	13.18	33.81	12.88	17.23	93.96
1999	1.80	14.38	12.45	33.05	15.93	20.01	97.62
2000	1.69	12.55	11.19	28.02	17.34	21.74	92.53
2001	2.00	12.03	10.78	29.75	18.53	21.04	94.14
2002	1.93	14.08	11.10	30.25	19.79	20.35	97.49
2003	1.55	13.90	11.56	32.32	19.64	19.29	98.26
2004	1.72	14.64	14.29	35.61	17.49	16.23	99.96
2005	1.91	15.15	14.42	36.08	14.93	16.93	99.41
2006	2.01	14.96	14.09	34.90	12.68	16.00	94.64
2007	1.76	12.58	12.49	36.71	10.84	15.35	89.73
2008	1.68	10.29	10.29	34.00	12.80	15.15	84.21
2009	1.58	8.71	8.15	30.50	12.88	13.82	75.63
2010	1.22	8.77	7.20	28.85	12.16	13.52	71.72
2011	1.09	8.83	4.00	22.76	9.26	12.74	58.68
2012	1.22	7.85	4.81	18.23	6.75	11.93	50.79
2013	1.17	7.75	5.77	17.53	5.41	10.45	48.07
2014	1.16	7.75	6.06	13.87	4.24	9.23	42.31
2015	1.17	8.01	6.53	14.58	3.59	8.23	42.10
2016	1.32	8.13	6.73	13.57	3.84	8.19	41.79
2017	1.43	8.32	7.17	13.71	4.24	7.58	42.44

TABLE C3. Time-series of removals from by sources (million lb, net wt.).

Year	Commercial landings	Commercial discards	Recreational	Subsistence	Bycatch	Total
1888	1.47	0.00	0.00	0.00	0.00	1.47
1889	1.29	0.00	0.00	0.00	0.00	1.29
1890	1.37	0.00	0.00	0.00	0.00	1.37
1891	2.13	0.00	0.00	0.00	0.00	2.13
1892	2.77	0.00	0.00	0.00	0.00	2.77
1893	3.22	0.00	0.00	0.00	0.00	3.22
1894	3.76	0.00	0.00	0.00	0.00	3.76
1895	4.25	0.00	0.00	0.00	0.00	4.25
1896	5.42	0.00	0.00	0.00	0.00	5.42
1897	6.59	0.00	0.00	0.00	0.00	6.59
1898	7.77	0.00	0.00	0.00	0.00	7.77
1899	8.94	0.00	0.00	0.00	0.00	8.94
1900	13.41	0.00	0.00	0.00	0.00	13.41
1901	17.87	0.00	0.00	0.00	0.00	17.87
1902	22.34	0.00	0.00	0.00	0.00	22.34
1903	25.21	0.00	0.00	0.00	0.00	25.21
1904	28.08	0.00	0.00	0.00	0.00	28.08
1905	22.00	0.00	0.00	0.00	0.00	22.00
1906	36.00	0.00	0.00	0.00	0.00	36.00
1907	50.00	0.00	0.00	0.00	0.00	50.00
1908	50.62	0.00	0.00	0.00	0.00	50.62
1909	51.23	0.00	0.00	0.00	0.00	51.23
1910	51.85	0.00	0.00	0.00	0.00	51.85
1911	56.93	0.00	0.00	0.00	0.00	56.93
1912	60.43	0.00	0.00	0.00	0.00	60.43
1913	66.54	0.00	0.00	0.00	0.00	66.54
1914	67.43	0.00	0.00	0.00	0.00	67.43
1915	68.48	0.00	0.00	0.00	0.00	68.48
1916	49.76	0.00	0.00	0.00	0.00	49.76
1917	48.60	0.00	0.00	0.00	0.00	48.60
1918	37.69	0.00	0.00	0.00	0.00	37.69
1919	40.14	0.00	0.00	0.00	0.00	40.14
1920	46.62	0.00	0.00	0.00	0.00	46.62
1921	52.46	0.00	0.00	0.00	0.00	52.46
1922	42.49	0.00	0.00	0.00	0.00	42.49
1923	51.32	0.00	0.00	0.00	0.00	51.32
1924	53.14	0.00	0.00	0.00	0.00	53.14
1925	50.66	0.00	0.00	0.00	0.00	50.66
1926	52.47	0.00	0.00	0.00	0.00	52.47
1927	54.95	0.00	0.00	0.00	0.00	54.95
1928	54.26	0.00	0.00	0.00	0.00	54.26
1929	56.92	0.00	0.00	0.00	0.00	56.92
1930	49.51	0.00	0.00	0.00	0.00	49.51
1931	44.22	0.00	0.00	0.00	0.00	44.22
1932	44.49	0.00	0.00	0.00	0.00	44.49
1933	46.91	0.00	0.00	0.00	0.00	46.91
1934	44.72	0.00	0.00	0.00	0.00	44.72
1935	47.34	0.00	0.00	0.00	0.00	47.34
1936	48.92	0.00	0.00	0.00	0.00	48.92
1937	49.54	0.00	0.00	0.00	0.00	49.54
1938	49.55	0.00	0.00	0.00	0.00	49.55
1939	50.90	0.00	0.00	0.00	0.00	50.90

TABLE C3. Continued.

Year	Commercial landings	Commercial discards	Recreational	Subsistence	Bycatch	Total
1940	53.38	0.00	0.00	0.00	0.00	53.38
1941	52.23	0.00	0.00	0.00	0.00	52.23
1942	50.39	0.00	0.00	0.00	0.00	50.39
1943	53.70	0.00	0.00	0.00	0.00	53.70
1944	53.44	0.00	0.00	0.00	0.00	53.44
1945	53.40	0.00	0.00	0.00	0.00	53.40
1946	60.27	0.00	0.00	0.00	0.00	60.27
1947	55.70	0.00	0.00	0.00	0.00	55.70
1948	55.56	0.00	0.00	0.00	0.00	55.56
1949	55.03	0.00	0.00	0.00	0.00	55.03
1950	57.23	0.00	0.00	0.00	0.00	57.23
1951	56.05	0.00	0.00	0.00	0.00	56.05
1952	62.26	0.00	0.00	0.00	0.00	62.26
1953	59.84	0.00	0.00	0.00	0.00	59.84
1954	70.58	0.00	0.00	0.00	0.00	70.58
1955	57.52	0.00	0.00	0.00	0.00	57.52
1956	66.59	0.00	0.00	0.00	0.00	66.59
1957	60.85	0.00	0.00	0.00	0.00	60.85
1958	64.51	0.00	0.00	0.00	0.00	64.51
1959	71.20	0.00	0.00	0.00	0.00	71.20
1960	71.61	0.00	0.00	0.00	0.00	71.61
1961	69.27	0.00	0.00	0.00	0.00	69.27
1962	74.86	0.00	0.00	0.00	8.61	83.47
1963	71.24	0.00	0.00	0.00	9.42	80.66
1964	59.78	0.00	0.00	0.00	15.91	75.70
1965	63.18	0.00	0.00	0.00	21.36	84.54
1966	62.02	0.00	0.00	0.00	17.77	79.79
1967	55.22	0.00	0.00	0.00	16.34	71.56
1968	48.59	0.00	0.00	0.00	15.22	63.81
1969	58.27	0.00	0.00	0.00	15.23	73.50
1970	54.84	0.00	0.00	0.00	16.29	71.13
1971	46.65	0.00	0.00	0.00	19.72	66.37
1972	42.88	0.00	0.00	0.00	19.28	62.16
1973	31.74	0.00	0.00	0.00	17.53	49.27
1974	21.31	0.20	0.00	0.00	19.03	40.54
1975	27.62	0.31	0.00	0.00	11.91	39.84
1976	27.54	0.34	0.00	0.00	13.75	41.63
1977	21.88	0.29	0.29	0.00	11.78	34.24
1978	22.00	0.28	0.38	0.00	12.24	34.90
1979	22.54	0.30	0.56	0.00	15.28	38.68
1980	21.87	0.30	0.85	0.00	18.70	41.72
1981	25.74	0.35	1.11	0.00	14.86	42.06
1982	29.01	0.40	1.30	0.00	12.37	43.08
1983	38.39	0.53	1.62	0.00	10.88	51.41
1984	44.97	0.72	1.84	0.00	10.19	57.73
1985	56.10	2.70	2.36	0.00	7.70	68.86
1986	69.63	4.65	3.18	0.00	8.76	86.22
1987	69.47	4.20	3.51	0.00	11.28	88.46
1988	74.39	3.49	4.88	0.00	14.66	97.42
1989	66.95	3.46	5.23	0.00	13.65	89.29
1990	61.60	3.40	5.59	0.00	17.68	88.27
1991	57.08	3.47	6.51	2.01	19.67	88.74

TABLE C3. Continued.

Year	Commercial landings	Commercial discards	Recreational	Subsistence	Bycatch	Total
1992	59.89	2.50	6.18	1.11	20.29	89.98
1993	59.27	2.06	7.73	0.93	15.96	85.95
1994	54.73	2.51	7.07	0.93	16.95	82.19
1995	43.88	0.93	7.46	0.54	15.93	68.75
1996	47.34	1.15	8.08	0.54	14.46	71.59
1997	65.20	1.45	9.03	0.54	13.51	89.72
1998	69.76	1.72	8.59	0.74	13.16	93.96
1999	74.31	1.64	7.38	0.75	13.54	97.62
2000	68.29	1.45	9.01	0.76	13.02	92.53
2001	70.70	1.69	8.10	0.77	12.88	94.14
2002	74.66	1.72	8.01	0.77	12.33	97.49
2003	73.14	2.09	9.35	1.38	12.31	98.26
2004	73.11	2.31	10.71	1.55	12.29	99.97
2005	71.82	2.22	10.86	1.54	12.97	99.42
2006	67.98	2.49	10.20	1.48	12.49	94.64
2007	62.87	2.60	11.47	1.49	11.31	89.73
2008	58.57	2.76	10.68	1.34	10.86	84.21
2009	52.05	2.95	8.79	1.31	10.54	75.63
2010	49.72	3.21	7.85	1.24	9.70	71.72
2011	39.51	2.47	7.10	1.15	8.45	58.68
2012	31.99	1.67	6.78	1.15	9.20	50.79
2013	29.04	1.43	7.63	1.13	8.83	48.07
2014	23.70	1.30	7.18	1.20	8.93	42.31
2015	24.67	1.29	7.46	1.20	7.47	42.10
2016	25.05	1.18	7.38	1.17	7.02	41.79
2017	26.16	0.989	8.13	1.17	6.00	42.44

Appendix D
Time series' of fishery catch-rates

TABLE D1. Time-series of commercial fishery WPUE by Regulatory Area (net lb/skate). Years prior to 1984 are based on fishing conducted with "J" hooks.

Year	2A	2B	2C	3A	3B	4A	4B	4C	4D	4E	Total
1907	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	280
1910	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	271
1911	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	237
1912	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	176
1913	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	129
1914	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	124
1915	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	118
1916	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	137
1917	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	98
1918	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	96
1919	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	93
1920	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	96
1921	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	88
1922	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	73
1923	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	78
1924	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	74
1925	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	68
1926	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	67
1927	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	65
1928	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	58
1929	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	51
1930	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	46
1931	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	50
1932	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	60
1933	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	63
1934	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	62
1935	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	76
1936	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	71
1937	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	80
1938	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	88
1939	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	80
1940	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	81
1941	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	85
1942	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	90
1943	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	95
1944	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	110
1945	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	102
1946	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	101
1947	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	99
1948	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	99
1949	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	95
1950	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	95
1950	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	95

TABLE D1. Continued.

Year	2A	2B	2C	3A	3B	4A	4B	4C	4D	4E	Total
1951	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	96
1952	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	110
1953	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	131
1954	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	133
1955	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	119
1956	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	129
1957	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	110
1958	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	121
1959	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	129
1960	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	132
1961	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	127
1962	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	115
1963	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	105
1964	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	100
1965	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	99
1966	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	100
1967	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	101
1968	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	103
1969	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	95
1970	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	91
1971	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	89
1972	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	78
1973	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	63
1974	59	64	57	65	57	NA	NA	NA	NA	NA	61
1975	59	68	53	66	68	NA	NA	NA	NA	NA	61
1976	33	53	42	60	65	NA	NA	NA	NA	NA	55
1977	83	61	45	61	73	NA	NA	NA	NA	NA	63
1978	39	63	56	78	53	NA	NA	NA	NA	NA	71
1979	50	48	80	86	37	NA	NA	NA	NA	NA	75
1980	37	65	79	118	113	NA	NA	NA	NA	NA	94
1981	33	67	144	142	160	158	99	110	NA	NA	111
1982	22	69	146	168	203	103	NA	91	NA	NA	127
1983	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1984	63	147	284	502	474	366	161	NA	197	NA	291
1985	62	139	345	500	592	337	234	594	330	NA	351
1986	55	118	290	506	506	260	238	427	218	NA	315
1987	53	130	260	498	478	342	220	384	241	NA	316
1988	134	137	281	503	654	453	224	371	201	NA	363
1989	113	133	258	457	590	409	268	333	432	NA	353
1990	168	176	270	354	484	418	209	288	381	NA	315
1991	158	149	233	319	466	471	329	223	399	NA	314
1992	117	171	230	397	440	372	280	249	412	NA	315
1993	147	208	256	393	514	463	218	257	851	NA	369
1994	93	215	207	354	377	463	197	167	480	NA	302
1995	116	219	234	417	476	349	189	286	475	NA	326
1996	159	227	239	473	557	515	269	297	543	NA	387
1997	226	241	246	458	563	483	275	335	671	NA	400
1998	194	232	236	452	611	525	287	287	627	NA	403
1999	342	213	199	437	538	497	310	271	535	NA	390
2000	263	229	187	443	579	548	320	223	556	NA	399

TABLE D1. Continued.

Year	2A	2B	2C	3A	3B	4A	4B	4C	4D	4E	Total
2001	171	227	196	469	431	474	270	203	511	NA	358
2002	181	223	244	508	399	402	245	148	503	NA	356
2003	173	221	233	485	365	355	196	105	388	NA	325
2004	143	203	240	486	328	315	202	120	445	NA	315
2005	137	195	203	446	293	301	238	91	379	NA	293
2006	156	201	170	403	292	241	218	72	280	NA	267
2007	96	198	160	398	257	206	230	65	237	NA	249
2008	69	174	161	370	234	206	193	94	247	NA	229
2009	98	188	155	318	211	234	189	88	249	NA	220
2010	149	222	158	285	173	182	142	82	188	NA	202
2011	92	240	175	280	140	189	165	75	166	NA	196
2012	102	248	207	263	133	194	149	60	155	108	193
2013	110	246	195	238	112	160	127	56	157	NA	178
2014	106	282	204	234	100	136	146	60	196	NA	183
2015	109	291	212	274	144	156	149	98	164	NA	202
2016	88	288	226	257	150	162	123	73	180	NA	196
2017	95	301	231	273	142	123	118	87	301	NA	206

Assessment of the Pacific halibut (*Hippoglossus stenolepis*) stock at the end of 2017

PREPARED BY: IPHC SECRETARIAT (I. STEWART & A. HICKS; 21 DECEMBER 2017)

PURPOSE

To provide the Commission with a detailed report of the 2017 stock assessment analysis.

ABSTRACT

This stock assessment reports the status of the Pacific halibut (*Hippoglossus stenolepis*) resource in the International Pacific Halibut Commission (IPHC) Convention Area at the end of 2017. Coastwide mortality (removals; including all sizes of Pacific halibut) from all sources in 2017 were estimated to be 42.4 million pounds[1] (~19,200 t), up slightly from 41.8 million pounds (~18,960 t) in 2016. In addition to the removals, the assessment includes data from both fishery dependent and fishery independent sources, as well as auxiliary biological information. The IPHC's 2017 fishery-independent setline survey (FISS or setline survey) detailed a coastwide aggregate legal (O32) Weight-Per-Unit-Effort (WPUE) which was 10% lower than the value observed in 2016. Numbers-Per-Unit-Effort (NPUE) showed a 24% decrease from 2016 to 2017. Coastwide commercial fishery WPUE was up 5% (projected to be only 3% when logbook data are complete) over the same period. Age distributions in 2017 from both the setline survey and fishery remained similar to those observed in 2011-16, but with somewhat fewer fish younger than the 2005 cohort (age-12), indicating that subsequent coastwide recent recruitment events have been lower than those in previous years. At the coastwide level, individual size-at-age continues to be very low relative to the rest of the time-series, and there has been little clear change over the last several years.

This stock assessment consists of four equally-weighted models, two long time-series models, and two short time-series models either using data sets by geographical region, or aggregating all data series into coastwide summaries; these models are structurally unchanged since the most recent detailed scientific review in 2015. Results are based on the approximate probability distributions derived from the ensemble of models, thereby incorporating the uncertainty within each model as well as the uncertainty among models. The results at the end of 2017 indicate that the Pacific halibut stock declined continuously from the late 1990s to around 2010, as a result of decreasing size-at-age, as well as somewhat weaker recruitment strengths than those observed during the 1980s. Since the estimated female spawning biomass (SB) stabilized near 200 million pounds (~90,100 t) in 2010, the stock is estimated to have been increasing gradually to 2017. The SB at the beginning of 2018 is estimated to be 202 million pounds (~91,600 t), with an approximate 95% confidence interval ranging from 148 to 256 million pounds (~67,100-116,100 t). Pacific halibut recruitment estimates show the largest recent cohorts in 1999 and 2005; cohorts from 2006 through 2013 are estimated to be smaller than any recruitment from 1999-2005. This indicates a high probability of decline in both the stock and fishery yield as recent recruitments become increasingly important to the age range over which much of the harvest and spawning takes place.

A comparison of the median 2018 ensemble SB to reference levels specified by the interim management procedure suggests that the stock is currently at 40% (approximate 95% credible range = 26-60%) of specified unfished levels (relative to the SB specified by the current

[1] All weights in the document are 'net' weights; head-off and entrails removed approximately 75% of round weight.

management procedure). However, the probability distribution indicates considerable uncertainty, with a 6/100 (6%) probability the stock is below the $SB_{30\%}$ level. Stock projections were conducted using the integrated results from the stock assessment ensemble, details of Regulatory Area-specific catch sharing plans and estimates of removals from the 2017 directed fisheries and other sources of mortality where these values are projected for 2018. A more detailed harvest decision table including a finer grid of management alternatives and additional risk metrics is reported. The stock is projected to decrease gradually over the period from 2018-20 for removals around the reference SPR (46%) level (31 million pounds, ~14,060 t). There is a relatively small chance (<21/100; 21%) that the stock will decline below the threshold reference point (SB30%) in projections for all the levels of TCEY up to 40 million pounds (~18,100 t) evaluated over three years; for TCEYs exceeding that level, the probability begins to increase rapidly. Major sources of uncertainty, retrospective analyses and sensitivity analyses exploring current research avenues are included in this document.

INTRODUCTION

This stock assessment reports the status of the Pacific halibut (*Hippoglossus stenolepis*) resource in the International Pacific Halibut Commission (IPHC) Convention Area at the end of 2017. As in recent stock assessments, the resource is modelled as a single stock extending from northern California to the Aleutian Islands and Bering Sea, including all inside waters of the Strait of Georgia and Puget Sound, but excludes known extremities in the western Bering Sea within the Russian Exclusive Economic Zone. The stock assessment provides a brief summary of recently collected data; a more detailed treatment of data sources included in the assessment and used for other analyses supporting harvest policy calculations is provided in document IPHC-2018-AM094-09. Results include current model estimates of stock size and trend reflecting all available data. Specific management information is summarized via a decision table reporting the estimated risks associated with alternative management actions. A concise summary of the assessment and management information is provided in document IPHC-2018-AM094-08. Catch tables detailing Regulatory Area-specific projections are provided separately in IPHC-2018-AM094-11.

DATA SOURCES

Each year, the data sources used to support this assessment are updated to include newly available information, and refined to reflect the most current and accurate information available to the IPHC. Major reprocessing and development of supplementary data sources was conducted in 2013 and 2015 (Stewart 2014, 2016, Stewart and Martell 2016). In 2016, a model-based estimator was introduced for the IPHC fishery-independent setline survey (Stewart 2017b, Webster 2017). For 2017, the model-based estimator was extended to include fishery-independent setline survey data from 1993-97, and survey age data collected at expansion stations from 2014-2017 were added to existing samples from the annually surveyed stations. All available information was finalized on 11 November 2017 in order to provide adequate time for analysis and modeling. As has been the case in all years, some data are incomplete, or include projections for the remainder of the year. These include commercial fishery WPUE, commercial fishery age composition data, and 2017 removals for all fisheries still operating after 11 November 2017. All preliminary data series in the assessment will be fully updated in 2018.

Data are initially compiled by management area and then aggregated to the coastwide level and to four geographical regions: Region 2 (2A, 2B, and 2C), Region 3 (3A, 3B), Region 4 (4A, 4CDE) and Region 4B. In addition to the removals (including all sizes of Pacific halibut), the assessment includes data from both fishery dependent and fishery independent sources as well as auxiliary biological information. Primary sources of information for this assessment include indices of abundance from the annual setline survey and commercial Catch-Per-Unit-Effort (numbers and weight), and biological summaries (length-, weight-, and age-composition data). In aggregate, the historical time series of data available for this assessment represents a considerable resource for analysis. The range of relative data quality and geographical scope are also considerable, with the most complete information available only in recent years (Figure 1). A detailed summary of input data used in this stock assessment can be found in IPHC-2018-AM094-09.

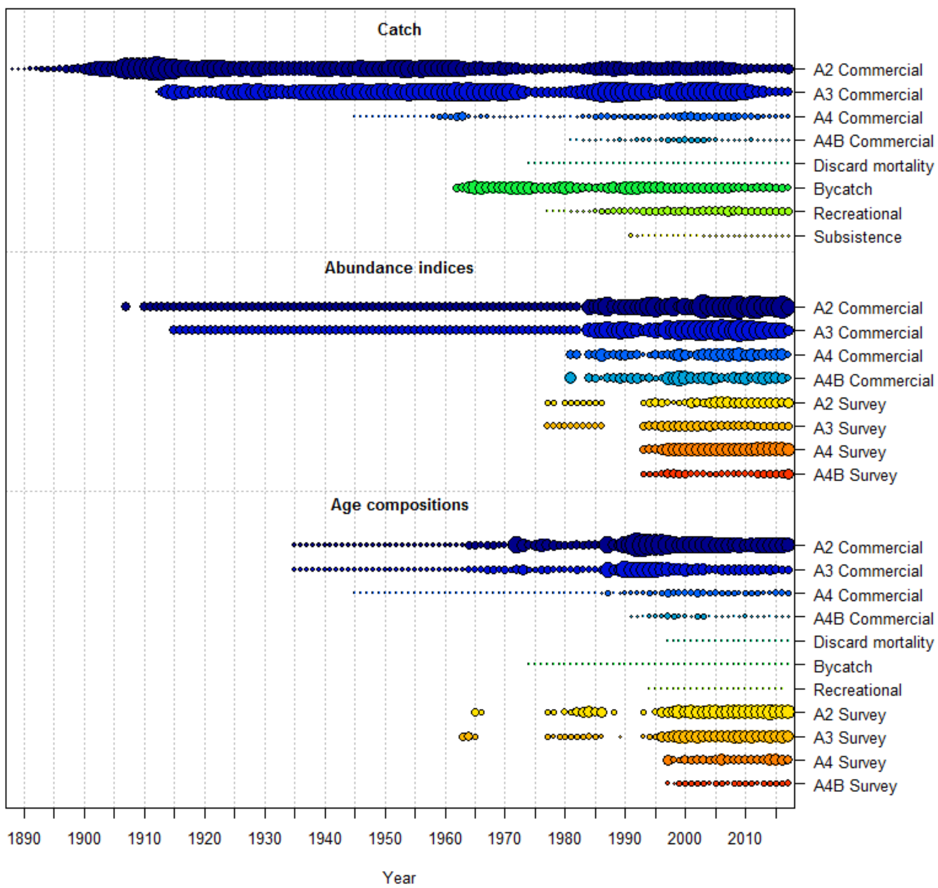

FIGURE 1. Overview of data sources. Circle areas are proportional to magnitude (catches) or the relative precision of the data (indices of abundance and age composition data).

Briefly, known Pacific halibut removals (mortality) consist of target fishery landings and discard mortality (including research), recreational fisheries, subsistence, and bycatch mortality in fisheries targeting other species (where Pacific halibut retention is prohibited). Over the period 1918-2017 removals have totaled 7.2 billion pounds (~3.2 million t), ranging annually from 34 to 100 million pounds (16,000-45,000 t) with an annual average of 63 million pounds (~29,000 t). Annual removals were above this long-term average from 1985 through 2010 and have been relatively stable near 42 million pounds (~19,000 t) since 2014. Coastwide commercial Pacific halibut fishery landings in 2017 were approximately 26.2 million pounds (~11,900 t), up from a low of 23.7 million pounds (~10,700 t) in 2014. Bycatch mortality was estimated to be 6.0 million pounds in 2017 (~2,720 t)[2], the lowest level in the estimated time series, beginning with the arrival of foreign fishing fleets in 1962, and just over one million pounds (~450 t) less than estimated for 2016. The total recreational removals was estimated to be 8.1 million pounds (~3,675 t), up 10% from 2016. Removals from all sources in 2017 were estimated to be 42.4 million pounds (~19,200 t), up slightly from 41.8 million pounds in 2016 (~18,960 t).

The 2017 IPHC's fishery-independent setline survey detailed a coastwide aggregate legal (O32) WPUE which was 10% lower than the value observed in 2016, with individual Regulatory Areas varying from a 1% increase (Area 2C) to a 32% decrease (Area 3B). Setline survey NPUE showed a more pronounced decrease from 2016 to 2017 (24% coastwide), with individual Regulatory Areas ranging from a 1% increase (Area 4A) to a 44% decrease (Area 2A). Commercial fishery WPUE (based on extensive, but still incomplete logbook records available for this assessment) was slightly increased (5%) at the coastwide level with mixed trends among Regulatory Areas. Based on review by the IPHC's Scientific Review Board (SRB), a bias correction for each Regulatory Area was developed using the last five years of post-assessment revisions resulting from additional logbooks available after the assessment deadline in early November. Applying these corrections reduced the increase in coastwide commercial fishery WPUE to only 3% and negative trends were predicted for all Areas except Area 4D (+71%), Area 4C (+20%) and Area 3A (+6%). Tribal and non-tribal commercial fishery trends in Area 2A are reported separately this year in response to important differences in the timing and spatial extent of the two components. Tribal fishery WPUE has been increasing since 2014 in that Area, and non-tribal WPUE has been declining over the same period, although a small increase (5%) from 2016 to 2017 was observed. The very large increase in WPUE observed in Area 4D appears to be a function of much higher catch-rates around St. Matthew Island (also observed in the setline survey) and a shift of 25% of the catch previously occurring along the shelf-edge to the waters around that island in 2017. Age distributions in 2017 show a 2005 cohort somewhat stronger than those in adjacent years, and weak recruitments from 2006 onward. At the coastwide level, individual size-at-age continues to be very low relative to the rest of the time-series, and there has been little change over the last several years.

STOCK ASSESSMENT

Creating robust, stable, and well-performing stock assessment models for the Pacific halibut stock has historically proven to be problematic due to the highly dynamic nature of the biology, distribution, and fisheries (Stewart and Martell 2014). The stock assessment for Pacific halibut has evolved through many different modeling approaches over the last 30 years (Clark 2003). These changes have reflected improvements in fisheries analysis methods, changes in model assumptions, and responses to recurrent retrospective biases and other lack-of-fit metrics (Stewart and Martell 2014). Although recent modelling efforts have created some new alternatives, no single model satisfactorily approximates all aspects of the available data and scientific understanding. Building on simpler approaches in 2012 and 2013, in 2014, an ensemble of four stock assessment models representing a two-way cross of short vs. long time series', and aggregated coastwide vs. Areas-As-Fleets (AAF) models was used to explore the range of plausible current stock estimates. AAF models are commonly applied when biological differences among areas or sampling programs make coastwide summary of data sources

[2] The IPHC receives a preliminary estimate of the current year's bycatch mortality from the National Marine Fisheries Service Alaska Regional Office in early November.

problematic (Waterhouse et al. 2014). AAF models continue to treat the population dynamics as a single aggregate stock, but fit to each of the spatial datasets individually, allowing for differences in selectivity and catchability of the fishery and survey among regions. In addition, the AAF models more easily accommodate temporal and spatial trends in where and how data have been collected, and fishery catches have occurred. This is achieved through explicitly, accounting for missing information in some years, rather than making assumptions to expand incomplete observations to the coastwide level. These four models are structurally unchanged since the most recent detailed scientific review in 2015 (Stewart and Martell 2016). Each of these models (and many alternatives explored during development) has shown a similar historical pattern: a stock declining from the late 1990s, with several years of relative stability at the end of the time-series.

The ensemble approach recognizes that there is no “perfect” assessment model, and that a robust risk assessment can be best achieved via the inclusion of multiple models in the estimation of management quantities and the uncertainty about these quantities (Stewart and Martell 2015a). This stock assessment is based on the approximate probability distributions derived from an ensemble of models, thereby incorporating the uncertainty within each model as well as the uncertainty among models. This approach reduces potential for abrupt changes in management quantities as improvements and additional data are added to individual models, and provides a more realistic perception of uncertainty than any single model, and therefore a stronger basis for risk assessment.

This stock assessment is implemented using the generalized software stock synthesis, a widely used modeling platform developed at the National Marine Fisheries Service (Methot and Wetzel 2013). This combination of models included a broad suite of structural and parameter uncertainty, including natural mortality rates (estimated in the long time-series models, fixed in the short time-series models), environmental effects on recruitment (estimated in the long time-series models), fishery and survey selectivity (by region in the AAF models) and other model parameters. These sources of uncertainty have historically been very important to the understanding of the stock, as well as the annual assessment results (Clark and Parma 1999, Clark and Hare 2006, Stewart and Martell 2016). The benefits of the long time-series models include historical perspective on recent trends and biomass levels; however, these benefits come at a computational and complexity cost. The short time-series models make fewer assumptions about the properties of less comprehensive historical data, but they suffer from much less information in the short data series as well as little context for current dynamics.

Each of the models in the ensemble was equally weighted, and differences in uncertainty within models propagated in the integration of results. In the future, it may be desirable to develop a method for weighting models based on the lack-of-fit to key data sources, retrospective patterns within models, as well as consistency of the results with biological understanding. Evaluation of alternative weighting approaches was presented to the IPHC Scientific Review Board (SRB) in 2015, 2016 and 2017 (Stewart 2017), but did not suggest a change to the equal weights that have been applied; therefore, that assumption is retained. It is also anticipated that additional models or variations of existing models will be evaluated for potential inclusion into the ensemble in future years. In this manner, the ensemble approach can be transparently improved in the future as additional approaches and refinements become available.

COMPARISON WITH PREVIOUS ASSESSMENTS

Comparison of this year's results with previous stock assessments indicates that the estimates of spawning biomass from the 2017 ensemble remain consistent with those from 2012-16. Each of the previous assessment values lie inside the predicted 50% interval of the ensemble in recent years (Figure 2). Models prior to 2012, which had shown a problematic retrospective pattern, suggested terminal stock trends and sizes in the mid-2000s that are no longer considered plausible. The estimates from these models for the late 1990s now occur at the lower edge of the plausible range: all four of the current models suggest a larger spawning biomass during that period. Point estimates for the 2017 SB from the 2016 ensemble (Stewart and Hicks 2017) were slightly higher than the current results, but statistically very similar given the degree of uncertainty (Table 1). The level of fishing intensity (measured via the Spawning Potential Ratio, SPR) projected for 2017 was $F_{45\%}$; however, in retrospect (based on revised recent year-class strengths) a higher level of fishing intensity ($F_{40\%}$) is estimated in this year's assessment (Table 1).

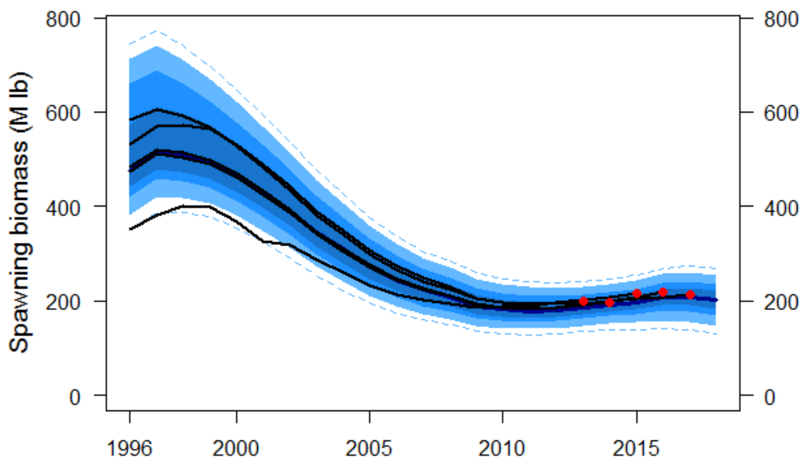

FIGURE 2. Retrospective comparison among recent IPHC stock assessments. Black lines indicate estimates of spawning biomass from assessments conducted from 2012-2016 with the terminal estimate shown as a point, the shaded distribution denotes the 2017 ensemble: the dark blue line indicates the median (or "50:50 line") with an equal probability of the estimate falling above or below that level; colored bands moving away from the median indicate the intervals containing 50/100, 75/100, and 95/100 estimates; dashed lines indicating the 99/100 interval.

TABLE 1. Comparison of 2017 median ensemble beginning-of-year spawning biomass (Mlb, with relative 95% confidence intervals) and Spawning Potential Ratio estimates from the 2016 and current assessments.

Quantity	2016 Assessment	2017 Assessment
2017 Spawning biomass	212 (153-286)	208 (156-261)
2017 SPR	45%	40%

BIOMASS, RECRUITMENT, AND REFERENCE POINT RESULTS

Ensemble

The results of the 2016 stock assessment indicate that the Pacific halibut stock declined continuously from the late 1990s to 2011(Figure 2, Table 2). The differences among the individual models contributing to the ensemble are most pronounced prior to the early 2000s (Figure 3). However, current stock size estimates (at the beginning of 2018) also differ substantially among the four models (Figure 4). The differences in both scale and recent trend reflect the structural assumptions, e.g., higher natural mortality estimated in the long coastwide model and dome-shaped selectivity for Regions 2 and 3 in the AAF models. Differences are also apparent in the recent recruitment estimates, which suggest larger recruitments in 1999 and 2005 than in other recent years (Figure 5, Table 2). These recent recruitments are much lower than the 1987 cohort, and in the coastwide long model below those in the late 1970s and early 1980s (Figure 6). Recruitments from 2006-13 are all estimated to be below those from 1999-2005. This is particularly important for near-term trends in fishery yield as well as spawning biomass, as Pacific halibut born in 2006 will be 50% mature in 2018, and will be fully available to the directed fisheries. The differing effects of these reduced recruitments on fishery yield are illustrated in the estimated declines in age-8+ biomass, which start earlier and are more pronounced than those seen for spawning biomass (Figure 7, Table 2). Recruitment estimates after 2010 remain poorly informed by information from the fishery and survey data, and are therefore highly uncertain.

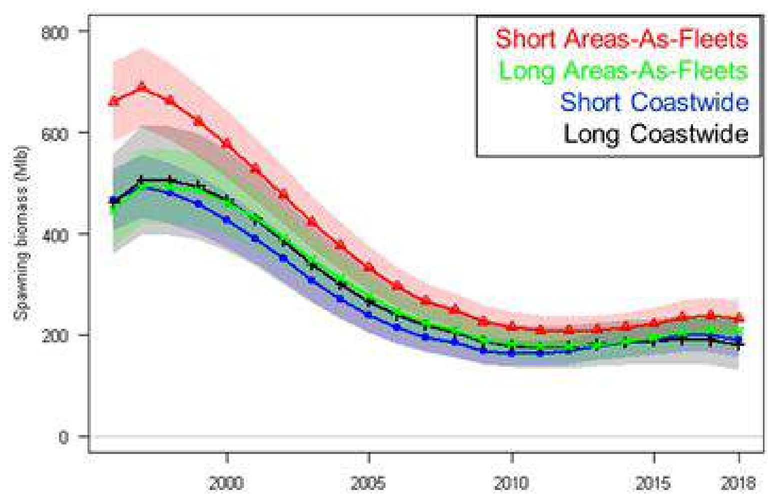

FIGURE 3. Estimated spawning biomass trends (1996-2018) based on the four individual models included in the 2017 stock assessment ensemble. Solid lines indicate the maximum likelihood estimates; shaded intervals indicate approximate 95% confidence intervals.

In addition to recruitment trends, observed decreases in size-at-age have also been an important contributor to recent stock declines. The results of the 2017 stock assessment indicate that the Pacific halibut stock declined continuously from the late 1990s to around 2010 (Figure 3). That trend is estimated to have been largely a result of decreasing size-at-age, as well as somewhat weaker recruitment strengths than those observed during the 1980s. Since the estimated female spawning biomass (SB) stabilized near 180 million pounds (~81,600 t) in 2011 the stock is estimated to have increased gradually to 2017. The SB at the beginning of 2018 is estimated to be 202 million pounds (~91,600 t), with an approximate 95% confidence interval ranging from 148 to 256 million pounds (~67,100-116,100 t; Figure 8, Table 2).

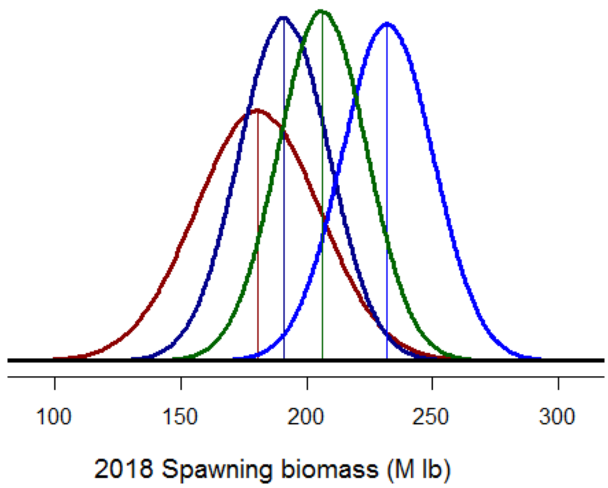

FIGURE 4. Distribution of individual model estimates for the 2017 spawning biomass. Vertical lines indicate the median values.

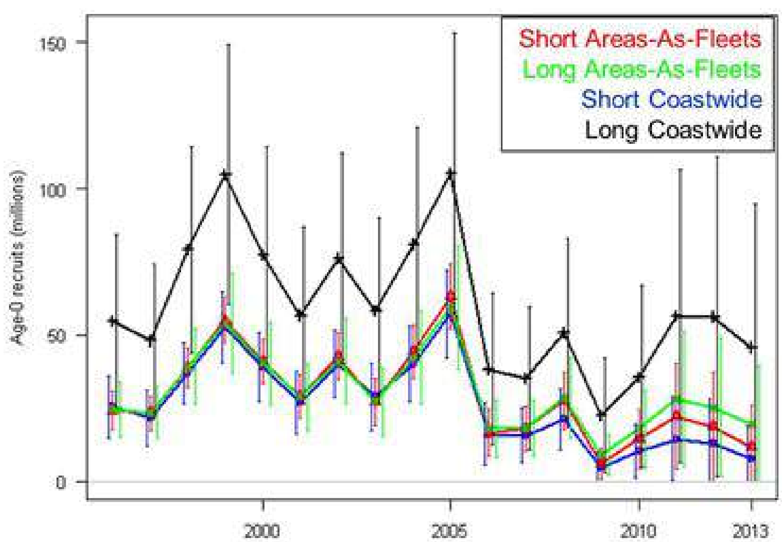

FIGURE 5. Estimated age-0 recruitment trends (1996-2013) based on the four individual models included in the 2017 stock assessment ensemble. Series indicate the maximum likelihood estimates; vertical lines indicate approximate 95% confidence intervals.

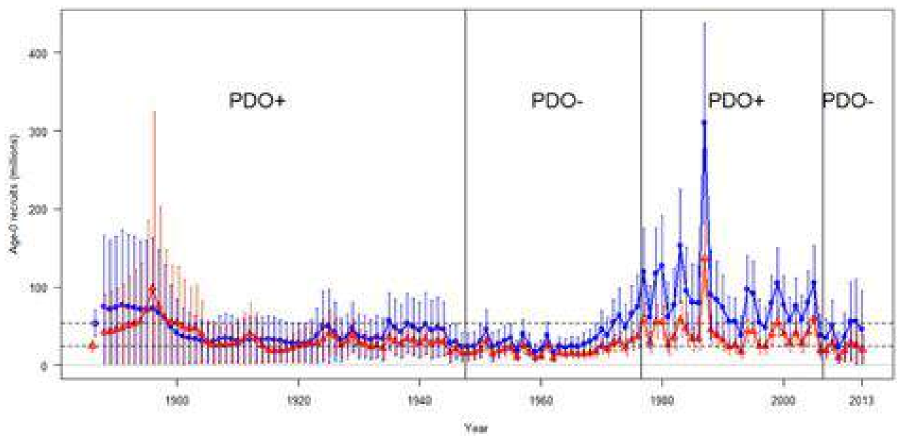

FIGURE 6. Trend in historical recruitment strengths (by birth year) estimated by the two long time-series models, including the effects of the Pacific Decadal Oscillation (PDO) regimes.

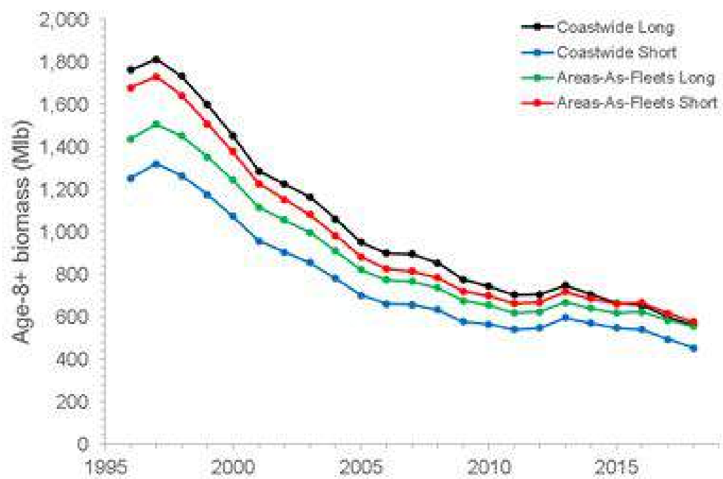

FIGURE 7. Estimated age-8+ biomass trends (1996-2013) based on the four individual models included in the 2017 stock assessment ensemble. Note that confidence intervals for these estimates are not currently available but are likely larger than those observed for spawning biomass.

TABLE 2. Recent median spawning biomass (millions lbs) and fishing intensity (based on median Spawning Potential Ratio, where smaller values indicate higher fishing intensity) from the 2017 stock assessment ensemble, and Age-0 recruitment (millions) and age-8+ biomass (millions lbs) estimates from the individual models (CW=coastwide, AAF=Areas-As-Fleets) comprising the ensemble.

		Fishing	Recruitment				Age-8+ biomass			
Year	Spawning biomass	intensity ($F_{XX\%}$)	CW Long	CW Short	AAF Long	AAF Short	CW Long	CW Short	AAF Long	AAF Short
1996	475	48%	54.7	25.4	24.6	24.2	1,763	1,253	1,440	1,680
1997	514	43%	48.1	21.7	23.6	23.4	1,814	1,321	1,508	1,732
1998	509	41%	79.2	37.0	39.2	38.9	1,735	1,265	1,452	1,643
1999	495	39%	104.8	52.4	53.9	55.0	1,601	1,176	1,354	1,510
2000	467	39%	77.4	39.1	40.2	41.0	1,454	1,075	1,244	1,378
2001	433	36%	56.7	27.0	28.9	29.0	1,287	957	1,118	1,227
2002	392	32%	76.3	40.1	41.0	42.6	1,227	907	1,057	1,154
2003	347	29%	58.2	29.0	27.2	27.1	1,166	855	999	1,082
2004	309	26%	81.0	40.1	42.3	44.3	1,062	782	911	983
2005	274	24%	105.1	57.2	59.4	63.2	953	701	823	884
2006	245	24%	38.4	16.1	18.1	16.6	900	661	774	827
2007	223	24%	35.1	15.7	18.1	18.1	896	658	767	816
2008	208	24%	50.8	21.3	28.8	27.6	854	634	737	786
2009	190	25%	22.5	4.8	9.2	6.0	776	578	675	721
2010	182	25%	35.7	10.5	18.0	14.6	745	565	655	700
2011	179	29%	56.4	14.5	28.2	22.3	705	541	619	663
2012	180	34%	56.2	13.1	25.3	18.6	706	549	623	668
2013	186	36%	45.8	7.8	19.5	11.8	749	596	669	718
2014	192	41%	NA	NA	NA	NA	706	571	641	686
2015	198	42%	NA	NA	NA	NA	665	548	618	662
2016	207	42%	NA	NA	NA	NA	654	541	625	666
2017	208	40%	NA	NA	NA	NA	599	494	584	617
2018	202	NA	NA	NA	NA	NA	562	454	556	579

Long time-series models

The two long time-series models provided different perceptions of current vs. historical stock sizes (Figure 9). The AAF model suggests that the stock is at 35% of the equilibrium unfished stock size used in the interim management procedure; however, the model estimates that current spawning biomass is at only 96% of the historically low levels estimated for the 1970s. The coastwide model suggests that the stock is at 48% of the equilibrium unfished stock size; however, the current spawning biomass is estimated to be at 216% of the minimum values estimated for the 1970s. These differences represent considerable uncertainty in both the current stock size and trend. Recent differences are likely attributable to the separation of signals from each region (particularly Region 2, with the longest time-series of data), and allowance for different properties in each region's fishery and survey. Historical differences appear to be due to the differing assumptions regarding connectivity between Regions 2 and 3 and Regions 4 during the early part of the 1900s when there are no data available from Area 4 (Stewart and Martell 2016).

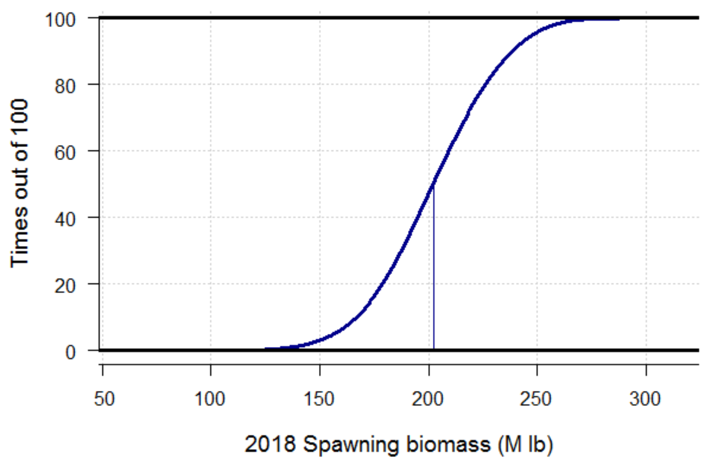

FIGURE 8. Cumulative distribution of the estimated spawning biomass from the ensemble at the beginning of 2018. Curve represents the estimated probability that the biomass is less than or equal to the value on the x-axis; vertical line represents the median (202 million pounds; ~91,600 t).

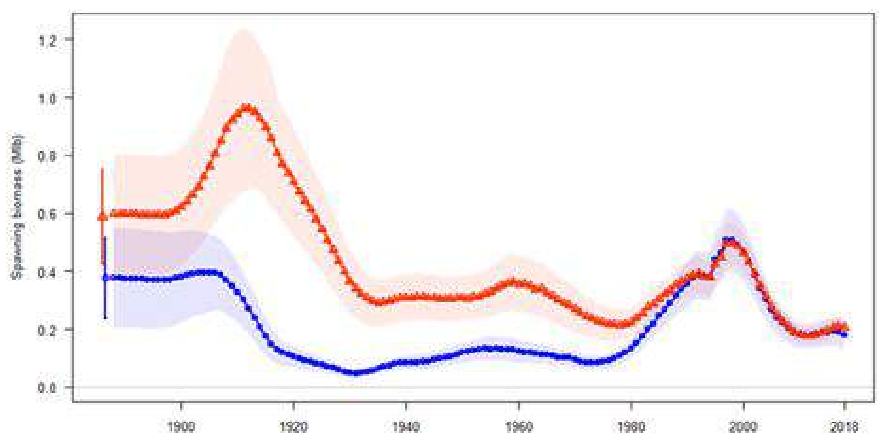

FIGURE 9. Spawning biomass estimates from the two long time-series models. Shaded region indicates the approximate 95% within-model interval. The red (upper) series is the AAF model and the blue (lower) series is the coastwide model.

Ecosystem conditions

Based on the two long time-series models, average Pacific halibut recruitment is estimated to be higher (41 and 76% for the coastwide and AAF models respectively) during favorable Pacific Decadal Oscillation (PDO) regimes, a widely used indicator of productivity in the north Pacific. Historically, these regimes included positive conditions prior to 1947, poor conditions from 1947-77, positive conditions from 1978-2006, and poor conditions from 2007-13. Annual average PDO values from 2014 through October 2016 have been positive; however, many other environmental indicators, current and temperature patterns have been anomalous relative to historical periods. Further, observed declines in Pacific cod (*Gadus macrocephalus*) in the Gulf of Alaska, seabird mortality events and other conditions suggest that historical patterns of productivity related to the PDO may not be relevant to the most recent few years.

Reference points

A comparison of the median 2018 ensemble SB to reference levels specified by the interim management procedure suggests that the stock is currently at 40% (approximate 95% credible range = 26-60%) of specified unfished levels (relative to the SB specified by the interim management procedure; Figure 10). The probability that the stock is below the $SB_{30\%}$ level is estimated to be 6%, with less than a 1% chance that the stock is below $SB_{20\%}$. Consistent with the interim management procedure (while improvements are ongoing), estimates of spawning biomass are compared to equilibrium values representing poor recruitment regimes and relatively large size-at-age. Alternative reference points include the spawning biomass estimated to have occurred at the lowest point in the historical time-series (1977-78), as well as the spawning biomass that would be estimated to occur at present (given recent recruitment and biology) in the absence of fishing (dynamic SB0; Hicks and Stewart 2017). The estimates of current spawning biomass relative to the dynamic reference point range from 26-43% among the four stock assessment models, with an average value of 33%. Relatively large differences among models reflect both the uncertainty in historical dynamics as well as the importance of spatial patterns in the data and population processes, for which all of the models represent only simple approximations. All sources of estimated removals for 2017 correspond to a fishing intensity point estimate of $F_{40\%}$ (Table 2, Figure 11). The 95% interval of this distribution is considerable ($F_{58\%}$-$F_{29\%}$), and slightly irregular, reflecting the different distributions estimated within each of the individual models. Harvest levels of this magnitude are generally at or below target rates for many similar stocks. The recent time-series shows that the 2017 estimate corresponds to slightly higher fishing intensity than 2014-2016, but below values from 2000-2013 (Figure 12).

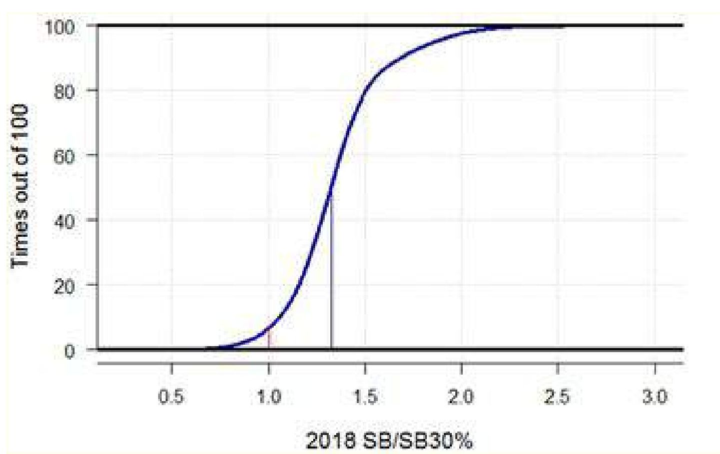

FIGURE 10. Cumulative distribution of 2018 ensemble spawning biomass estimates relative to the SB30% reference point. Curve represents the estimated probability that the biomass is less than or equal to the value on the x-axis. Vertical lines indicate the median value (40%), and the value corresponding to the IPHC’s harvest policy threshold.

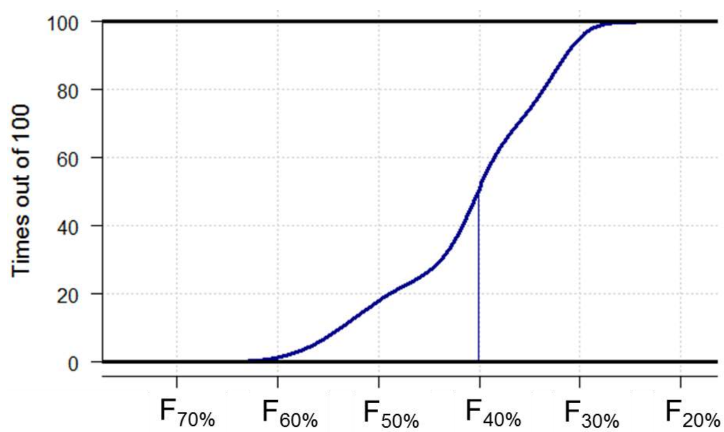

FIGURE 11. Cumulative distribution of the estimated relative fishing intensity (based on the Spawning Potential Ratio) estimated to have occurred in 2017. Curve represents the estimated probability that the fishing intensity is less than or equal to the value on the x-axis. Vertical line indicates the median value (F40%).

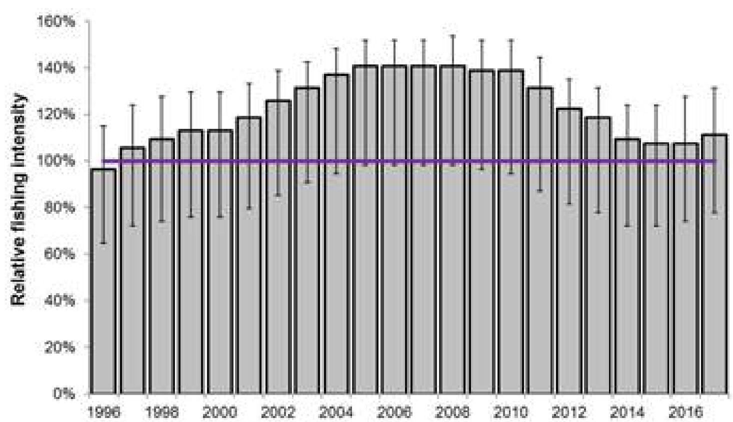

FIGURE 12. Recent estimated fishing intensity (based on the Spawning Potential Ratio) relative to the SPR=46% reference level (horizontal line). Vertical lines indicate approximate credible intervals from the stock assessment ensemble.

MAJOR SOURCES OF UNCERTAINTY

This stock assessment includes uncertainty associated with estimation of model parameters, treatment of the data sources (e.g., short and long time-series), natural mortality (fixed vs. estimated), approach to spatial structure in the data, and other differences among the models included in the ensemble. Although this is an improvement over the use of a single assessment model, there are important sources of uncertainty that are not included.

Two uncertainties in our current understanding of the Pacific halibut resource are:

1) The sex-ratio of the commercial catch (not sampled due to the dressing of fish at sea), which serves to set the scale of the estimated female abundance in tandem with assumptions regarding natural mortality. Voluntary marking in tandem with genetic sampling of all Pacific halibut sampled from the commercial landings will allow an

estimate of the 2017 landings to be available for the next stock assessment. It will take several years to generate enough information on the sex ratio of the landings to begin to meaningfully inform the stock assessment models; however, this represents a crucial step toward addressing this source of uncertainty for future stock assessments. The uncertainty in the historical time-series will remain.

2) The treatment of spatial dynamics and movement rates among Regulatory Areas, which are represented via Regions in the coastwide and AAF approaches, and have large implications for the current stock trend. In addition, movement rates for adult and younger Pacific halibut (roughly ages 0-6, which were not well-represented in the PIT-tagging study), particularly to and from Region 4, are necessary for parameterizing a spatially explicit stock assessment. Current understanding of these rates has now been summarized, but remains problematic for tactical stock assessment modelling.

Other important contributors to assessment uncertainty and potential bias include recruitment, size-at-age, and fishery removals. The link between Pacific halibut recruitment strengths and environmental conditions remains poorly understood, and there is no guarantee that observed correlations will continue in the future. Therefore, recruitment variability remains a substantial source of uncertainty in current stock estimates due to the lag between birth year and direct observation in the fishery and survey data (6-10 years). Reduced size-at-age relative to levels observed in the 1970s is the most important driver of recent stock trends, but its cause also remains unknown. The historical record suggests that size-at-age changes relatively slowly; therefore, although projection of future values is highly uncertain, near-term values are unlikely to be substantially different than those currently observed. Data suggest that the decreasing trend in size-at-age has slowed and coastwide values have been relatively stable over the last decade. Like most stock assessments, estimated removals from the stock are assumed to be accurate. Therefore uncertainty due to bycatch mortality estimation (observer sampling and representativeness), discard mortality rates, and any other unreported sources of removals in either directed or non-directed fisheries could create bias in this assessment. Ongoing research on these topics may help to inform our understanding of these processes in the long-term, but in the near-future it appears likely that a high degree of uncertainty in both stock scale and trend will continue to be an integral part of the annual management process.

This stock assessment contains a broader representation of uncertainty in stock levels relative to analyses for many other species. Although the data available for this stock assessment has narrowed both the historical and projected confidence intervals for stock size and trend relative to last year's assessment and projections, the considerable remaining uncertainty can be seen in the distribution for spawning biomass estimated at the beginning of 2018 (Figure 8), such that the small differences between the estimate from the 2017 and recent assessments (Table 1, Figure 2) are not statistically significant.

Since 2012, natural mortality has been an important source of uncertainty that is included in the stock assessment. In 2012, three fixed levels were used to bracket the plausible range of values. In 2013, the three models contributing to the ensemble included both fixed and estimated values of natural mortality. In the current ensemble, the models again span both fixed (0.15/year for female Pacific halibut) and estimated values. The female value estimated in the long AAF model (0.15) differs substantially from the value estimated in the coastwide model (0.22). This discrepancy contributes to the difference in scale and productivity for the two models, but is not easily reconciled at present. Although this uncertainty is directly incorporated into the ensemble results, it remains an avenue for future investigation.

Future expansion of the ensemble approach will continue to improve uncertainty estimates, and create assessment results that are robust to changes in individual models, data sets, and other sources of historical changes in stock assessment results from year to year.

SENSITIVITY AND RETROSPECTIVE ANALYSES

A wide range of sensitivity analyses were conducted during the development of the 2015 stock assessment (Stewart and Martell 2016). These efforts form the primary basis for the identification of important sources of uncertainty outlined above. The most important contributors to estimates of both population trend and scale included: the sex-ratio of the commercial catch, the treatment of historical selectivity in the long time-series models, and natural mortality. Several sensitivity analyses were revisited this year in order to update and illustrate their importance, particularly with regard to the IPHC's research program.

The first sensitivity conducted for this assessment was an investigation into the potential effects of a downward trend in spawning output for the Pacific halibut stock. This could be caused by a change in the underlying fecundity or maturity schedules, or by a trend in the rate of skip-spawning (where a reproductively mature fish does not actually spawn in a particular year). To implement this sensitivity, a reduction in spawning output was added to the assessment beginning in 2002 and ending with 10% less spawning output in 2017 (a 15-year trend). When compared with the short coastwide model included in the ensemble, the change in maturity results in a nearly proportional decrease in the estimate of spawning biomass over the same period, leading to a bias in recent trend and scale of the current stock (Figure 13). This result illustrates the importance of ongoing research into factors influencing reproductive biology and success for Pacific halibut.

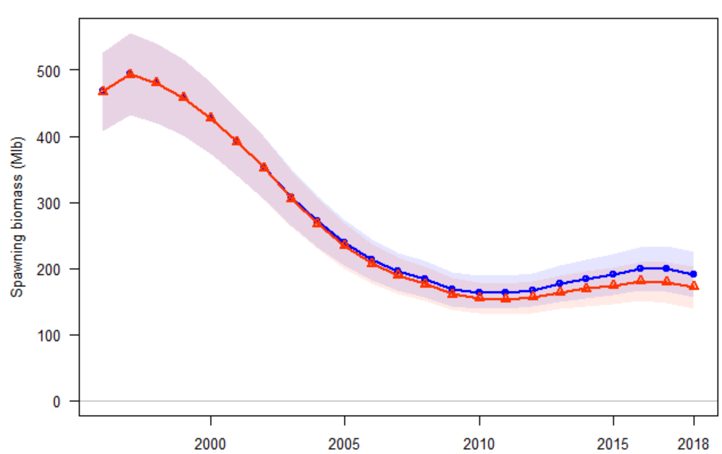

FIGURE 13. Spawning biomass estimates from a sensitivity analysis using the short coastwide model to evaluate the effect of a 10% decrease in spawning output over the last 15 years (lower series) with the results included in the ensemble (upper series). Shaded region indicates the approximate 95% within-model interval.

Currently, the survey is assumed to be a reasonable proxy for relative fishery selectivity of the oldest male and female Pacific halibut. The second sensitivity examined the effect of higher or lower relative fishery selectivity of males (using the coastwide short model); effectively testing the sensitivity to the assumption of sex-ratio of the commercial catch. A decrease in relative selectivity for males was found to result in larger absolute levels of spawning biomass, but little effect on trend, given a constant assumption over time (Figure 14). An increase in the relative selectivity of males did not produce greatly differing results for this model. It is likely that trends in sex-ratio could result in a bias to the estimated stock trends if it were unaccounted for. This sensitivity illustrates the importance of ongoing efforts to directly measure the sex-ratio of the commercial catch through marking at sea and genetic validation.

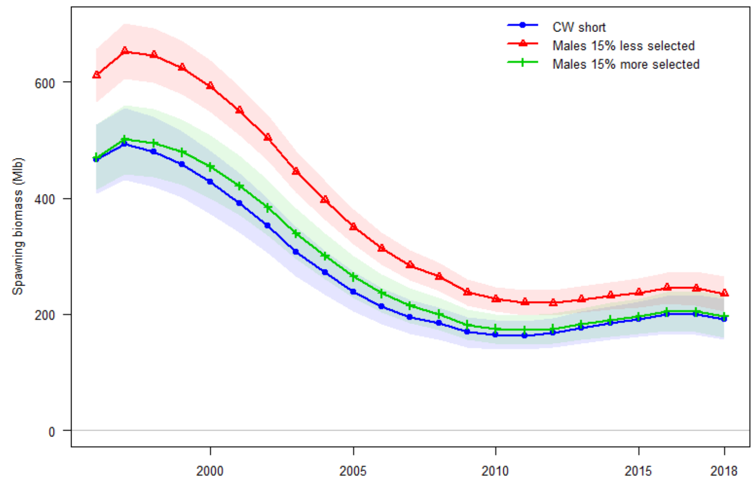

FIGURE 14. Spawning biomass estimates from a sensitivity analysis using the coastwide short model to evaluate the effect of a 15% change (+/-) in the relative selectivity for male halibut in the commercial fishery with the results included in the ensemble (middle series). Shaded region indicates the approximate 95% within-model intervals.

The third sensitivity added for this assessment explored the effect of additional unobserved mortality on the halibut stock. The sensitivity included two tests: 1) a 20% increase in mortality over the whole time-series, and 2) a trend of increasing mortality to 20% over the most recent 15 years. Unobserved mortality increases the estimate of stock size (Figure 15), and the trend causes a very small bias at the terminal end of the series, but mainly results in a small bias as well (Figure 16). Both of these results are relevant to both the stock assessment and harvest policy development, if unobserved mortality were occurring.

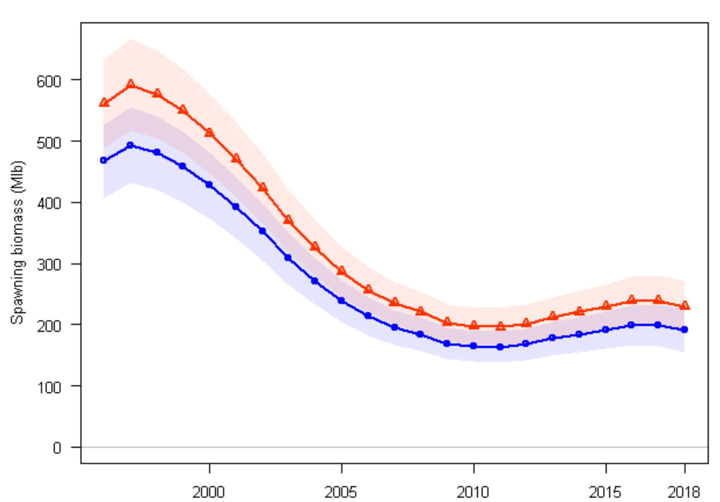

FIGURE 13. Spawning biomass estimates from a sensitivity analysis using the coastwide short model to evaluate the effect of a 20% increase in the total mortality from all sources (upper series), compared to the estimate used in the ensemble (lower series). Shaded region indicates the approximate 95% within-model intervals.

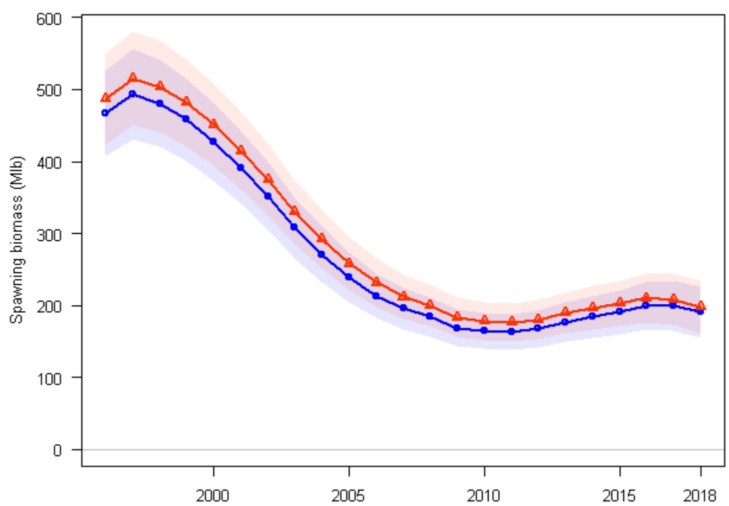

FIGURE 14. Spawning biomass estimates from a sensitivity analysis using the coastwide short model to evaluate the effect of a trend of a 20% increase in the total mortality from all sources over the last 15 years (upper series), compared to the estimate used in the ensemble (lower series). Shaded region indicates the approximate 95% within-model intervals.

A retrospective analysis was performed for each of the individual models contributing to this assessment. Both long time-series models showed little pattern in the most recent years, but slightly higher estimates as additional data were removed from each (Figure 15); however terminal biomass estimates remained inside the confidence intervals for the full model result over three of five years of the retrospective analysis. The short time-series models showed similar but slightly larger retrospective behavior (Figure 16), being inside the confidence intervals three to four of five years. This is not unexpected for short time-series models where there is a greater proportion of the total information available contained in each year's data.

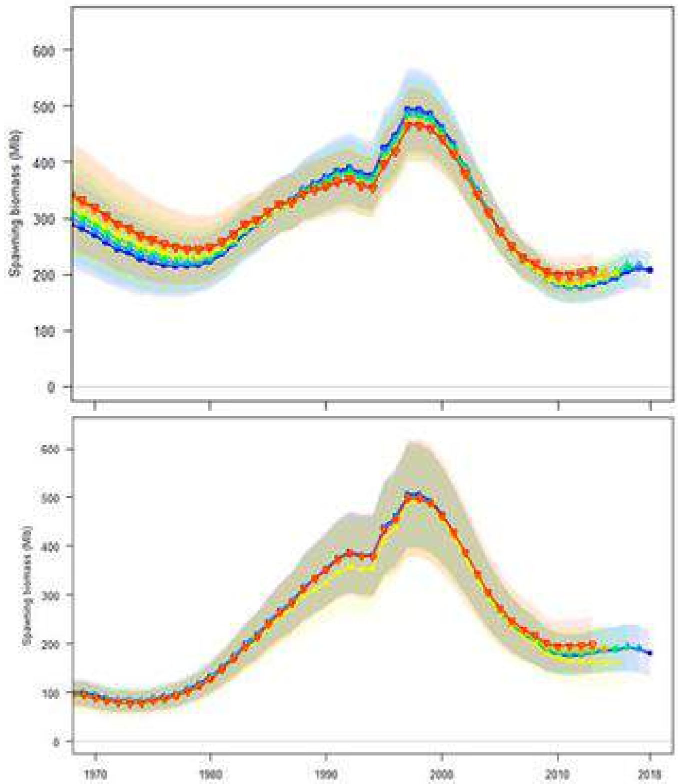

FIGURE 15. Results of the retrospective analysis on spawning biomass estimates using the Areas-as-fleets long (upper panel) and coastwide long (lower panel) time-series models and sequentially removing one year of data for five years. Dashed lines and shaded regions indicate within-model 95% intervals.

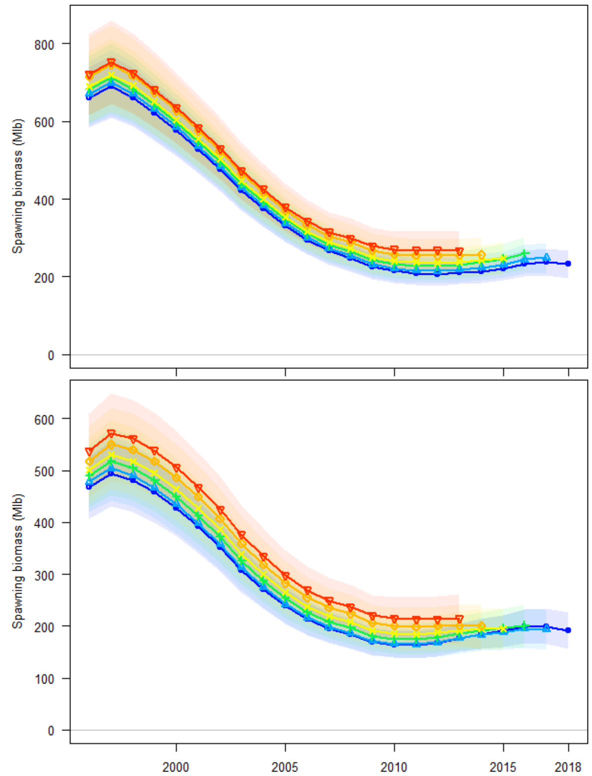

FIGURE 16. Results of the retrospective analysis on spawning biomass estimates using the coastwide short (upper panel) and Areas-As-Fleets short (lower panel) time-series models and sequentially removing one year of data for five years. Dashed lines and shaded regions indicate within-model 95% intervals.

FORECASTS AND DECISION TABLE

Stock projections were conducted using the integrated results from the stock assessment ensemble, estimates of removals from the 2017 directed fisheries and other sources of mortality. The harvest decision table (Table 3) provides a comparison of the relative risk (in times out of 100), using stock and fishery metrics (rows), against a range of alternative harvest levels for 2018 (columns). The orientation of this table has changed from previous analyses in order to make the comparison of additional metrics easier (the second year of projection is now explicitly included), and to increase consistency with the results produced from the Management Strategy Evaluation (Hicks & Stewart 2017). The block of rows entitled “Stock Trend” provides for evaluation of the risks to short-term trend in spawning biomass, independent of all harvest policy calculations. The remaining rows portray risks relative to the spawning biomass reference points (“Stock Status”) and fishery performance identified in the interim management procedure. The alternatives (columns) provided include several coarsely spaced levels of mortality intended to provide for evaluation of stock dynamics including:

- No mortality (useful to evaluate the stock trend due solely to population processes),

- A 10 million pound (~4,500 t) 2018 Total Constant Exploitation Yield (TCEY[3])
- A 50 million pound (~22,700 t) 2018 TCEY
- A 60 million pound (~27,200 t) 2018 TCEY
- The removals consistent with the reference SPR ($F_{46\%}$) level.

A finer grid of alternative TCEY values is provided around the column corresponding to the reference level of fishing intensity (SPR=46%; for 2018 a TCEY of 31 million pounds, ~14,060 t).

For each row of the decision table, the total mortality of all sizes and from all sources, the coastwide TCEY and the associated level of fishing intensity (median value with the 95% credible range below; measured via the Spawning Potential Ratio) are reported. Fishing intensity reflects the relative reduction in equilibrium (long-term) spawning biomass per recruit from all sources and sizes of removals, reported as $F_{x\%}$, (where x = the SPR) for comparison to other management processes in both nations where harvest rate targets and limits are commonly reported in these units. As in previous years, it is expected that additional alternatives will be produced during the IPHCs annual process such that all management alternatives considered for 2018 can be directly evaluated in terms projected total mortality and risk.

The stock is projected to decrease gradually over the period from 2018-20 for removals around the reference SPR level (Figure 11). The risk of stock declines begins to increase rapidly for TCEYs above 31 million pounds (~14,060 t), becoming more pronounced by 2020 (Table 3). The reference SPR corresponds to a 78/100 (78%) chance of stock decline through 2019, and a 46% chance of at least a 5% decline through 2021 at that constant level of TCEY. TCEYs corresponding to recent levels of fishing mortality correspond to probabilities of stock decline over the next one to three years greater than 95%. There is a relatively small chance (<21/100; 21%) that the stock will decline below the threshold reference point (SB30%) in projections for all the levels of TCEY up to 40 million pounds (~18,100 t) evaluated over three years; for TCEYs exceeding that level, the probability begins to increase rapidly.

[3] The TCEY corresponds approximately to the mortality comprised of Pacific halibut greater than 26 inches (66 cm) in length.

TABLE 3. Harvest decision table for 2018. Columns correspond to yield alternatives and rows to risk metrics. Values in the table represent the probability, in "times out of 100" (or percent chance) of a particular risk.

		2018 Alternative	No removals							*Reference: SPR=46%*								
		Total removals (M lb)	0.0	11.8	21.8	28.8	29.8	30.8	31.8	32.8	33.8	34.8	35.8	37.3	41.8	51.8	61.9	
		TCEY (M lb)	0.0	10.0	20.0	27.0	28.0	29.0	30.0	31.0	32.0	33.0	34.0	35.5	40.0	50.0	60.0	
		Fishing Intensity	$F_{100\%}$	$F_{73\%}$	$F_{58\%}$	$F_{50\%}$	$F_{49\%}$	$F_{48\%}$	$F_{47\%}$	$F_{46\%}$	$F_{45\%}$	$F_{44\%}$	$F_{43\%}$	$F_{42\%}$	$F_{39\%}$	$F_{32\%}$	$F_{27\%}$	
		Fishing Intensity Interval	–	61-84%	45-73%	37-67%	36-66%	36-65%	35-65%	34-64%	33-63%	32-63%	32-62%	31-61%	28-58%	23-53%	19-48%	
Stock Trend (spawning biomass)	In 2019	Is less than 2018	1	3	24	59	64	69	74	78	81	85	87	91	98	>99	>99	a
		Is 5% less than 2018	<1	<1	<1	2	2	3	4	5	7	9	11	14	29	69	96	b
	In 2020	Is less than 2018	<1	1	14	46	52	57	62	67	71	76	80	85	95	>99	>99	c
		Is 5% less than 2018	<1	<1	1	9	11	14	18	21	25	29	34	41	61	94	>99	d
	In 2021	Is less than 2018	<1	2	23	59	63	68	72	76	79	83	86	90	97	>99	>99	e
		Is 5% less than 2018	<1	<1	5	27	32	36	41	46	50	55	59	66	83	99	>99	f
Stock Status (Spawning biomass)	In 2019	Is less than 30%	3	4	5	6	6	7	7	7	7	7	7	8	9	11	15	g
		Is less than 20%	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1	h
	In 2020	Is less than 30%	2	2	4	6	6	6	7	7	8	8	9	9	12	21	32	i
		Is less than 20%	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1	1	j
	In 2021	Is less than 30%	1	1	4	7	8	8	9	10	11	12	13	15	21	37	54	k
		Is less than 20%	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1	2	7	l
Fishery Trend (TCEY)	In 2019	Is less than 2018	<1	<1	7	33	38	43	49	55	60	64	68	71	78	89	97	m
		Is 10% less than 2018	<1	<1	3	23	26	30	34	38	43	48	53	59	72	82	92	n
	In 2020	Is less than 2018	<1	<1	10	38	43	49	54	59	63	67	70	73	79	91	98	o
		Is 10% less than 2018	<1	<1	6	27	31	36	40	45	50	54	59	64	74	84	95	p
	In 2021	Is less than 2018	<1	<1	14	44	50	55	59	63	67	69	72	74	81	93	>99	q
		Is 10% less than 2018	<1	<1	9	34	38	43	48	52	56	60	63	67	75	86	99	r
Fishery Status (Fishing intensity)	In 2018	Is above $F_{46\%}$	0	<1	4	29	33	38	43	50	54	60	64	69	77	87	95	s

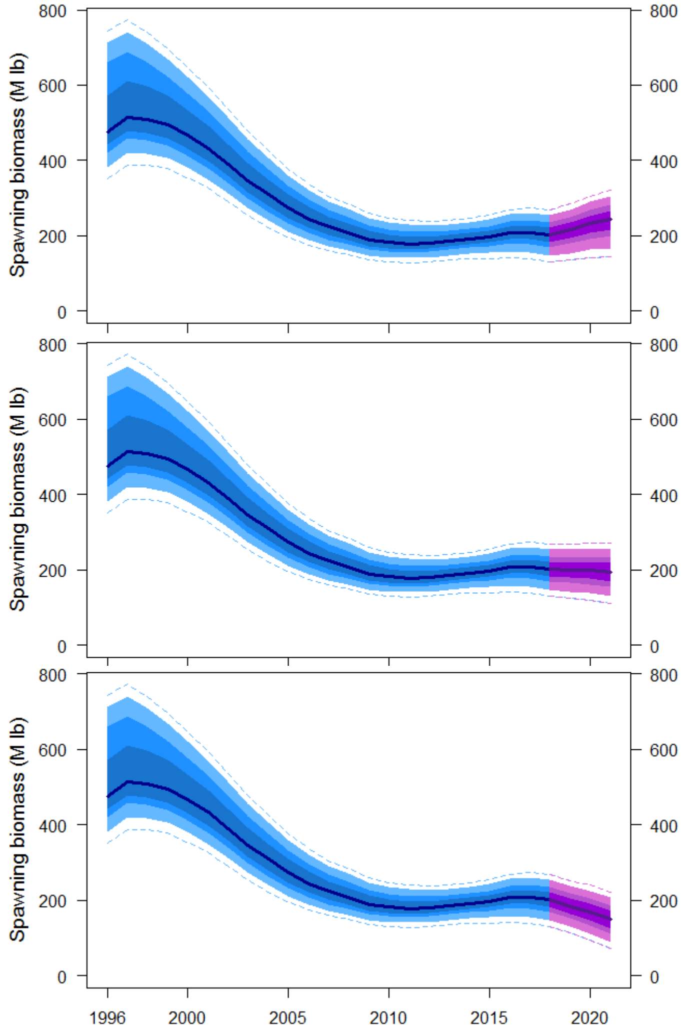

FIGURE 17. Three-year projections of stock trend under alternative levels of mortality: no removals (upper panel), Reference SPR=46% (32.8 million pounds, ~14,900 t; middle panel) and a TCEY of 60 million pounds (~27,200 t; lower panel).

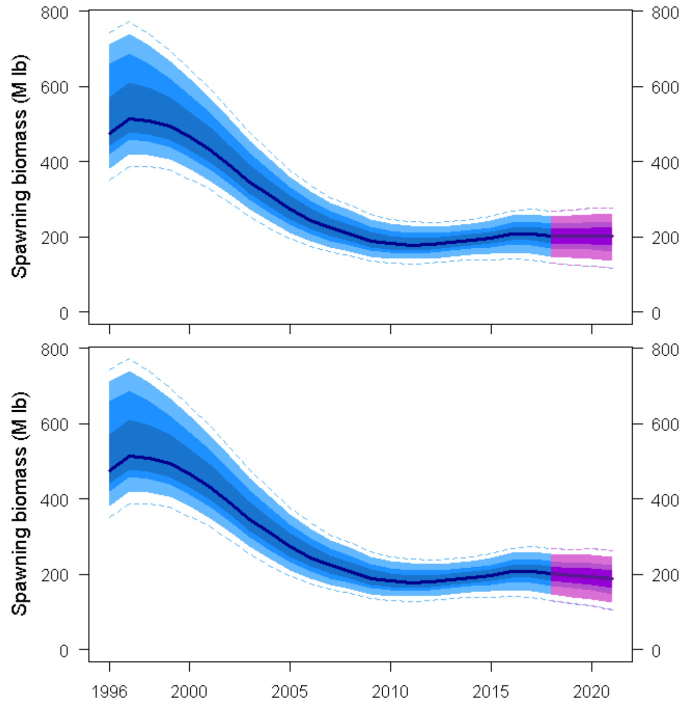

FIGURE 18. Three-year projections of stock trend under an SPR=50% (TCEY=27.0 million pounds, ~12,250 t; upper panel) and an SPR=42% (TCEY=35.5 million pounds, ~16,100 t; lower panel).

RESEARCH PRIORITIES

Research priorities for the stock assessment and related analyses can be delineated into two broad categories: gaps in biological understanding and technical development.

Biological understanding: During the last several years, the IPHC Secretariat has developed a comprehensive five-year research program (Planas 2017). The development of the research priorities has been closely tied to the needs of the stock assessment and harvest strategy policy analyses, such that each of the IPHC's ongoing projects (e.g., determining the sex-ratio of the commercial landings, updating estimates of the maturity schedule for Pacific halibut, better understanding of recruitment processes and stock structure, etc.) will provide data, and hopefully knowledge, about key biological and ecosystem processes that can then be incorporated directly into analyses supporting the management of Pacific halibut.

Technical development: The IPHC's stock assessment, Management Strategy Evaluation (MSE), and harvest strategy policy methods is ongoing, and responds to new developments in the data or analyses necessary each year. New approaches are tested, reported to the IPHC's SRB (generally in June), refined (and reviewed again in October, as needed), and ultimately incorporated in the development of the best scientific information available for the annual management process. Current technical research priorities include:

1) Maintaining consistency and coordination between MSE, and stock assessment data, modelling and methodology.

2) Continued refinement of the ensemble of models used in the stock assessment.

3) Continued development of weighting approaches for models included in the ensemble, potentially including fit to the survey index of abundance, retrospective, and predictive performance.
4) Exploration of methods for better including uncertainty in discard mortality and bycatch estimates in the assessment (now evaluated only via alternative catch tables or model sensitivity tests) in order to better include these sources uncertainty in the decision table.
5) Bayesian methods for fully integrating parameter uncertainty may provide improved uncertainty estimates within the models contributing to the assessment, and a more natural approach for combining the individual models in the ensemble.

ACKNOWLEDGEMENTS

We thank all of the IPHC Secretariat staff for their contributions to data collection, analysis and preparation for the stock assessment. We also thank the staff at the NMFS, DFO, ADFG, WDFW, ODFW, and CDFW for providing the annual information required for this assessment in a timely manner. The SRB and the Science Advisors provided critical review and helpful guidance during the 2017 process.

RECOMMENDATION/S

That the Commission:

a) **NOTE** paper IPHC-2018-AM094-10 which provides the results of the 2017 stock assessment for Pacific halibut.

REFERENCES

Hicks, A., and Stewart, I. 2017. IPHC Managment Strategy Evaluation (MSE): Update. IPHC-2017-IM093-10. 32 p.

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Final Pacific halibut catch tables for 2018

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PURPOSE

To provide the Commission with a summary of International Pacific Halibut Commission (IPHC) Regulatory Area-specific mortality projections for 2018 based on the interim management procedure and other alternatives. This document provides an update of preliminary tables reflecting final 2017 mortality estimates from all sources where updated information was available.

SUMMARY

This document summarizes the results of the application of the IPHC's interim management procedure, as well as additional alternatives for 2018. The scale of coastwide mortality from all sources is based on the reference level of fishing intensity adopted for 2017 (IPHC 2017), a Spawning Potential Ratio (SPR) equal to 46%. The mortality consistent with the reference level, is estimated iteratively for 2018 based on the current stock assessment (Stewart and Hicks 2017). In order to distribute the target mortality among the IPHC's Regulatory Areas, there are two inputs: 2017 stock distribution, and relative target harvest rates among IPHC Regulatory Areas. The IPHC's fishery-independent setline survey legal-size (O32, or over 32 inches (81 cm) in total length) Weight-Per-Unit-Effort (WPUE) is used to estimate the distribution of the stock (Webster 2017). The relative target harvest rates for each IPHC Regulatory Area: 1.00 for Areas 2A-3A, and 0.75 for Areas 3B-4CDE, apply to the Total Constant Exploitation Yield (TCEY, approximately the mortality of Pacific halibut over 26 inches (66 cm) in length; O26). These relative rates are consistent with the historical approach of applying rates of 21.5% and 16.125% (Stewart 2017), the ratio being equal to 1.00:0.75. The combination of the stock distribution and relative target harvest rates results in a target distribution for the annual TCEY.

The application of the interim management procedure results in a substantial decrease in the 2018 TCEY (31.00 million lb, ~14,060 t) from both the 2017 reference level based on the 2016 stock assessment (-21%) and the catch limits adopted for 2017 (-24%). Because components within the TCEY have changed since 2016, the Fishery Constant Exploitation Yields (FCEYs), and allocations to specific fisheries based on domestic catch agreements have also changed; however, all projections for 2018 are lower than values from 2017. Detailed catch tables including all sizes and sources of removals are presented for the reference level, as well as several other requested management alternatives. This document remains replaces the preliminary analysis provided for the 2017 Interim Meeting (IM093), as updated estimates for bycatch from the non-directed Pacific halibut fleets in Alaska were provided to the IPHC in early January, 2018. Additional alternatives will be created during the Annual Meeting, on request.

INTRODUCTION

The IPHC's interim management procedure has changed appreciably since 2012. In that year, the IPHC began to transparently delineate between the results of scientific analyses, the application of harvest policy, and the management decisions resulting in annual catch limits[1] (Stewart et al. 2013, Webster and Stewart 2013). From 2012 through 2017, the “Blue Line” represented results of both the scale and distributional targets of the IPHC’s harvest policy, although it was never applied to annual catch limits (based on FCEYs) at the coastwide level or as a complete set of Regulatory Area-specific limits. In 2017, the Commission adopted a “Reference” level of coastwide fishing intensity based on the average of values estimated (from the 2016 stock assessment) for the period from 2014 through 2016. This reference was an SPR equal to 46%. In addition, the Commission directed the Secretariat to provide for future management decisions to be based on TCEYs, rather than FCEYs, such that catch limits would be more comparable across Regulatory Areas.

This document uses the most recent Pacific halibut mortality estimates from all sources, and the results from the 2017 stock assessment for Pacific halibut for projections of the mortality and level of fishing intensity for 2018.

SCALE

For any distribution of coastwide mortality across all fisheries and Regulatory Areas, the 2017 stock assessment can be used to determine the scale of this mortality that results in the reference SPR (46%). This is achieved iteratively, using all four models in the stock assessment ensemble via the following method:

1) Adding the projected mortality for 2018 to each model
2) Calculating the projected SPR for each model
3) Integrating the model results into a probability distribution for the projected SPR
4) Comparing the median projected SPR to the reference level
5) Iteratively repeating this approach until the median is equal to the reference.

This method includes all sizes and sources of mortality, as well as all currently available data, and is based on the parameter estimates from the current stock assessment. It includes uncertainty due to estimation as well as structural uncertainty among the four models that comprise the stock assessment ensemble.

DISTRIBUTION

There are two inputs to the current management procedure for distributing the TCEY among IPHC Regulatory Areas: the current stock distribution, and the relative target harvest rates. The stock distribution has historically been based on the catch of O32 Pacific halibut in the IPHC’s fishery-independent setline survey. These values have been revised from 2016 estimates (Stewart and Hicks 2017), indicating a larger proportion of the coastwide stock in Regulatory Areas 2C, 3A, 4A, 4B, and 4CDE in 2017 and a smaller proportion in 2A, 2B, and 3B (Table 1). The relative target harvest rates for each IPHC Regulatory Area are 1.00 for Areas 2A-3A, and 0.75 for Areas 3B-4CDE, and are consistent with the historical rates of 21.5% and 16.125% (the ratio being equal to 1.00:0.75) used prior to the transition to an SPR-based fishing intensity target. The combination of the stock distribution and relative target harvest rates results in a target distribution for the annual TCEY (Table 1).

[1] Note that the term “catch limit” is used variously to refer to portions of the total mortality, FCEYs, and specific limits on domestic fisheries; in some cases these limits may not contain all sources of mortality, and in no cases do they contain fish that are released and estimated to have survived the capture process.

TABLE 1. IPHC Regulatory Area stock distribution from the 2017 O32 fishery-independent setline survey catch, IPHC Regulatory Area-specific relative target harvest rates, and resulting 2018 target TCEY distribution based on the IPHC's current management procedure.

	2A	2B	2C	3A	3B	4A	4B	4CDE	Total
O32 stock distribution	1.7%	11.3%	16.6%	35.6%	10.0%	6.6%	4.8%	13.3%	100.0%
Relative harvest rates	1.00	1.00	1.00	1.00	0.75	0.75	0.75	0.75	--
Target TCEY Distribution	1.9%	12.4%	18.2%	38.9%	8.2%	5.4%	3.9%	10.9%	100.0%

PROJECTION OF MORTALITY

Pacific halibut mortality by fishery within each Regulatory Area is projected for 2018 based on the allocations specified by the domestic catch agreements in place, as applicable. Further, projected discard mortality is based on the 2017 *rates*, such that the magnitude will scale with the retained removals for both commercial and recreational fisheries in each Regulatory Area. The remainder of the projected mortality is comprised of the following sources: unguided recreational mortality (retained and discarded) in Alaska, subsistence mortality, and mortality due to bycatch (Pacific halibut captured in fisheries where retention is prohibited). For default projections, these sources of mortality are assumed to remain unchanged from 2017, although alternative catch tables can (and have been) produced utilizing different values. A summary of estimated 2017 mortality, including those components used directly in projections is provided in Table 2.

TABLE 2. Estimated Pacific halibut mortality for 2017 based on data through 9 November 2017. All values reported in millions of net pounds. Values in bold are projected to remain constant through 2018 for default calculations.

	2A	2B	2C	3A	3B	4A	4B	4CDE	Total
<u>O26 Non-FCEY</u>									
Commercial discards[1]	0.02	0.17	NA	NA	0.21	0.06	0.03	0.03	0.52
Bycatch	**0.11**	**0.23**	**0.02**	**1.01**	**0.45**	**0.29**	**0.20**	**1.96**	**4.26**
Recreational (+ discards)	**NA**	**NA**	**1.43**	**1.86**	**0.01**	**0.02**	**0.00**	**0.00**	**3.31**
Subsistence	**NA**	**0.41**	**0.44**	**0.22**	**0.01**	**0.01**	**0.00**	**0.05**	**1.14**
Total Non-FCEY	0.13	0.81	1.89	3.06	0.69	0.37	0.22	2.04	9.19
<u>O26 FCEY</u>									
Commercial discard	NA	NA	0.08	0.34	NA	NA	NA	NA	0.42
Recreational (+ discards)[2]	0.52	1.23	0.96	2.11	NA	NA	NA	NA	4.82
Subsistence	**0.03**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**0.03**
Commercial Landings[1]	0.75	6.26	4.23	7.79	3.09	1.30	1.09	1.64	26.16
Total FCEY	1.30	7.49	5.28	10.23	3.09	1.30	1.09	1.64	31.42
TCEY	1.43	8.29	7.16	13.29	3.78	1.67	1.31	3.69	40.61
<u>U26</u>									
Commercial discards	0.00	0.00	0.00	0.01	0.02	0.01	0.00	0.00	0.05
Bycatch	**0.00**	**0.02**	**0.00**	**0.42**	**0.44**	**0.11**	**0.01**	**0.79**	**1.79**
Total U26	0.00	0.03	0.00	0.42	0.46	0.12	0.01	0.79	1.82
Total Mortality	1.43	8.32	7.17	13.74	4.24	1.79	1.33	4.47	42.49

[1] Includes research catches.
[2] Includes leases to the recreational sector: XRQ in Area 2B and Guided Angler Fish (GAF) in IPHC Regulatory Areas 2C and 3A.

Reference Projection

The reference projection results in a 2018 TCEY of 31.00 million lb, (~14,060 t; Table 3). This represents a reduction of 21% from the reference level calculated based on the 2016 stock assessment, and 24% from the catch limits adopted for 2017 (Table 4). Because components within the TCEY have changed since 2016, the Fishery Constant Exploitation Yields (FCEYs), and allocations to specific fisheries based on domestic catch agreements have also changed (Figure 1); however, projected FCEYs are all lower for 2018 than values adopted in 2017.

TABLE 3. Pacific halibut mortality projected for 2018 based on the reference SPR (46%) and interim management procedure for TCEY distribution. All values reported in millions of net pounds.

	2A	**2B**	**2C**	**3A**	**3B**	**4A**	**4B**	**4CDE**	**Total**
O26 Non-FCEY									
Commercial discards	0.01	0.07	NA	NA	0.13	0.06	0.03	0.02	0.32
Bycatch	0.11	0.23	0.02	1.01	0.45	0.29	0.20	1.96	4.26
Recreational (+ discards)	NA	NA	1.43	1.86	0.01	0.02	0.00	0.00	3.31
Subsistence	NA	0.41	0.44	0.22	0.01	0.01	0.00	0.05	1.14
Total Non-FCEY	0.12	0.71	1.89	3.09	0.61	0.37	0.22	2.04	9.04
O26 FCEY									
Commercial discard	NA	NA	0.06	0.30	NA	NA	NA	NA	0.36
Recreational (+ discards)	0.21	0.48	0.69	1.70	NA	NA	NA	NA	3.08
Subsistence	0.03	NA	NA	NA	NA	NA	NA	NA	0.03
Commercial Landings	0.23	2.65	3.01	6.99	1.95	1.32	0.99	1.36	18.49
Total FCEY	0.47	3.14	3.76	8.98	1.95	1.32	0.99	1.36	21.96
TCEY	0.59	3.84	5.65	12.07	2.56	1.69	1.21	3.39	31.00
U26									
Commercial discards	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.04
Bycatch	0.00	0.02	0.00	0.42	0.44	0.11	0.01	0.79	1.79
Total U26	0.00	0.02	0.00	0.43	0.45	0.12	0.01	0.79	1.82
Total Mortality	0.59	3.87	5.65	12.50	3.01	1.81	1.22	4.18	32.82

Table 4. Comparison of TCEY values (M lb).

	2A	**2B**	**2C**	**3A**	**3B**	**4A**	**4B**	**4CDE**	**Total**
2017 Reference SPR	**0.96**	**6.08**	**6.47**	**13.84**	**4.39**	**1.84**	**1.46**	**4.06**	**39.10**
2017 Adopted	**1.47**	**8.32**	**7.04**	**12.96**	**3.98**	**1.80**	**1.34**	**3.84**	**40.74**
2018 Reference SPR	**0.59**	**3.84**	**5.65**	**12.07**	**2.56**	**1.69**	**1.21**	**3.39**	**31.00**

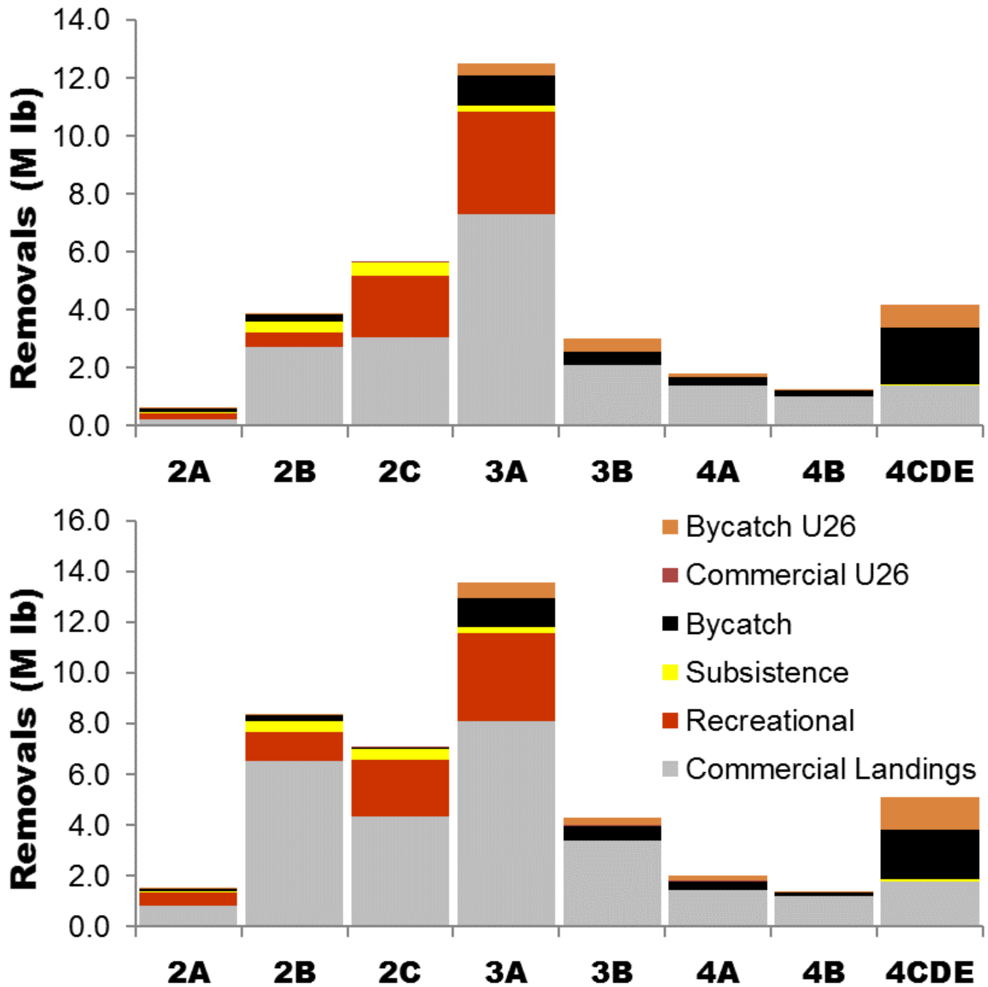

FIGURE 1. Comparison of the 2018 reference projection (top) and the 2017 adopted catch limits (bottom). Note that the scale differs between the two panels.

ALTERNATIVE PROJECTIONS

Applying the 2017 adopted TCEYs to the projection for 2018 results in a level of fishing intensity greater than the references level, an SPR of 38%. This fishing intensity is estimated to be higher than any recent value since 2013; however, these values have wide and overlapping plausibility intervals. A summary of all components for this projection is provided in Table 5; it is important to note that this projection does not result in the same FCEYs for 2018, as projections for specific components contributing to the TCEY have changed.

TABLE 5. Pacific halibut mortality projected for 2018 based on applying the same TCEYs adopted for 2017. All values reported in millions of net pounds.

	2A	2B	2C	3A	3B	4A	4B	4CDE	Total
O26 Non-FCEY									
Commercial discards	0.02	0.17	NA	NA	0.23	0.07	0.03	0.03	0.54
Bycatch	0.11	0.23	0.02	1.01	0.45	0.29	0.20	1.96	4.26
Recreational (+ discards)	NA	NA	1.43	1.86	0.01	0.02	0.00	0.00	3.31
Subsistence	NA	0.41	0.44	0.22	0.01	0.01	0.00	0.05	1.14
Total Non-FCEY	0.13	0.81	1.89	3.09	0.70	0.38	0.23	2.04	9.26
O26 FCEY									
Commercial discard	NA	NA	0.08	0.33	NA	NA	NA	NA	0.41
Recreational (+ discards)	0.54	1.15	0.92	1.87	NA	NA	NA	NA	4.47
Subsistence	0.03	NA	NA	NA	NA	NA	NA	NA	0.03
Commercial Landings	0.78	6.36	4.15	7.68	3.28	1.42	1.11	1.79	26.57
Total FCEY	1.34	7.52	5.15	9.88	3.28	1.42	1.11	1.79	31.48
TCEY	1.47	8.32	7.04	12.96	3.98	1.80	1.34	3.84	40.74
U26									
Commercial discards	0.00	0.00	0.00	0.01	0.02	0.01	0.00	0.00	0.05
Bycatch	0.00	0.02	0.00	0.42	0.44	0.11	0.01	0.79	1.79
Total U26	0.00	0.03	0.00	0.43	0.46	0.12	0.01	0.79	1.84
Total Mortality	1.47	8.35	7.04	13.39	4.44	1.92	1.35	4.62	42.58

During IM093, the Commission requested the Secretariat provide catch tables corresponding to a range of SPR values (also added in the harvest decision table), including 50, 48, 46 (the reference level), 44 and 42. These tables are provided in **APPENDIX A**, and provide more detail for the finer grid of potential management alternatives.

As requested by the Commission, additional catch tables are provided to illustrate the results of differing assumptions regarding bycatch in non-Pacific halibut target fisheries in Alaska. These three tables project differing magnitudes of bycatch, assuming the same distribution among Regulatory Areas and sizes of fish:

1) Full attainment of regulatory limits (Prohibited Species Catch (PSC) limits) in Alaska
2) 110% of PSC limits in Alaska
3) 90% of 2017 bycatch estimates in Alaska (updated in January, 2018)

The TCEY in each of the three projections was iteratively scaled to achieve the reference SPR (46%) and an initial TCEY distribution was based on the current management procedure (methods described above). The detailed results of these projections are included in **APPENDIX B**. The projection including full PSC attainment resulted in insufficient TCEY to provide for the directed Pacific halibut fishery in Regulatory Area 4CDE, and the TCEYs in all other Regulatory Areas were reduced proportionally in order to achieve the reference SPR (Table A1). A similar result occurred for the projection including 110% of the PSC limits in Alaska (Table A2). The third projection (90% of 2017 bycatch estimates) resulted in a greater proportion of the TCEY allocated to the directed Pacific halibut fisheries, and also a slightly larger TCEY (31.5 million lb, ~14,290 t) than the reference projection (Table 3) due to the effect of the reduction in U26 bycatch on the estimated SPR.

In order to provide historical context for current and future Commission decisions, a summary of historical FCEYs and TCEYs is provided in **APPENDIX C**. Tables are included reflecting the FCEYs and TCEYs consistent with the harvest policy calculations at the time, as well as FCEYs recommended by the IPHC Secretariat (until 2012 when the Decision Table approach was introduced). Adopted FCEYs and TCEYs are also included.

RECOMMENDATION/S

That the Commission:

a) **NOTE** paper IPHC-2017-AM094-11 Rev_1 which provides a summary of projections for 2018.
b) **REQUEST** any additional analysis or alternatives for presentation during the Annual Meeting.

REFERENCES

IPHC. 2017. Report of the 93rd session of the IPHC Annual Meeting (AM093). Victoria, British Columbia, Canada, 23-27 January 2017. IPHC-2017-AM093-R Rev 1, 61 p.

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APPENDICES

Appendix A: 2018 projected catch tables based on alternative SPR values.

Appendix B: 2018 projected catch tables based on alternative bycatch levels in Alaska.

Appendix C: Historical FCEYs and TCEYs.

APPENDIX A
2018 catch tables based on alternative SPR values

TABLE A1. Pacific halibut mortality projected for 2018 based on an SPR of 42% and interim management procedure for TCEY distribution. All values reported in millions of net pounds.

	2A	2B	2C	3A	3B	4A	4B	4CDE	Total
O26 Non-FCEY									
Commercial discards	0.01	0.09	NA	NA	0.16	0.07	0.03	0.03	0.38
Bycatch	0.11	0.23	0.02	1.01	0.45	0.29	0.20	1.96	4.26
Recreational (+ discards)	NA	NA	1.43	1.86	0.01	0.02	0.00	0.00	3.31
Subsistence	NA	0.41	0.44	0.22	0.01	0.01	0.00	0.05	1.14
Total Non-FCEY	0.12	0.72	1.89	3.09	0.63	0.38	0.23	2.04	9.10
O26 FCEY									
Commercial discard	NA	NA	0.07	0.36	NA	NA	NA	NA	0.44
Recreational (+ discards)	0.25	0.56	0.84	1.89	NA	NA	NA	NA	3.54
Subsistence	0.03	NA	NA	NA	NA	NA	NA	NA	0.03
Commercial Landings	0.28	3.12	3.67	8.48	2.30	1.55	1.16	1.84	22.39
Total FCEY	0.56	3.68	4.58	10.74	2.30	1.55	1.16	1.84	26.40
TCEY	0.68	4.40	6.47	13.82	2.93	1.93	1.39	3.89	35.50
U26									
Commercial discards	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.05
Bycatch	0.00	0.02	0.00	0.42	0.44	0.11	0.01	0.79	1.79
Total U26	0.00	0.02	0.00	0.43	0.45	0.12	0.01	0.79	1.83
Total Mortality	0.68	4.42	6.47	14.25	3.38	2.05	1.40	4.67	37.33

TABLE A2. Pacific halibut mortality projected for 2018 based on an SPR of 44% and interim management procedure for TCEY distribution. All values reported in millions of net pounds.

	2A	2B	2C	3A	3B	4A	4B	4CDE	Total
O26 Non-FCEY									
Commercial discards	0.01	0.08	NA	NA	0.15	0.07	0.03	0.02	0.35
Bycatch	0.11	0.23	0.02	1.01	0.45	0.29	0.20	1.96	4.26
Recreational (+ discards)	NA	NA	1.43	1.86	0.01	0.02	0.00	0.00	3.31
Subsistence	NA	0.41	0.44	0.22	0.01	0.01	0.00	0.05	1.14
Total Non-FCEY	0.12	0.71	1.89	3.09	0.62	0.38	0.23	2.04	9.06
O26 FCEY									
Commercial discard	NA	NA	0.06	0.33	NA	NA	NA	NA	0.39
Recreational (+ discards)	0.23	0.52	0.76	1.85	NA	NA	NA	NA	3.35
Subsistence	0.03	NA	NA	NA	NA	NA	NA	NA	0.03
Commercial Landings	0.25	2.86	3.31	7.59	2.10	1.42	1.06	1.57	20.17
Total FCEY	0.51	3.38	4.13	9.76	2.10	1.42	1.06	1.57	23.94
TCEY	0.63	4.09	6.01	12.85	2.72	1.79	1.29	3.61	33.00
U26									
Commercial discards	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.04
Bycatch	0.00	0.02	0.00	0.42	0.44	0.11	0.01	0.79	1.79
Total U26	0.00	0.02	0.00	0.43	0.45	0.12	0.01	0.79	1.83
Total Mortality	0.63	4.11	6.02	13.28	3.17	1.92	1.30	4.40	34.83

TABLE A3. Pacific halibut mortality projected for 2018 based on an SPR of 48% and interim management procedure for TCEY distribution. All values reported in millions of net pounds.

	2A	**2B**	**2C**	**3A**	**3B**	**4A**	**4B**	**4CDE**	**Total**
O26 Non-FCEY									
Commercial discards	0.01	0.07	NA	NA	0.12	0.06	0.03	0.02	0.30
Bycatch	0.11	0.23	0.02	1.01	0.45	0.29	0.20	1.96	4.26
Recreational (+ discards)	NA	NA	1.43	1.86	0.01	0.02	0.00	0.00	3.31
Subsistence	NA	0.41	0.44	0.22	0.01	0.01	0.00	0.05	1.14
Total Non-FCEY	0.12	0.70	1.89	3.09	0.60	0.37	0.22	2.03	9.01
O26 FCEY									
Commercial discard	NA	NA	0.05	0.27	NA	NA	NA	NA	0.33
Recreational (+ discards)	0.20	0.44	0.62	1.55	NA	NA	NA	NA	2.81
Subsistence	0.03	NA	NA	NA	NA	NA	NA	NA	0.03
Commercial Landings	0.21	2.45	2.72	6.38	1.79	1.21	0.91	1.14	16.82
Total FCEY	0.44	2.89	3.40	8.21	1.79	1.21	0.91	1.14	19.99
TCEY	0.55	3.59	5.28	11.29	2.39	1.58	1.13	3.18	29.00
U26									
Commercial discards	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.03
Bycatch	0.00	0.02	0.00	0.42	0.44	0.11	0.01	0.79	1.79
Total U26	0.00	0.02	0.00	0.43	0.45	0.12	0.01	0.79	1.82
Total Mortality	0.55	3.62	5.29	11.72	2.84	1.70	1.14	3.96	30.82

TABLE A4. Pacific halibut mortality projected for 2018 based on an SPR of 50% and interim management procedure for TCEY distribution. All values reported in millions of net pounds.

	2A	**2B**	**2C**	**3A**	**3B**	**4A**	**4B**	**4CDE**	**Total**
O26 Non-FCEY									
Commercial discards	0.00	0.06	NA	NA	0.11	0.05	0.02	0.01	0.27
Bycatch	0.11	0.23	0.02	1.01	0.45	0.29	0.20	1.96	4.26
Recreational (+ discards)	NA	NA	1.43	1.86	0.01	0.02	0.00	0.00	3.31
Subsistence	NA	0.41	0.44	0.22	0.01	0.01	0.00	0.05	1.14
Total Non-FCEY	0.11	0.70	1.89	3.09	0.59	0.36	0.22	2.03	8.98
O26 FCEY									
Commercial discard	NA	NA	0.05	0.25	NA	NA	NA	NA	0.30
Recreational (+ discards)	0.18	0.41	0.56	1.40	NA	NA	NA	NA	2.54
Subsistence	0.03	NA	NA	NA	NA	NA	NA	NA	0.03
Commercial Landings	0.19	2.24	2.43	5.77	1.64	1.11	0.84	0.93	15.15
Total FCEY	0.40	2.65	3.03	7.43	1.64	1.11	0.84	0.93	18.02
TCEY	0.51	3.35	4.92	10.51	2.23	1.47	1.06	2.96	27.00
U26									
Commercial discards	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.03
Bycatch	0.00	0.02	0.00	0.42	0.44	0.11	0.01	0.79	1.79
Total U26	0.00	0.02	0.00	0.43	0.45	0.12	0.01	0.79	1.82
Total Mortality	0.51	3.37	4.92	10.94	2.68	1.59	1.07	3.74	28.82

APPENDIX B
2018 catch tables based on alternative bycatch levels in Alaska and maintaining the reference SPR of 46%

TABLE B1. Pacific halibut mortality projected for 2018 based on full PSC attainment in Alaska and maintaining the reference SPR of 46%. All values reported in millions of net pounds.

	2A	2B	2C	3A	3B	4A	4B	4CDE	Total
O26 Non-FCEY									
Commercial discards	0.01	0.07	NA	NA	0.11	0.05	0.02	0.00	0.25
Bycatch	0.11	0.23	0.02	1.40	0.64	0.50	0.32	3.41	6.63
Recreational (+ discards)	NA	NA	1.43	1.86	0.01	0.02	0.00	0.00	3.31
Subsistence	NA	0.41	0.44	0.22	0.01	0.01	0.00	0.05	1.14
Total Non-FCEY	0.12	0.70	1.89	3.48	0.77	0.57	0.35	3.46	11.34
O26 FCEY									
Commercial discard	NA	NA	0.05	0.26	NA	NA	NA	NA	0.32
Recreational (+ discards)	0.20	0.45	0.63	1.49	NA	NA	NA	NA	2.76
Subsistence	0.03	NA	NA	NA	NA	NA	NA	NA	0.03
Commercial Landings	0.21	2.46	2.74	6.12	1.63	1.02	0.79	0.00	14.96
Total FCEY	0.44	2.91	3.42	7.87	1.63	1.02	0.79	0.00	18.06
TCEY	0.55	3.61	5.31	11.34	2.40	1.58	1.14	3.46	29.40
U26									
Commercial discards	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.03
Bycatch	0.00	0.02	0.00	0.58	0.62	0.20	0.02	1.37	2.80
Total U26	0.00	0.02	0.00	0.59	0.63	0.20	0.02	1.37	2.83
Total Mortality	0.55	3.63	5.31	11.93	3.03	1.79	1.16	4.83	32.23

TABLE B2. Pacific halibut mortality projected for 2018 based on 110% of PSC limits in Alaska and maintaining the reference SPR of 46%. All values reported in millions of net pounds.

	2A	2B	2C	3A	3B	4A	4B	4CDE	Total
O26 Non-FCEY									
Commercial discards	0.01	0.06	NA	NA	0.10	0.04	0.02	0.00	0.24
Bycatch	0.11	0.23	0.03	1.54	0.70	0.55	0.36	3.75	7.26
Recreational (+ discards)	NA	NA	1.43	1.86	0.01	0.02	0.00	0.00	3.31
Subsistence	NA	0.41	0.44	0.22	0.01	0.01	0.00	0.05	1.14
Total Non-FCEY	0.12	0.70	1.89	3.62	0.83	0.61	0.38	3.81	11.95
O26 FCEY									
Commercial discard	NA	NA	0.05	0.25	NA	NA	NA	NA	0.30
Recreational (+ discards)	0.19	0.43	0.59	1.39	NA	NA	NA	NA	2.61
Subsistence	0.03	NA	NA	NA	NA	NA	NA	NA	0.03
Commercial Landings	0.20	2.37	2.60	5.74	1.50	0.92	0.73	0.00	14.07
Total FCEY	0.42	2.80	3.25	7.38	1.50	0.92	0.73	0.00	17.00
TCEY	0.54	3.50	5.14	10.99	2.33	1.54	1.10	3.81	28.95
U26									
Commercial discards	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.03
Bycatch	0.00	0.02	0.00	0.64	0.68	0.22	0.02	1.50	3.08
Total U26	0.00	0.02	0.00	0.65	0.69	0.22	0.02	1.50	3.10
Total Mortality	0.54	3.52	5.15	11.64	3.02	1.76	1.12	5.31	32.05

TABLE B3. Pacific halibut mortality projected for 2018 based on 90% of 2017 bycatch estimates in Alaska and maintaining the reference SPR of 46%. All values reported in millions of net pounds.

	2A	2B	2C	3A	3B	4A	4B	4CDE	Total
O26 Non-FCEY									
Commercial discards	0.01	0.07	NA	NA	0.14	0.06	0.03	0.03	0.34
Bycatch	0.11	0.23	0.02	0.91	0.41	0.26	0.18	1.77	3.87
Recreational (+ discards)	NA	NA	1.43	1.86	0.01	0.02	0.00	0.00	3.31
Subsistence	NA	0.41	0.44	0.22	0.01	0.01	0.00	0.05	1.14
Total Non-FCEY	0.12	0.71	1.89	2.99	0.57	0.34	0.21	1.84	8.66
O26 FCEY									
Commercial discard	NA	NA	0.06	0.31	NA	NA	NA	NA	0.37
Recreational (+ discards)	0.22	0.49	0.71	1.75	NA	NA	NA	NA	3.17
Subsistence	0.03	NA	NA	NA	NA	NA	NA	NA	0.03
Commercial Landings	0.24	2.71	3.09	7.22	2.03	1.37	1.03	1.61	19.28
Total FCEY	0.48	3.20	3.86	9.28	2.03	1.37	1.03	1.61	22.84
TCEY	0.60	3.90	5.74	12.27	2.60	1.71	1.23	3.45	31.50
U26									
Commercial discards	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.04
Bycatch	0.00	0.02	0.00	0.38	0.39	0.10	0.01	0.71	1.61
Total U26	0.00	0.02	0.00	0.39	0.41	0.11	0.01	0.71	1.65
Total Mortality	0.60	3.93	5.74	12.65	3.00	1.82	1.24	4.16	33.15

APPENDIX C
Historical FCEYs and TCEYs

TABLE C1. Fishery Constant Exploitation Yield (FCEY; millions of net pounds) for each IPHC Regulatory Area based on the harvest strategy that was in place in that year.

	Harvest Strategy FCEY (M lbs)								
Year	**2A**	**2B**	**2C**	**3A**	**3B**	**4A**	**4B**	**4CDE**	**Total**
1994	0.49	8.32	12.66	27.02	3.58		5.00		57.07
1995	0.52	9.52	8.54	16.87	3.66		5.92		45.03
1996				Skipped Between Models					
1997	0.93	15.99	11.41	33.55	11.49		25.29		98.66
1998	1.05	15.38	15.48	38.71	30.99	11.11	10.21	13.28	136.21
1999	0.69	11.21	10.49	24.67	26.83	8.42	6.71	9.80	98.82
2000	0.83	7.85	6.31	11.94	18.36	6.42	6.77	4.13	62.61
2001	1.14	9.99	8.78	21.89	25.46	9.82	10.06	7.63	94.77
2002	1.31	11.75	8.50	24.14	28.56	11.96	7.51	11.81	105.54
2003	1.29	11.32	9.11	34.22	29.19	11.22	7.76	13.82	117.93
2004	1.81	15.78	17.03	29.98	15.60	3.47	2.81	3.39	89.87
2005	1.17	12.70	11.80	26.30	10.70	3.40	1.70	4.40	72.17
2006	1.49	13.20	10.33	24.94	8.57	3.25	1.07	3.11	65.96
2007	0.66	6.22	4.98	27.63	16.77	5.23	2.56	3.85	67.90
2008	0.65	4.65	3.92	22.25	14.27	3.51	2.70	3.68	55.63
2009	0.50	4.92	2.86	20.84	13.20	2.20	2.09	1.97	48.58
2010	0.57	5.55	2.39	18.28	8.91	2.12	2.75	3.82	44.39
2011	1.12	7.94	2.33	14.36	7.51	2.57	2.21	3.99	42.03
2012	1.15	6.63	3.21	11.92	5.07	1.57	1.87	2.47	33.89
2013	0.71	4.58	3.12	9.24	2.73	0.85	0.62	0.85	22.70
2014	0.72	4.98	4.16	9.43	2.84	0.85	0.82	0.64	24.44
2015	0.75	4.96	4.30	10.10	2.46	1.39	0.73	0.52	25.21
2016	1.02	5.22	4.62	9.27	2.71	1.30	0.92	1.64	26.70
2017	0.84	5.28	4.69	10.88	3.53	1.43	1.25	1.92	29.81

TABLE C2. Fishery Constant Exploitation Yield (FCEY, millions of net pounds) for each IPHC Regulatory Area recommended by IPHC Secretariat.

	Staff Recommendations for FCEY (M lbs)								
Year	**2A**	**2B**	**2C**	**3A**	**3B**	**4A**	**4B**	**4CDE**	**Total**
1994	0.50	9.50	12.00	26.00	4.00	1.80	2.10	1.50	57.40
1995	0.45	8.50	8.50	20.00	3.70	2.00	1.60	2.30	47.05
1996	0.52	9.52	9.00	20.00	3.70	1.95	2.31	1.66	48.66
1997	0.70	12.50	10.00	25.00	9.00	3.00	3.20	2.80	66.20
1998	0.42	7.80	8.00	33.00	6.40	1.30	1.30	0.81	59.03
1999	0.69	11.21	10.49	24.67	13.37	4.24	3.98	4.13	72.78
2000	0.83	9.97	8.40	18.31	15.03	4.97	4.91	4.13	66.55
2001	1.14	9.99	8.78	21.89	18.50	4.97	4.91	4.45	74.63
2002	1.31	11.75	8.50	22.63	17.13	4.97	3.44	4.45	74.18
2003	1.31	11.75	8.50	22.63	17.13	4.97	4.18	4.45	74.92
2004	1.48	13.80	11.31	25.06	15.60	3.47	2.81	3.39	76.92
2005	1.33	13.25	10.93	25.47	13.15	3.44	2.26	3.99	73.82
2006	1.38	13.22	10.63	25.20	10.86	3.35	1.67	3.55	69.86
2007	1.02	9.72	7.81	26.01	12.83	3.98	1.97	3.65	66.99
2008	1.00	8.06	6.21	24.22	10.90	3.10	1.86	3.89	59.24
2009	0.86	6.96	4.54	22.53	11.67	2.65	1.94	2.93	54.08
2010	0.76	6.59	3.71	19.99	9.90	2.33	2.16	3.58	49.02
2011	0.91	7.65	2.33	14.36	7.51	2.41	2.18	3.72	41.07
2012	0.99	6.63	2.62	11.92	5.07	1.57	1.87	2.47	33.14
2013	*Decision Table*								
2014									
2015									
2016									
2017									

TABLE C3. Fishery Constant Exploitation Yield (FCEY, millions of net pounds) for each IPHC Regulatory Area adopted by the Commission.

	Adopted FCEY (M lbs)								
Year	**2A**	**2B**	**2C**	**3A**	**3B**	**4A**	**4B**	**4CDE**	**Total**
1994	0.55	10.00	11.00	26.00	4.00	1.80	2.10	1.50	56.95
1995	0.52	9.52	9.00	20.00	3.70	1.95	2.31	1.66	48.66
1996	0.52	9.52	9.00	20.00	3.70	1.95	2.31	1.66	48.66
1997	0.70	12.50	10.00	25.00	9.00	2.94	3.48	2.58	66.20
1998	0.82	13.00	10.50	26.00	11.00	3.50	3.50	3.50	71.82
1999	0.76	12.10	10.49	24.67	13.37	4.24	3.98	4.45	74.06
2000	0.83	10.60	8.40	18.31	15.03	4.97	4.91	4.45	67.50
2001	1.14	10.51	8.78	21.89	16.53	4.97	4.91	4.45	73.18
2002	1.31	11.75	8.50	22.63	17.13	4.97	4.18	4.45	74.92
2003	1.31	11.75	8.50	22.63	17.13	4.97	4.18	4.45	74.92
2004	1.48	13.80	10.50	25.06	15.60	3.47	2.81	3.79	76.51
2005	1.33	13.25	10.93	25.47	13.15	3.44	2.26	3.99	73.82
2006	1.38	13.22	10.63	25.20	10.86	3.35	1.67	3.55	69.86
2007	1.34	11.47	8.51	26.20	9.22	2.89	1.44	4.10	65.17
2008	1.22	9.00	6.21	24.22	10.90	3.10	1.86	3.89	60.40
2009	0.95	7.63	5.02	21.70	10.90	2.55	1.87	3.46	54.08
2010	0.81	7.50	4.40	19.99	9.90	2.33	2.16	3.58	50.67
2011	0.91	7.65	2.33	14.36	7.51	2.41	2.18	3.72	41.07
2012	0.99	7.04	2.62	11.92	5.07	1.57	1.87	2.47	33.54
2013	0.99	7.04	2.97	11.03	4.29	1.33	1.45	1.93	31.03
2014	0.96	6.85	4.16	9.43	2.84	0.85	1.14	1.29	27.52
2015	0.97	7.04	4.65	10.10	2.65	1.39	1.14	1.29	29.22
2016	1.14	7.30	4.95	9.60	2.71	1.39	1.14	1.66	29.89
2017	1.33	7.45	5.25	10.00	3.14	1.39	1.14	1.70	31.40

TABLE C4. Total Constant Exploitation Yield (TCEY, millions of net pounds) for each IPHC Regulatory Area based on the harvest strategy that was in place in that year, and the TCEY adopted by the Commission.

	Harvest strategy TCEY (M lbs)								
Year	**2A**	**2B**	**2C**	**3A**	**3B**	**4A**	**4B**	**4CDE**	**Total**
2013	0.82	5.28	5.00	15.13	4.20	1.93	1.09	3.18	36.63
2014	0.86	5.72	5.47	12.06	3.74	1.56	1.16	2.91	33.48
2015	0.84	5.75	5.85	13.00	3.51	1.95	1.10	3.48	35.48
2016	1.13	6.10	6.21	12.43	3.41	1.85	1.14	4.05	36.31
2017	0.96	6.08	6.47	13.84	4.39	1.84	1.46	4.06	39.10

	Adopted TCEY (M lbs)								
Year	**2A**	**2B**	**2C**	**3A**	**3B**	**4A**	**4B**	**4CDE**	**Total**
2013	1.11	7.78	5.02	17.07	5.87	2.43	1.93	4.28	45.48
2014	1.11	7.64	5.47	12.05	3.73	1.56	1.49	3.58	36.65
2015	1.06	7.91	6.20	13.00	3.72	1.96	1.53	4.27	39.63
2016	1.26	8.24	6.54	12.75	3.41	1.95	1.37	4.07	39.59
2017	1.47	8.32	7.04	12.96	3.98	1.80	1.34	3.84	40.74

IPHC Management Strategy Evaluation (MSE): Update

PREPARED BY: IPHC SECRETARIAT (A. HICKS & I. STEWART; 2 DECEMBER 2017)

PURPOSE

To provide an update on the progress of the IPHC Management Strategy Evaluation process and seek recommendations for future work.

INTRODUCTION

At the 2017 Annual Meeting (AM093) Commissioners supported a revised harvest policy that separates the scale and distribution of fishing mortality (Figure 1) and accounts for fishing related mortality of Pacific halibut of all sizes and from all sources. Furthermore, the Commission identified an interim "hand-rail" or reference for harvest advice based on a *status quo* SPR (46%), which uses the average estimated coastwide SPR for the years 2014–2016 from the stock assessment. The justification for using an average SPR from recent years is that this corresponds to fishing intensities that have resulted in a stable or slightly increasing stock, indicating that, in the short-term, this may provide an appropriate fishing intensity that will result in a stable or increasing spawning biomass.

The 2016 stock assessment predicted a 68% chance that the spawning biomass will decline in 2017 and a 6% chance that it will decline more than 5% under the status quo SPR fishing intensity (Table 4 in Stewart and Hicks (2017)). The greater than 50% chance of decline, although a slight decline, is inconsistent with the justification behind the status quo SPR, indicating that the status quo SPR may not determine a fishing intensity that will meet the long-term conservation, yield, and stability goals and objectives defined by the MSAB. Therefore, an evaluation of fishing intensities, through simulation, should be done. A very brief description of the framework and components of these simulations is given below, followed by a summary of the results presented at MSAB10 in October 2017. Details of the framework presented at SRB11 (IPHC-2017-SRB11-09) and MSAB10 (IPHC-2017-MSAB10-09 Rev_1) are available on the IPHC website. First, though, draft goals, objectives, and performance metrics defined by the MSAB are presented (IPHC-2017-MSAB10-08), and the paper finishes with a discussion of ideas on how the catch may be distributed across the coast (IPHC-2017-MSAB10-10).

GOALS, OBJECTIVES, AND PERFORMANCE METRICS

Defining goals and objectives is a necessary part of a management strategy evaluation (MSE) which should be revisited often to make sure that they are inclusive and relevant. The MSAB has developed six goals with multiple objectives for each (Appendix A). Performance metrics can be developed from the goals and objectives by defining a measurable outcome, a probability (i.e., level of risk), and time-frame over which it is desired to achieve that outcome.

GOALS AND OBJECTIVES

The goals and objectives include

- biological sustainability,
- fishery sustainability, access, and stability,
- minimize discard mortality,
- minimize bycatch and bycatch mortality,

- serve consumer needs, and
- preserve biocomplexity.

These goals continue to be defined and developed.

PERFORMANCE METRICS

IPHC-2017-MSAB09-08 Rev_2 presented thirteen performance metrics associated with the current goals and objectives, presented in terms of risk. Appendix A presents a summary of the measurable objectives and associated performance metrics.

FRAMEWORK

The framework of the closed-loop simulations is a map to how the simulations are performed (Figure 2). There are four main modules to the framework:

1. The **Operating Model (OM)** is a representation of the population and the fishery. It simulates the numbers-at-age, accounting for mortality and any other important processes. It also incorporates uncertainty in the processes and may be composed of multiple models to account for structural uncertainty.
2. **Management Procedure**
    a. **Monitoring (data generation)** is the code that simulates the data from the operating model that is used by the estimation model. It can introduce variability, bias, and any other properties that are desired.
    b. The **Estimation Model (EM)** is analogous to the stock assessment. Using the data generated, it produces an annual estimate of stock size and status and provides the advice for setting the catch levels for the next time step. However, simplifications may be necessary to keep simulation times within a reasonable duration.
    c. **Harvest Rule** is the application of the estimation model output along with the scale and distribution components of the management procedure (Figure 1) to produce the catch limit for that year.

OPERATING MODEL

For the simulations to investigate a coastwide fishing intensity, the stock synthesis (Methot and Wetzel 2013) assessment software was used as an operating model. This platform is currently used for the stock assessment, and the operating model was comprised of the two coastwide assessment models (short and long time-series) currently used in the ensemble. For future MSE evaluations (in particular, investigating the Distribution component of the harvest policy) a more complex operating model will be developed that can provide outputs by defined areas or regions and can account for migration between these areas. This model has been referred to as a multi-area model.

The current stock assessment ensemble, composed of four different assessment models, includes a cross between coastwide or fleets-as-areas structuring of the data, and the length of the time series. Using a areas-as-fleets model would require generating data and distributing catch to four areas of the coast, which would involve many assumptions. In addition, without a multi-area model, there would not be feedback from migration and productivity of harvesting in different areas. Therefore, only the two coastwide models were used, but with additional variability. These models are structured to use five general sources of removals (these are aggregated for modelling purposes and do not correspond to specific fisheries or sectors): the directed commercial halibut fishery (including research landings), commercial discard mortality (previously known as wastage), bycatch (from non-halibut-target fisheries), recreational, and subsistence. The TCEY was distributed to each source in an ad hoc manner using current available information (see below).

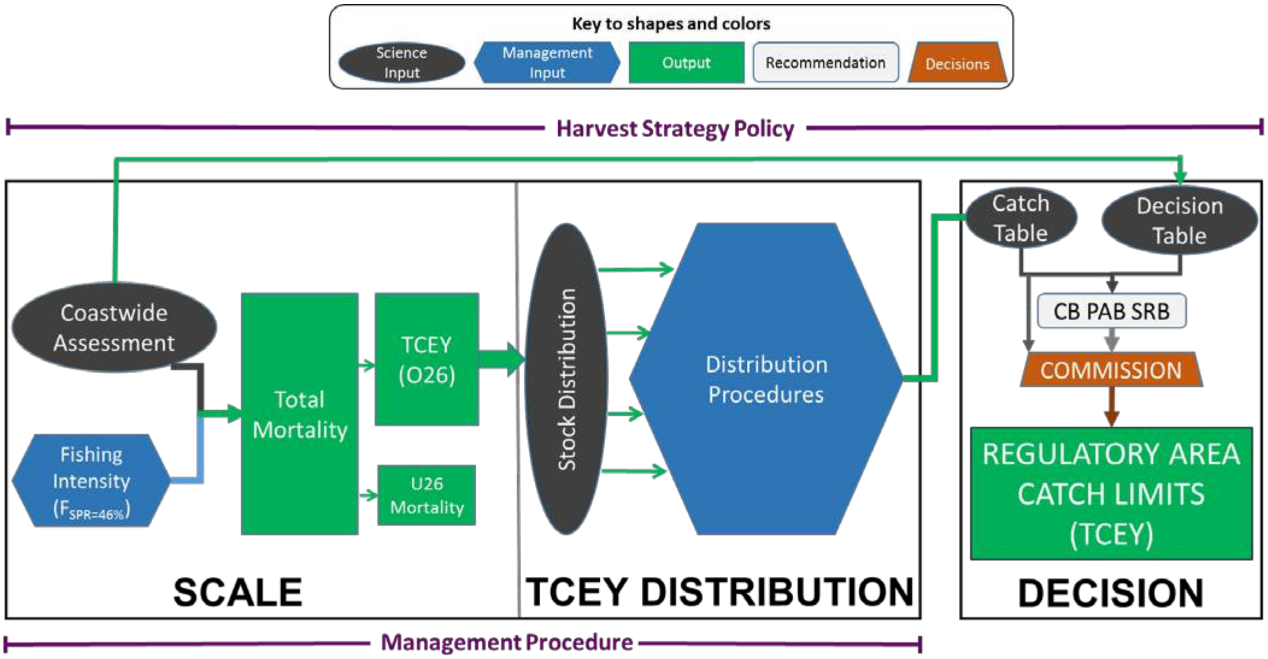

Figure 1: A pictorial description of the interim IPHC harvest strategy policy showing the separation of scale and distribution of fishing mortality. The "decision step" is when policy and decision making (not currently part of the management procedure) influences the final mortality limits.

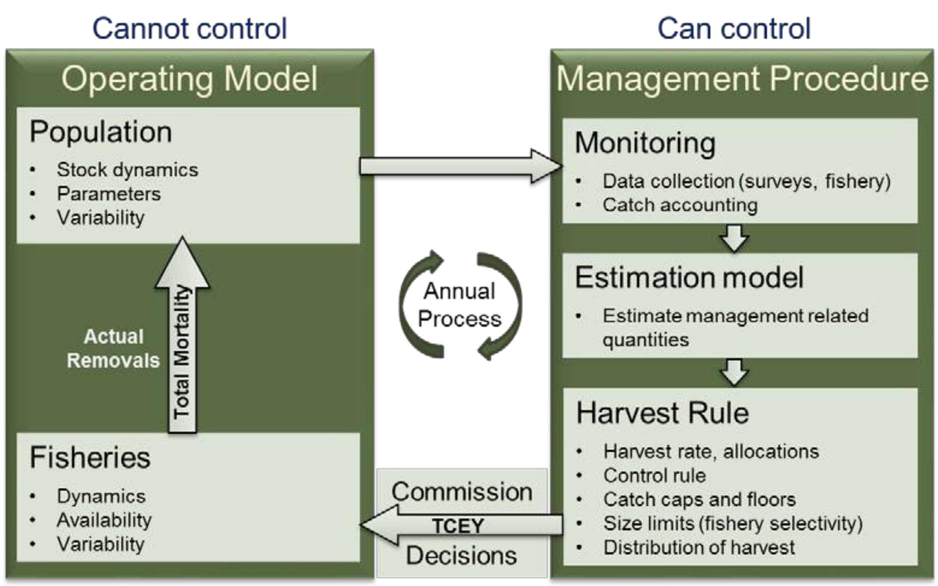

Figure 2: Diagram of the relationship between the four modules in the framework. The simulations run each module on an annual time-step, producing output that is used in the next time-step. See text for a description of operating model, monitoring, estimation model, and harvest rule.

MANAGEMENT PROCEDURE

Monitoring (Data Generation)

An estimation model was not used due to time constraints; thus, no data were generated.

Estimation Model

An option called "Perfect Information" was used in these simulations, which assumes that the population values needed to apply the harvest rule are exactly known (e.g., spawning biomass, stock status, etc.). This option is useful as a reference to the performance without the additional uncertainty of an estimation model. Perfect Information is a best-case scenario and introducing an estimation model will most likely increase variability, and therefore likely the risk in most performance metrics, sometimes in an unpredictable way.

An estimation model will be considered for future simulations, but due to time-constraints, was not used here.

Harvest Rule

The management procedure evaluated is shown in Figure 1, and the evaluations focused on the Scale portion. In addition to F_{SPR}, points in a control rule to adjust the fishing intensity at low stock status were examined (discussed below). For these simulations, the two coastwide models were used, thus mortality only needed to be distributed to the five coastwide sources of mortality (directed commercial, discard mortality, bycatch, recreational, and subsistence).

SUMMARY OF THE FRAMEWORK

A summary of the major specifications for each component is provided below, with the components listed in a specific order where the next component is dependent on the decisions for the previous components.

1) Operating Model
    a) Stock synthesis, based on coastwide assessment models (short and long models).
    b) Five sources of mortality (commercial, discard mortality, bycatch, recreational, and subsistence).
    c) Uncertainty incorporated through parameter uncertainty and model uncertainty.
2) Management Procedure
    a) Estimation Model
        i) Perfect Information (as a reference if we knew population values exactly when applying the harvest rule).
    b) Data Generation
        i) Not needed at this time.
    c) Harvest Rule
        i) A coastwide fishing intensity, SPR, which defines F_{SPR}.
        ii) A limit point, where fishing is set to zero, and a threshold point, below which fishing intensity decreases in the harvest control rule.
        iii) Mortality assigned to source based on historical information (with variability)

SCENARIOS AND UNCERTAINTY

Scenarios are alternative states of nature in the operating model, which are represented by parameter and model uncertainty. These alternative states of nature integrate over the uncertainty in the system that we cannot, or choose not to, control. The scenarios for the MSE simulations include uncertainty in the operating model processes as described in Table 1.

Table 1: Processes and associated uncertainty included in the operating model (OM). TM refers to total mortality.

Process	**Uncertainty**
Natural Mortality (M)	Estimate appropriate uncertainty when conditioning OM
Recruitment	Random, lognormal deviations with a standard deviation of 0.6
Size-at-age	Annual and cohort deviations in size-at-age with bounds
Steepness	Estimate appropriate uncertainty when conditioning OM
Regime Shifts	Autocorrelated indicator based on properties of the PDO for regime shift
TM to source	See section on allocating TM to sectors
Proportion of TCEY	Source specific. Sum of mortality across sources may not equal coastwide TM

ALLOCATING SIMULATED TOTAL MORTALITY TO SOURCE

The simulated management strategy returns a coastwide TCEY, which is then allocated to each of the five sources, with variability. In reality, there is a slight difference between the Total Mortality (TM) and the TCEY because of shortfalls and overages, but those should be dealt with on a source-specific basis. The MSAB09 meeting in May 2017 noted that the history of removals, in conjunction with uncertainties and sensitivities, can be used to allocate TM to each sector. Recent mortality or proportions of TM for each source were used to guide the allocation using relationships between the sources, or proportions of the TM.

A summary of the methods used to allocate total mortality to the five sources is provided in Table 2. Additional details can be found in IPHC-2017-MSAB10-09.

Due to specified minimum levels of subsistence and bycatch mortality, as well as random variability, it is possible that, at low levels of total mortality, there is no directed commercial mortality and that the actual total mortality exceeds the mortality determined from the management procedure. Expected values of the mortality and proportion by source plotted against Total Mortality is shown in Figure 7.

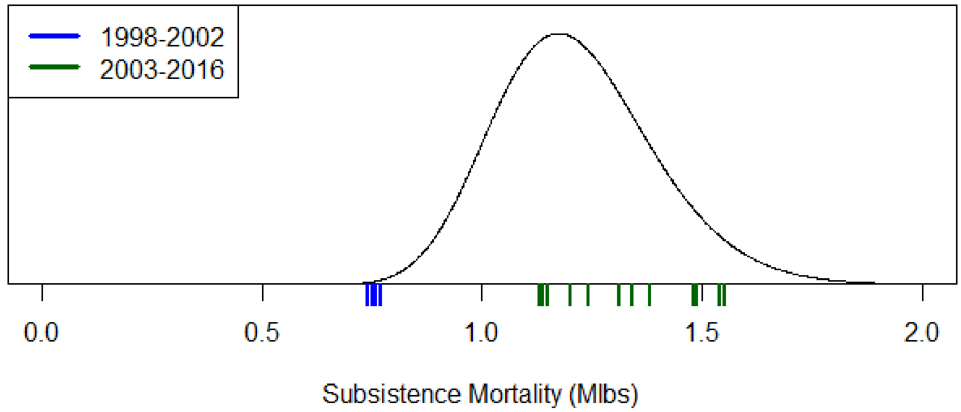

Figure 3: The lognormal distribution used to randomly generate subsistence mortality. Shown as blue and green tick lines at the bottom are the observed subsistence mortality (millions of pounds) from 1998-2002 (blue) and 2003-2016 (green).

Table 2: A summary of the methods to allocate total mortality to each of the five sources used in the operating model.

Source	**Method of allocating Total Mortality**
Subsistence	Randomly drawn from a lognormal distribution with a median of 1.2 million pounds (544 t) and a coefficient of variation (CV) of 15%. The 5th and 95th percentiles are approximately 0.9 million pounds (410 mt) and 1.5 million pounds (680 mt), respectively. This distribution, with historical mortality also plotted, is shown in Figure 3.
Bycatch	The non-directed component of the total mortality is randomly drawn from a lognormal distribution with a median of 7.0 million pounds (3,175 mt) and a CV of 20%. The 5th and 95th percentile are approximately 5.0 million pounds (2,300 mt) and 9.7 million pounds (4,400 mt), respectively. This distribution, with historical mortality also plotted, is shown in Figure 4.
Recreational	The percentage of recreational mortality was linearly decreasing with total mortality when the total mortality was less than 57 million pounds (25,855 mt). The recreational mortality was randomly drawn from a lognormal distribution with a median of 7.7 million pounds (3,493 mt) and a CV of 20% when the total mortality was greater than 57 million pounds (25,855 mt). Figure 5 shows the simulated distribution of recreational mortality at different levels of total mortality, and the recreational mortality proportion of total mortality at different levels of total mortality. Also shown are the historical observations.
Discard Mortality	The discard mortality was modelled as a function of the commercial plus discard mortality (total mortality minus subsistence, bycatch, and recreational mortality) and the size at age 8 for a male Pacific halibut (smaller fish likely results in more discard mortality). Figure 6 shows the simulated discard mortality as a proportion of the commercial plus discard mortality for various levels of commercial plus discard mortality and size at age 8 for a male Pacific halibut.
Commercial	The commercial mortality is the remainder of the total mortality after subtracting the subsistence, bycatch, sport, and discard components.

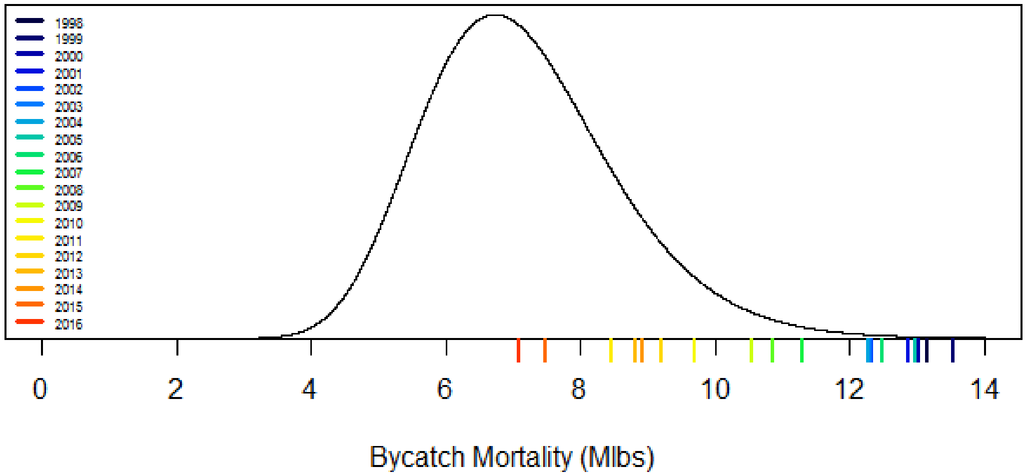

Figure 4: The lognormal distribution from which bycatch mortality is randomly drawn along with observed bycatch mortality since 1998. The colors represent years of the observations, starting with dark blue for 1998 moving to red in 2016.

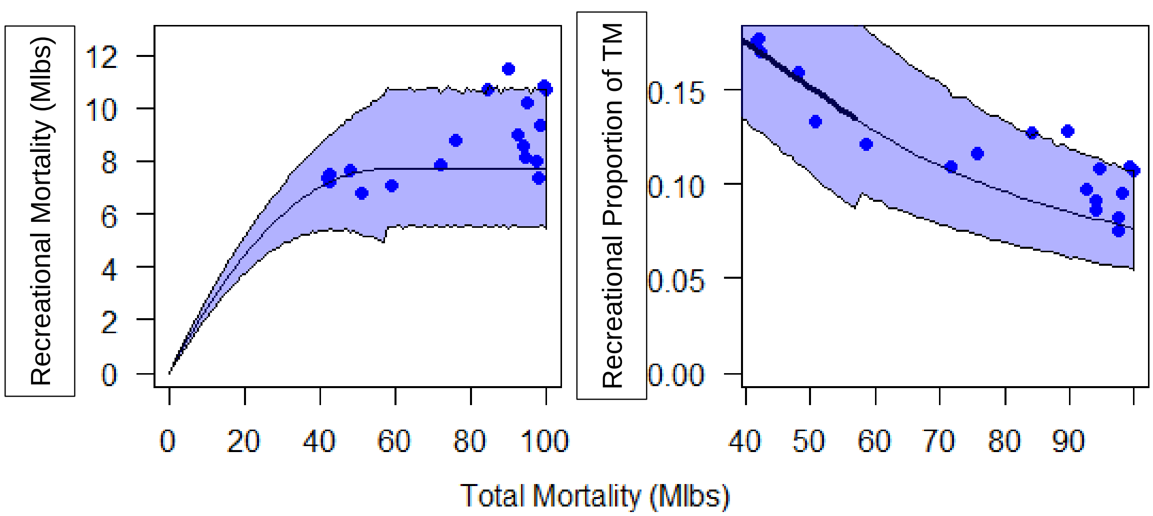

Figure 5: Simulated and observed recreational mortality (left) and the recreational proportion of the total mortality (right) with the area between the 5th and 95th quantiles shown in light blue.

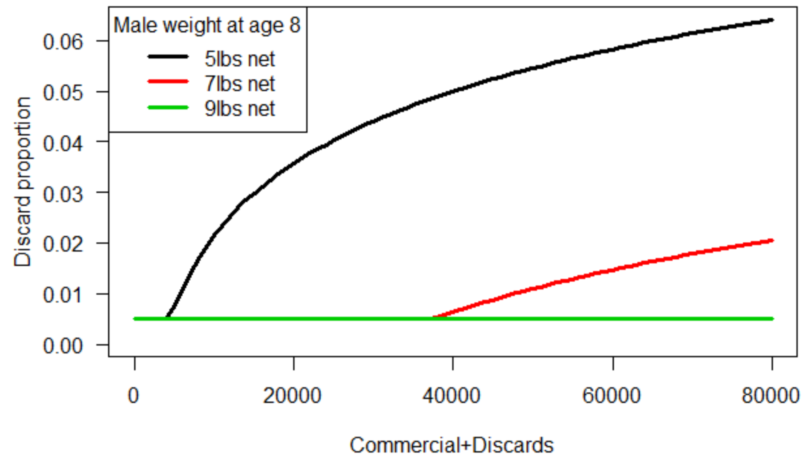

Figure 6: The discard proportion used to allocate discards as a function of commercial+discards and three different values of male weight at age 8.

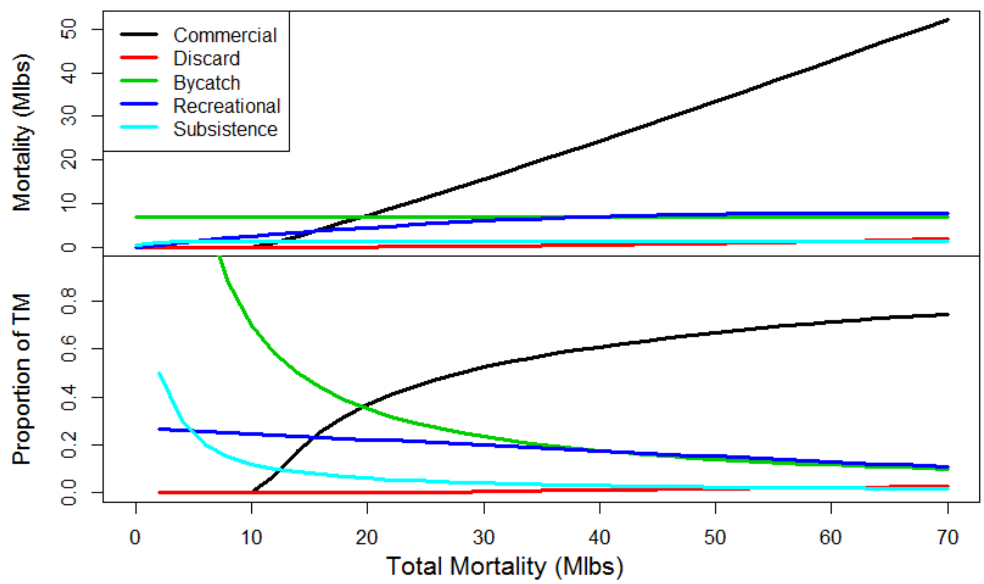

Figure 7: Average sector specific mortality (top, millions of pounds) and the sector-specific proportion of Total Mortality (TM) plotted against TM. For plotting purposes, age 8 males are 6 pounds and random variability is not included.

SIMULATING WEIGHT-AT-AGE

It is important to simulate time-varying weight-at-age because it is a very influential contributor to the yield and status of Pacific halibut. There are 82 years of weight-at-age observations in the long time-series assessment models, with an observed wide range over the years (Figure 8 and Figure 9). Many years of these data have been estimated from sparse data, and the entire time-series has been smoothed to eliminate large deviations from year to year.

Important behaviors of the historical weight-at-age time-series to consider when simulating future weight-at-age are

1. the age-specific weights-at-ages tend to increase and decrease in the same year (little evidence of lags due to specific cohort effects; Figure 8 upper plot),
2. the time-series appears to be similar to a random walk with smooth trends and few large jumps in observations (partly due to the smoothing that was done; Figure 8), and
3. there appears to be some ages that do not strictly follow the general trend (evident at the end of the time series where the sampling was likely greater; Figure 8 lower plot).

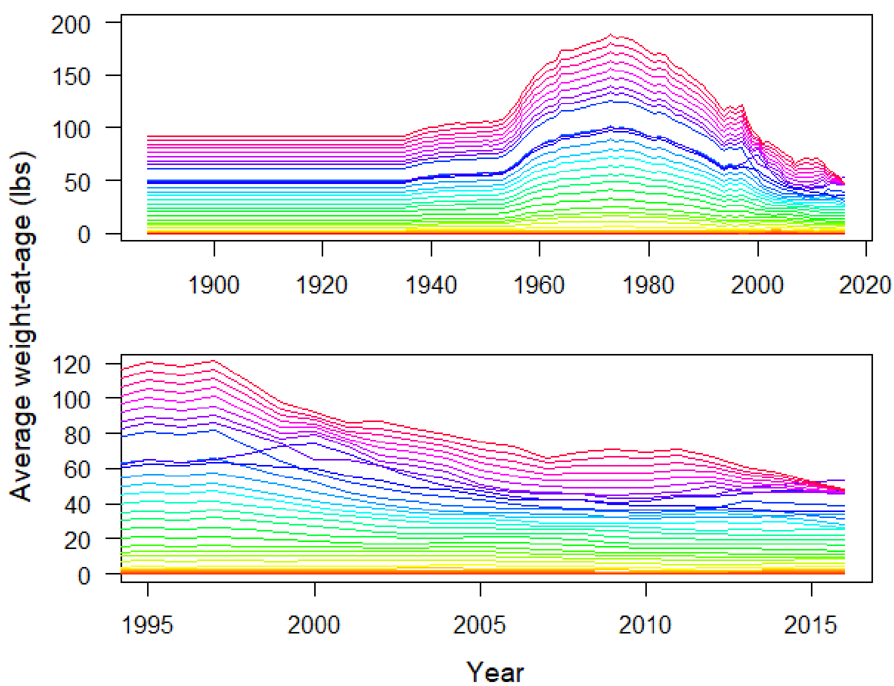

Figure 8: Historical weight-at-age as used in the long time-series assessment models. Note that the observations are smoothed over years to reduce the effect of observation error.

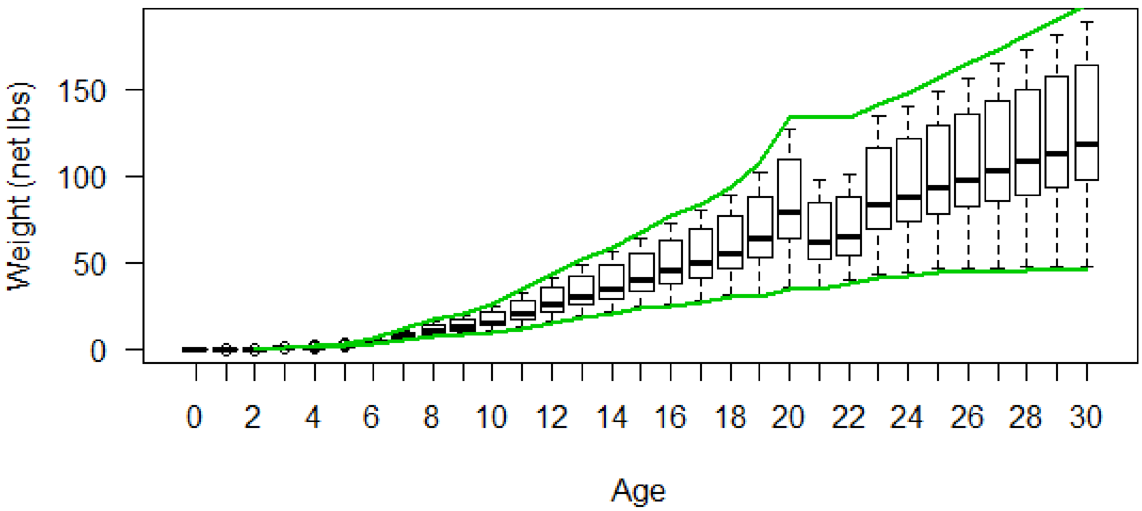

Figure 9: Boxplots of weight at ages 0 to 30 over all historical years. The green line shows the lower and upper bounds used in the simulations.

The method used to simulate weight-at-age addressed each of these behaviors in the following ways.

1. A single deviation was generated from a normal distribution with a constant standard deviation (0.05), and was a multiplier on the current year's weight-at-age to determine the weight-at-age in the next year. This made all weights for each age increase or decrease similarly.
2. A random walk was used where the weight-at-age in the next year was generated from the weight-at-age in the current year. The deviation in (1) was also correlated with past deviations to simulate periods of similar trends (ρ=0.5).
3. Deviations for each age 6 and greater were generated from a normal distribution with a constant coefficient of variation for each age (0.01), resulting in standard deviations scaled by the mean weight-at-age observed over all historical years with observations. This allows for larger deviations for older fish and provides a mechanism for the mean weight of a specific age to depart from the overall trend simulated in step 1.

The random walk could potentially traverse to extremely high values or low values (obviously negative weight-at-age is not valid). Therefore, boundary conditions were set to limit the range over which weight-at-age could vary. The boundary limits were determined from the observed range of weight at each age, and expanded 5% beyond the minimum and maximum weight at each age observed. Two upper boundaries (ages 21 and 22) were expanded further to equal the upper boundary of age 20 (Figure 9). The random walk simulations remained within the bounds by applying the following algorithm.

1. If a weight-at-age was simulated to be beyond the bounds, the deviations for only the ages where the age-specific bounds were exceeded were reduced by one-half and applied again to determine if it still exceeded the bounds.
2. Repeat step (1) until no age-specific bounds were exceeded.

Example simulated weight-at-age time series are shown in Figure 10 and Figure 11.

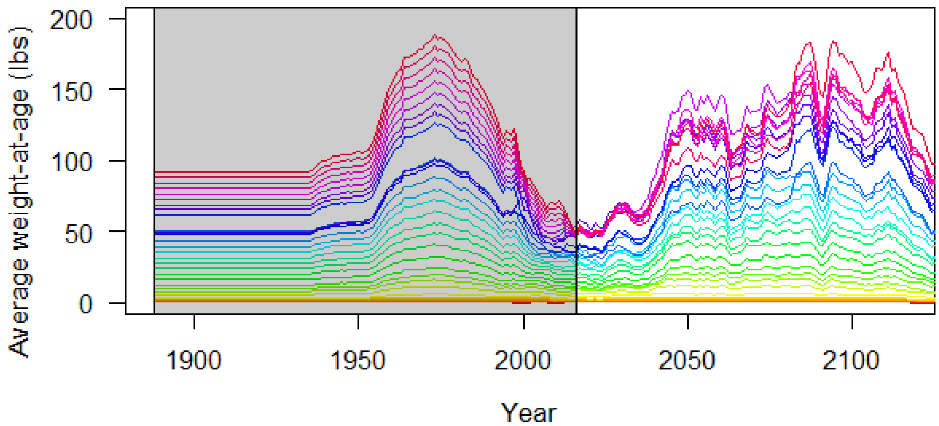

Figure 10: One potential simulated female weight at age (2017-2116). The historical period is shown for reference (1888-2016).

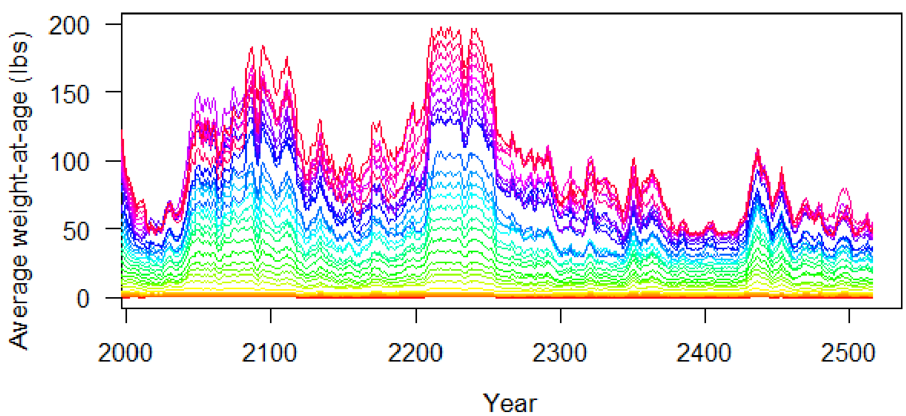

Figure 11: One potential simulation of female weight-at-age for 500 years.

SIMULATING REGIME SHIFTS

An environmental regime is used in the stock assessment to determine if average recruitment is high or low. This is based on the pacific Decadal Oscillation (PDO, http://research.jisao.washington.edu/pdo/, Mantua et al. 1997, Figure 12) and the value is 0 or 1 depending on classified cool or warm years, respectively (Figure 13).

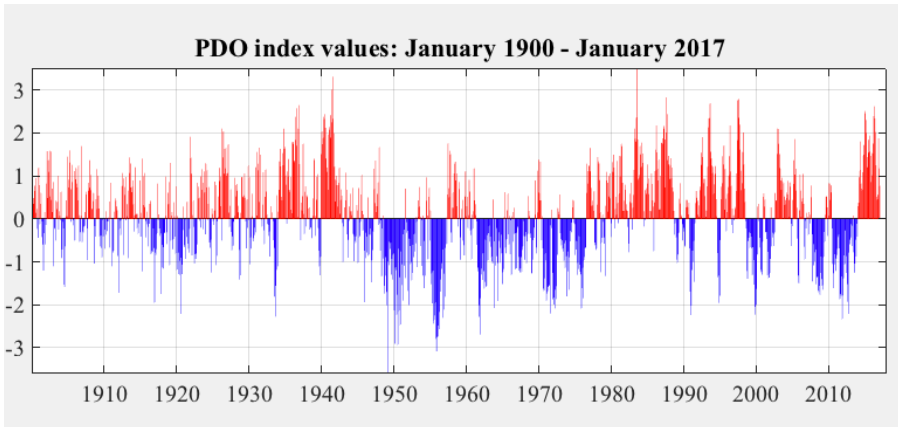

Figure 12: Pacific Decadal Oscillation (PDO) (figure from http://research.jisao.washington.edu/pdo/).

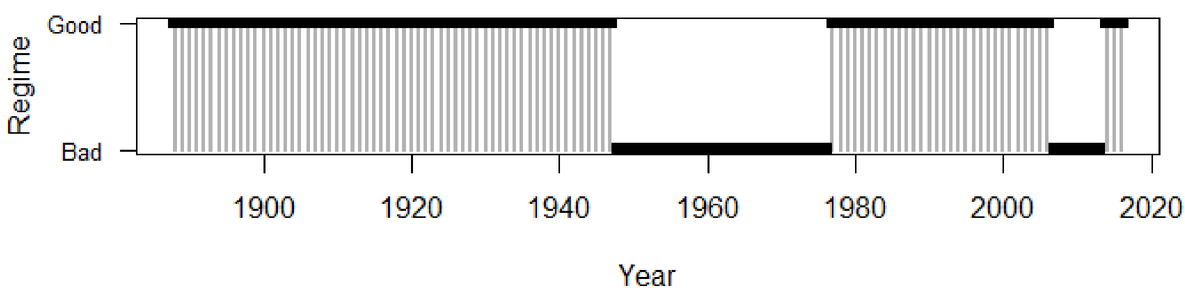

Figure 13: Good and bad regimes used in the Pacific halibut stock assessment for 1888-2016.

The regime was simulated in the MSE by generating a 0 or 1 to indicate the regime in that future year. To encourage runs of a regime between 15 and 30 years (an assumption of the common periodicity, although recent years have suggested less), the environmental index was simulated as a semi-Markov process, where the next year depends on the current year. However, the probability of changing to the opposite regime was a function of the length of the current regime with a probability of changing equal to 0.5 at 30 years, and a very high probability of changing at 40 years.

The simulated length of a regime was most often between 20 and 30 years, with occasional runs between 5 and 20 years.

Some Additional Sources of Uncertainty Not Currently Considered

Some sources of uncertainty that were not considered, but will likely be considered in the future are:

Selectivity: It may be desirable for the time-varying selectivity for at least commercial gears to be linked to changes in weight-at-age.

Migration: Migration will require a multi-area model and hypotheses about movement. A multi-area model is being developed with four regions. Migration hypotheses will be informed by tagging data as well as other observations from various fisheries and surveys.

Conditioning the Operating Model

The operating model (OM) should be a reasonable depiction of reality with an appropriate level of uncertainty. The OM consists of two stock synthesis (Methot and Wetzel 2013), models parameterized similarly to the short and long coastwide assessment models for Pacific halibut (Stewart 2015 appendix of RARA). Each model is conditioned by fitting to the same data used in the 2016 stock assessment (Stewart & Hicks 2017). To evaluate and choose management procedures that are robust to uncertainty in future states of the population, many assumptions in the assessment model were freed up to characterize a wider range of possibilities in the future. Estimating natural mortality for both sexes in both models and estimating steepness were the only changes to estimated parameters from the assessment model when conditioning.

Parameter variability was characterized by randomly sampling parameters for each simulation from a truncated multivariate normal distribution conditioned to data. Unrealistic simulated historical trajectories (e.g., the population could not support the observed catch) were eliminated.

The conditioned OM has a considerable amount of extra variability compared to the ensemble stock assessment (Figure 14). The assessment ensemble contains four individual models while the OM contains only two, which is why the trend at the end of the time series is slightly different, although well within the uncertainty.

A potential issue highlighted at SRB11 was that starting the OM in 2017 with such a wide range of uncertainty will not adequately characterize our best knowledge of the near future (short-term) and the medium-term (before long-term equilibrium). However, the long-term results are appropriate since the current state would not have an effect, and the wide range of uncertainty is a result of the chosen uncertainties to evaluate harvest strategies against. One solution to provide short-term results would be to start the OM from the assessment model and its uncertainty (the blue shaded region in Figure 14). However, this may not be indicative of our best predictions for the short-term or medium-term because of the wider range of uncertainty in the parameters that will result in large deviations at the start of the simulations and because the OM is not the best representation of the current state of the population (i.e., the ensemble assessment is with four models).

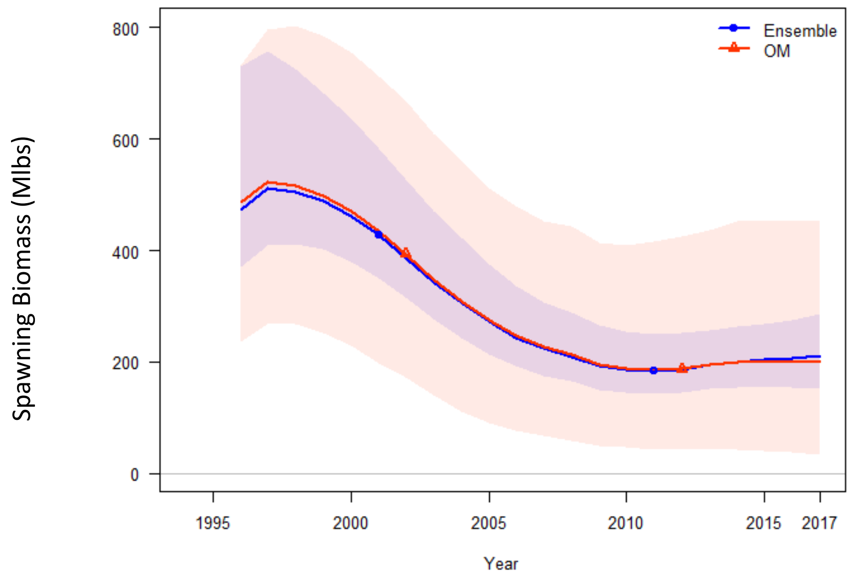

Figure 14: The conditioned operating model (red) compared to the stock assessment ensemble (blue) with 95% credibility intervals.

Instead, we present results for the long-term to identify management procedures that meet the goals and objectives defined by the MSAB. These management procedures can then be further investigated using short-term predictions directly from the assessment model (1-3 years from the end of the time-series; 8-11 years from the most recent information on recruitment) to identify how they may affect the fishery now. For example, the decision table already presents risk metrics for various SPR values, and these results can be used to evaluate the immediate consequences to the fishery of a change in the harvest policy. Additionally, transitory behavior from the short-term to the long-term can be highlighted in future analyses. This may be describing the trends of various trajectories (e.g., catch or spawning biomass) between the short-term or long-term. For example, the short-term may indicate low catches with a higher catch on average in the long-term, but to get there, it appears that catches may be low for a short time before increasing.

The reason that it is difficult to quantify medium-term results is that we have very little predictive power for that time-period. In the short-term, we have an idea of where we currently are and what may occur in the next few years (e.g., we have some data indicating recruitment and weight-at-age). In the long-term, we are summarizing statistics over a wide range of uncertainty and all possible states (we do not need to know anything about the current state of the population). However, that uncertainty is not well described in the medium-term because it is partially dependent on the current state, but also affected by the wide range of possibilities. Therefore. it could be very misleading to present medium-term results as unbiased and informative predictions.

SIMULATIONS

The simulations focused on the scale component of the harvest strategy policy (Figure 1) and distributing the TCEY was not necessary because the operating model used only coastwide models. As a result, IPHC Regulatory Area-specific performance metrics cannot be calculated at this time.

MANAGEMENT PROCEDURES

Simulations were used to investigate the fishing intensity in the scale component of the harvest strategy policy. A harvest control rule consists of a procedural SPR, a threshold value, and a limit value (Figure 15). The procedural SPR determines the fishing intensity (F_{SPR}) when stock status (measured from dynamic relative spawning biomass, dRSB) is above a threshold. The threshold is the dRSB where the fishing intensity is reduced if stock status falls below this value. The limit is the point at which fishing is halted if the dRSB is below this value. Dynamic relative spawning biomass (dRSB) is a measure of stock status that measures the effect of fishing on the population by accounting for changing conditions.

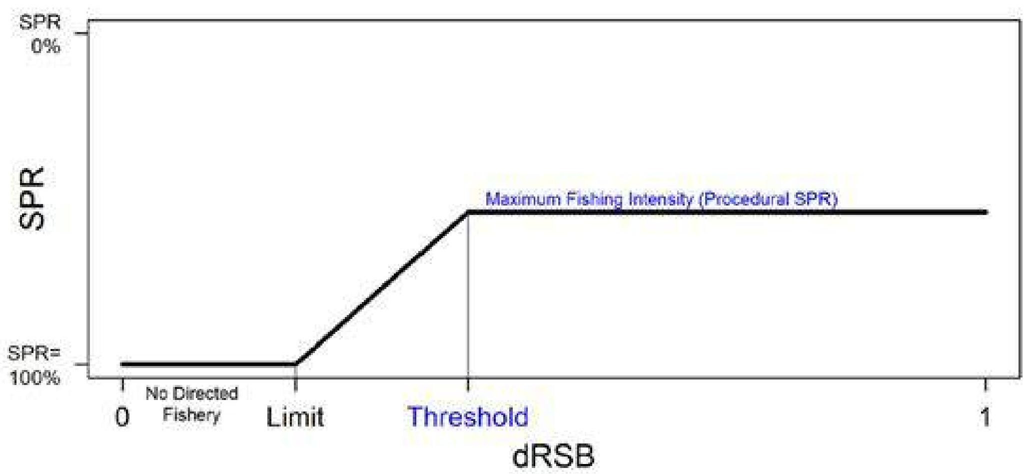

Figure 15: The harvest control rule with stock status (dRSB) on the horizontal axis and SPR (spawning potential ratio) on the vertical axis (determining fishing intensity, F_{SPR}). Note that the SPR values on the vertical axis range from 100% at the bottom to 0% at the top to indicate increasing fishing intensity. Fishing intensity decreases when stock status is below the threshold point, and fishing is halted when stock status is less than the limit point. Items in blue were evaluated in these simulations.

The procedural SPR and the threshold value of the harvest control rule were the focus for evaluation. A ceiling (maximum) on total mortality and a floor (minimum) on total mortality were also evaluated, but are not reported in this document. Table 3 lists the specific values of the elements of the management procedure that were investigated.

Table 3: Recommendation from MSAB09 (paragraph 28 of IPHC-2017-MSAB09-R) of elements of the management procedure to evaluate.

Element of the Management Procedure	Values
Procedural SPR	0.25 – 0.60, higher density near 46%
Control Points (thresholds:limits)	30:20, 40:20
Ceiling on Total Mortality	85 million pounds (38,555 mt)
Floor on Total Mortality	30 million pounds (13,608 mt)

RESULTS

Results from the simulations are presented in relation to two goals: 1) biological sustainability, and 2) fishery sustainability, stability, and access (see Appendix A). Many performance metrics were developed, but only performance metrics identified as important to MSAB members and directly related to the current goals and objectives were reported. Performance metrics related to the goals of minimizing discard mortality, minimizing bycatch, and preserving biocomplexity were not reported since the modelling did not provide adequate feedback in the simulation of these concepts. These goal and objectives will be addressed in future analyses.

Performance metrics are reported as a probability, a median average, or an average annual variability (AAV; Table 4 and Table 5). When a performance metric is reported as a probability, it can thought of as the probability that the event occurs in the final year of the simulation (i.e., long-term). An alternative probability not reported here (although useful) was the probability that an event occurred in any one of ten years, when the stock is at equilibrium (i.e., long-term). This alternative probability will be reported in the future after further refinement of the details. A “median average” performance metric provides a measure of an absolute value, and is determined by calculating the average of the last ten years for each simulation and then finding the median of these averages. The averages from each simulation form a distribution from which any summary statistic can be calculated. Finally, the average annual variability is a measure of the average annual change in the catch and is determined by calculating the change in catch between each year in a ten-year period and dividing by the average catch over that same period. It is also a distribution across simulations and can be summarized by any statistic (most commonly the median).

Four performance metrics were reported for the biological sustainability goal. The median average dynamic relative spawning biomass (dRSB), the median average number of mature females in millions, the probability that dRSB is less than 20%, and the probability that dRSB is less than 30%. The reference points 20% and 30% were used because they match the current limit and threshold points, and objectives of avoiding very low stock sizes (20%) and low stock sizes (30%) were stated during the development of the previous harvest policy. However, these target reference points may be updated in future iterations of this process.

Ten performance metrics were reported to reflect fishery objectives. The median average total mortality and median average FCEY (defined here, for simplicity, as all removals except bycatch) were calculated coastwide. What is labeled FCEY here is not the true FCEY, as each Regulatory Area has a very specific definition of FCEY, but it is a proxy including commercial, discard, recreational, and subsistence mortality. The 10th and 90th percentiles of the total mortality were reported to provide insight into the variability. The probability of no commercial mortality is also reported and can be a result of the stock status being below the limit or the total mortality being at a low level such that there is not enough for the commercial fishery after allocating to other sectors. The probability that the FCEY is less than 50.6 million pounds (23,000 mt) was also reported, where 50.6 million pounds is 70% of the average from 1993–2012 (72.25 million pounds; 32,800 mt). The probability that the total mortality decreases by more than 15% from the previous year measures the chance of a large decrease. Finally, three statistics for the average annual variability (AAV) measure the median average annual change in total, FCEY, and commercial mortalities.

An additional metric not related to any of the goals was the realized SPR. This metric reports the median average SPR and can be different than the procedural SPR due mostly to the reduction in fishing intensity when stock status is less than the threshold value in the harvest control rule, but a small part is due to variability in the sources of mortality.

The performance metrics related to biological sustainability show higher relative spawning biomass as SPR increases (i.e., fishing intensity decreases; Table 4 and Figure 16 panel a), but less change at lower SPR because the stock status is often below the threshold where the SPR is reduced. The realized SPR shows the same pattern (Table 4 and Figure 16 panel d). The effect of the control rule is also seen with a higher dRSB at lower SPR when using the 40:20 control rule, but similar dRSB at higher SPR's since the control rule would rarely be invoked at these higher SPR's (lower fishing intensities (Table 5 and Figure 16 panel a). With a control rule, as the target SPR declines, the realized SPR levels off at a minimum value (Table 4 and Figure 16, panel d).

Performance metrics related to fishery sustainability show that yield, both in terms of total mortality (TM) and FCEY (all mortality minus bycatch), is similar across values of SPR between 25% and 40%, but declines at higher values of SPR (i.e., lower fishing intensity; Figure 17). The maximum median average total mortality is around 40 million pounds (18,000 mt), but the variability from the simulations show that total mortality commonly ranges from less than 20 million pounds (9,000 mt) to over 80 million pounds (36,000 mt). The variability in total mortality is influenced by uncertainty in the population parameters (e.g., natural mortality) as well as variation in weight-at-age and recruitment.

The median average FCEY was less than 34 million pounds (15,000 mt) for the range of SPR's and control rules simulated, thus the probabilities of being less than 50.6 million pounds (23,000 mt; 70% of the 1993-2012 benchmark FCEY) is greater than 65%. The range of years used for this benchmark represent a period of time with high weight-at-age and some extremely large recruitment events, and is atypical of average conditions.

The variability in yield is represented with a number of performance metrics (Figure 16 panel c, Table 4, and Table 5). A decrease in the total mortality from one year to the next of greater than 15% was more likely at low SPRs (more often below the stock status threshold) and ranged from 24% at an SPR of 25% to 3% at an SPR of 60%. The probability of a large decrease was less at an SPR of 30% with a threshold of 40% compared to a threshold of 30% because the ramp of the harvest control rule was shallower. The average annual variability (AAV) showed that the minimum variability in total mortality that is likely to be achieved with these management procedures is around 6%. However, the trade-off between variability and yield becomes apparent at an SPR of 30%, where a slight increase in yield results in a nearly doubling of yield variability (Figure 16, panels b and c). The AAV for FCEY and commercial catch was greater than for total mortality.

Table 4: Performance metrics determined from outputs of the closed-loop simulations for various fishing intensities indicated by a procedural Spawning Potential Ratio (SPR) and a 30:20 threshold:limit in the harvest control rule.

	30:20 Threshold:Limit										
	High Fishing Intensity										**Low Fishing Intensity**
Procedural SPR	**25%**	**30%**	**40%**	**42%**	**44%**	**46%**	**48%**	**50%**	**55%**	**60%**	**100%**
Median average realized SPR	39%	39%	42%	44%	46%	47%	49%	51%	56%	61%	93%
Biological Sustainability											
Median average dRSB	29%	29%	34%	36%	38%	41%	43%	45%	50%	56%	92%
Median Average # of Mature Females (million)	5.87	5.97	6.73	6.98	7.19	7.59	7.91	8.03	9.01	9.75	13.63
P(dRSB<20%)	3%	3%	3%	2%	2%	2%	2%	2%	1%	1%	0%
P(dRSB<30%)	78%	64%	19%	13%	10%	7%	6%	5%	3%	2%	0%
Fishery Sustainability											
Median average Total Mortality (Mlbs)	40.09	39.56	39.91	37.62	35.27	36.37	34.71	35.50	33.48	32.72	7.63
10^{th} & 90^{th} percentiles TM (Mlbs)	13 113	13 126	13 109	13 101	14 98	13 99	13 90	13 91	13 82	12 75	7 8
Median average FCEY (Mlbs)	32.86	32.69	32.72	30.76	28.31	29.23	27.57	28.14	26.33	25.38	0.50
P(No Commercial)	11%	9%	8%	8%	7%	8%	8%	8%	8%	10%	100%
P(FCEY < 50.6 Mlbs)	69%	66%	69%	69%	72%	73%	74%	74%	77%	80%	100%
P(decrease TM > 15%)	24%	17%	6%	5%	5%	5%	5%	4%	4%	3%	27%
Median catch variability (AAV of TM)	19%	13%	7%	7%	6%	6%	6%	6%	6%	6%	20%
Median catch variability (AAV of FCEY)	25%	17%	10%	10%	10%	10%	10%	10%	10%	10%	17%
Median catch variability (AAV of Commercial)	34%	23%	13%	13%	14%	13%	14%	14%	14%	14%	0%

Table 5: Performance metrics determined from outputs of the closed-loop simulations for various fishing intensities indicated by a procedural Spawning Potential Ratio (SPR) and a 40:20 threshold:limit in the harvest control rule. SPR values with missing numbers did not have simulations, but are included for comparison to Table 4.

	40:20 Threshold:Limit										
	High Fishing Intensity										**Low Fishing Intensity**
Procedural SPR	**25%**	**30%**	**40%**	**42%**	**44%**	**46%**	**48%**	**50%**	**55%**	**60%**	**100%**
Median average realized SPR		44%	46%			48%		51%		61%	93%
Biological Sustainability											
Median average dRSB		37%	39%			41%		45%		56%	92%
Median Average # of Mature Females (million)		6.92	7.38			7.67		8.32		9.60	13.63
P(dRSB<20%)		1%	1%			1%		2%		1%	0%
P(dRSB<30%)		3%	3%			3%		3%		2%	0%
Fishery Sustainability											
Median average Total Mortality (Mlbs)		39.00	38.57			34.78		34.51		29.27	7.63
10th & 90th percentiles TM (Mlbs)		13 108	14 109			13 96		13 95		12 80	7 8
Median average FCEY (Mlbs)		31.75	31.52			27.65		27.26		22.31	0.50
P(No Commercial)		9%	7%			8%		8%		10%	100%
P(FCEY < 50.6 Mlbs)		68%	69%			73%		72%		80%	100%
P(decrease TM > 15%)		12%	8%			6%		4%		3%	27%
Median catch variability (AAV of TM)		10%	8%			7%		6%		6%	20%
Median catch variability (AAV of FCEY)		14%	12%			11%		10%		10%	17%
Median catch variability (AAV of Commercial)		19%	16%			14%		13%		15%	0%

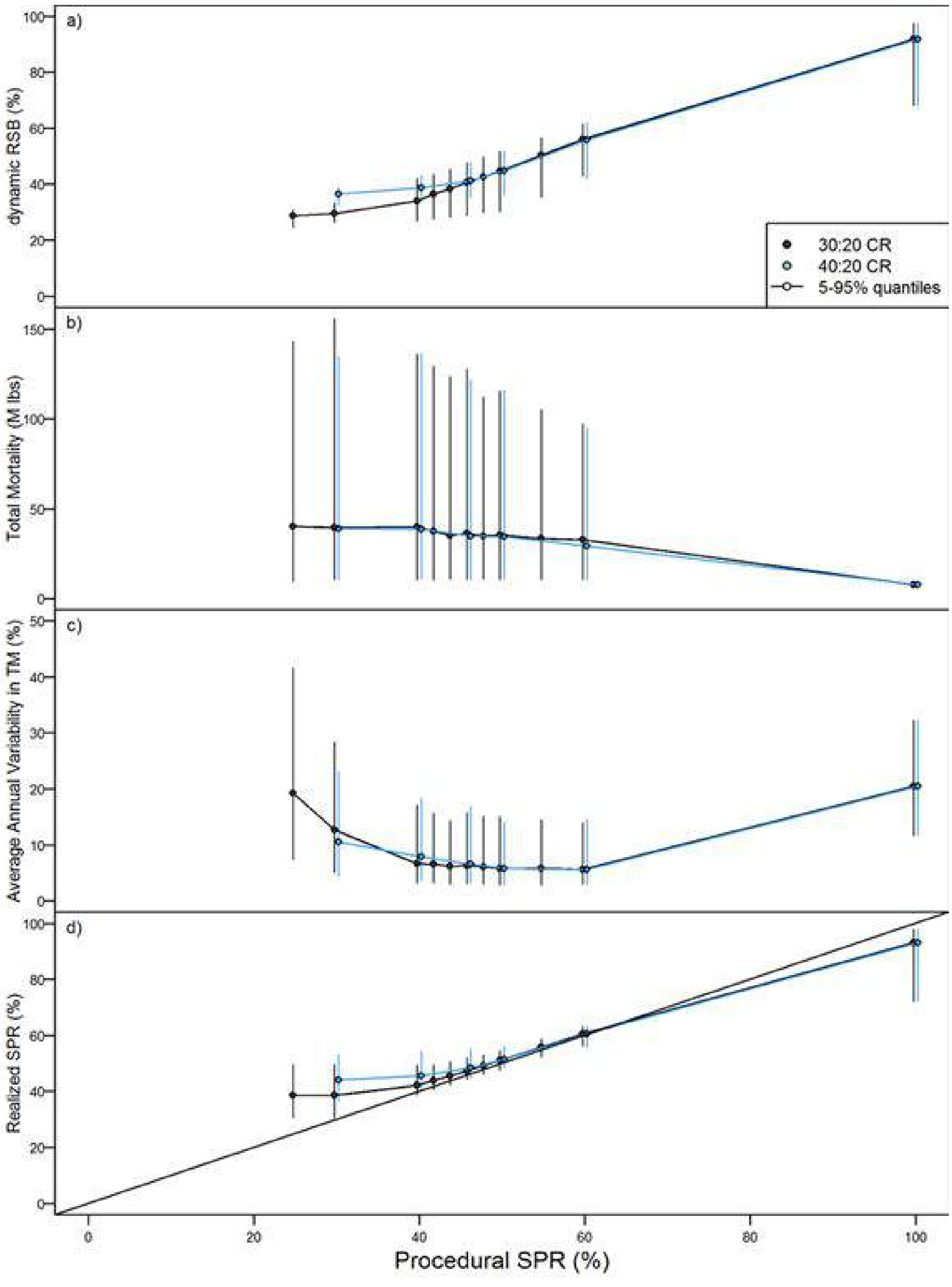

Figure 16: Performance metrics plotted against the procedural SPR (horizontal axis) for different threshold:limit combinations (30:20 in black and 40:20 in blue). Panel a) shows the dynamic relative spawning biomass (biological sustainability goal), panel b) shows the total mortality (fishery sustainability goal), and panel c) shows the average annual variability for total mortality (fishery stability goal). Panel d) shows the realized SPR.

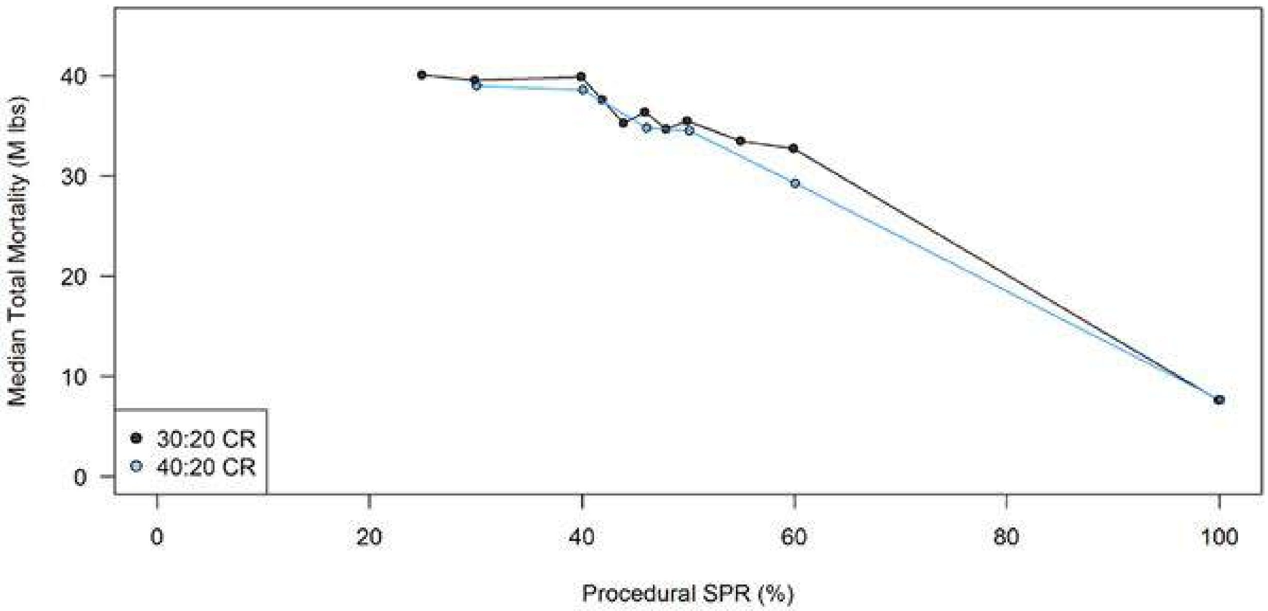

Figure 17: Median average total mortality (Mlbs) plotted against procedural SPR for two different threshold:limit combinations (30:20 in black and 40:20 in blue).

Overall, the 46% reference SPR (*status quo* at AM093) is within the range of SPR's that would likely meet the goals and objectives defined by the MSAB. However, an important caveat and caution is that these results use perfect information to determine total mortality from the harvest control rule. Future simulations will incorporate appropriate imperfect information, but insight can be gained from these simulations. For example, the performance of the lowest SPRs (high fishing intensity) will worsen with imperfect information, and it is apparent that variability in yield increases greatly with little gain in yield at SPR values of 30% and lower (Figure 16 and Table 4). Therefore, values of SPR lower than 30% are unlikely to meet fishery stability objectives.

IDEAS ON ESTIMATING STOCK DISTRIBUTION AND DISTRIBUTING THE TCEY

Recommendations from the 93rd IPHC Annual Meeting (AM093) included the following related to distributing TCEY among the Regulatory Areas (IPHC-2017-AM093-R).

> *Para. 30. **NOTING** that the Commission has indicated its interest in clearer accounting for all mortality, and that Canada has put forward catch limit allocation principles proposing that catch limits include all sources of mortality for each regulatory area, the Commission **RECOMMENDED** that the presentation of harvest advice be changed to be based on the TCEY… which includes all O26 commercial, sport, personal use/subsistence, bycatch and wastage removals, for the 2018 Annual Meeting cycle, as a step towards more comprehensive and responsible management of the resource that will result in the negotiation of Regulatory Area-specific catch limits based on TCEYs.*
>
> *Para. 38. **NOTING** that the term "apportionment" has connotations broader than stock distribution that are not reflective of its meaning in the IPHC context, the Commission **RECOMMENDED** that it be replaced with the terms "stock distribution" or "stock distribution model(ing)".*
>
> *Para. 39. The Commission **RECOMMENDED** that the IPHC Management Strategy Evaluation (MSE) process be accelerated so that more of the elements contained within the current Program of Work are delivered at the 94th Annual Meeting of the Commission in 2018.*
>
> *Para. 40. The Commission **REQUESTED** that the IPHC Secretariat initiate a process to develop alternative, biologically based stock distribution strategies for consideration by the Commission and its subsidiary bodies. This should also be incorporated into the MSE Program of Work.*

There is a strong interest in beginning evaluations of the distribution part of the updated harvest strategy policy (Figure 1). Compared to only evaluating the scale component, also evaluating the distribution component increases the complexity of the simulations, involves additional programming, and requires additional stakeholder guidance (i.e., MSAB meetings). The most difficult aspect of accelerating the timeline in the work plan is ensuring that the MSAB is providing the necessary feedback and guidance to the MSE process. Regardless, it has been beneficial to begin the conversation with the MSAB and to begin identifying management procedures related to distributing catch among the Regulatory Areas.

TCEY DISTRIBUTION

TCEY distribution is the management procedure for distributing the TCEY among Regulatory Areas and may be comprised of a purely scientific component to distribute the TCEY in proportion to its estimated biomass in each area (stock distribution) and/or the management component of distributing harvest based on additional considerations (distribution procedures). Stock distribution may be focused on biological areas rather than management areas, and may distribute the TCEY to Regional Areas composed of multiple Regulatory Areas (Figure 18, also see IPHC-2017-MSAB09-09). Changes to that biological distribution and further distributing or allocating the TCEY to individual Regulatory Areas could be different components of the management procedure (Figure 19).

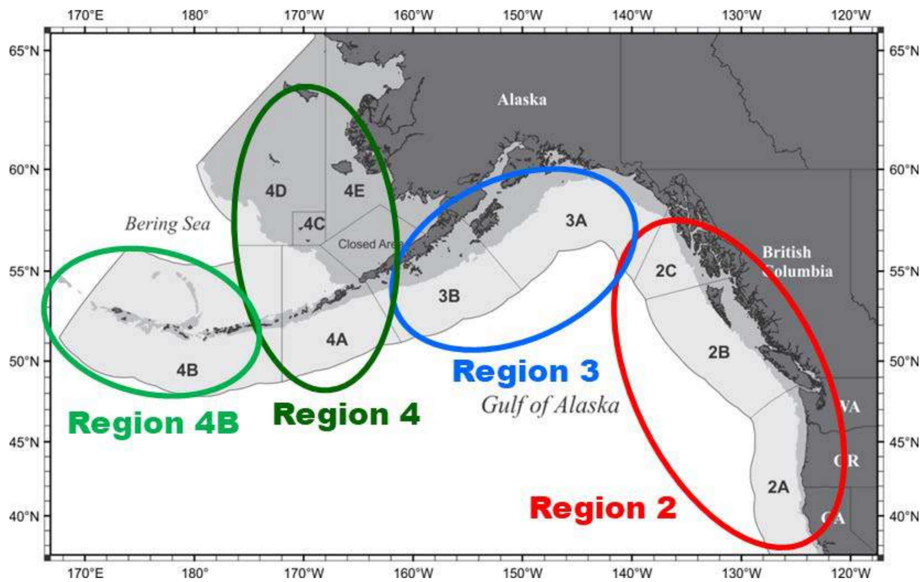

Figure 18: Proposed biological stock distribution Regions.

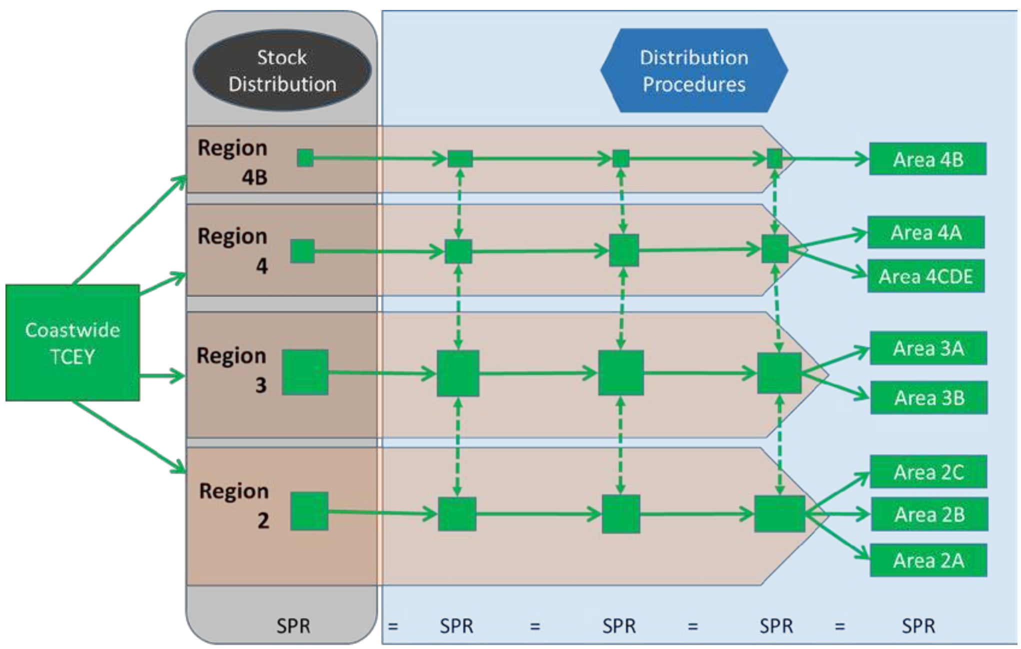

Figure 19: The process of distributing the TCEY to Regulatory Areas from the coastwide TCEY (TCEY distribution in Figure 1). The first step is to distribute the TCEY to regional areas based on the estimate of stock distribution. Following this, a series of adjustments may be made based on observations or social, economic, and other considerations. Finally, the adjusted regional TCEY's are allocated to Regulatory Areas. The allocation to Regulatory Areas may occur at any point after stock distribution and may also be external to the management procedure and instead part of the decision-making process (see Figure 1). The dashed arrows represent balancing that is required to maintain a constant SPR, but the allocation step may deviate from the defined SPR.

Stock Distribution

Stock distribution is the analytical process of estimating the proportion of biomass in defined areas of the coast relative to the coastwide biomass. This is a science product and the outcome does not need to specifically align with IPHC Regulatory Areas.

Stock distribution has been determined from the O32 space-time model estimates of the relative proportion of biomass in each Regulatory Area using data from the annual IPHC fisheries-independent setline survey. There may be some disconnect with the TCEY, which is meant to represent the O26 mortality. The SRB agreed (para. 44 of IPHC-2017-SRB10-R) that reporting the estimates of relative proportions using total survey catch may be useful. This may be a better representation of O26 mortality and better align the estimate of stock distribution with the O26 mortality.

Stock distribution may play a role in distributing the TCEY if there is an objective of maintaining a diversity in the population across space. It has been shown that maintaining a diverse portfolio of stocks in salmon populations (e.g., Schindler et al. 2010) has resulted in better resilience to environmental changes and regime shifts, resulting in more sustainable fisheries. Little is known about the exact interplay between geographic regions and, for example, spawning success within the Pacific halibut population, but there may be subtle genetic differences (Drinan et al. 2016) that may make it beneficial to distribute harvest across all the population instead of potentially over-exploiting one component. Additionally, distributing the harvest provides opportunity for many areas. The MSAB agreed (para. 36 of IPHC-2017-MSAB10-R) to consider the definition of biocomplexity and develop objectives related to this goal.

Biocomplexity is linked to biology and therefore not necessarily management areas. Therefore, distributing the O26 mortality among biological regions may be more appropriate than among Regulatory Areas. The MSAB considered a proposal for stock distribution to operate on biological regions (Figure 18) at MSAB10 (para. 35 of IPHC-2017-MSAB10-R). Given the current understanding of Pacific halibut, four biologically relevant regions that meet management needs are: all of IPHC Regulatory Area 2 (called Region 2), all of IPHC Regulatory Area3 (called Region 3), IPHC Regulatory Areas 4ACDE(called Region 4), and Regulatory Area 4B (called Region 4B). Figure 18 shows these four regions in relation to the Regulatory Areas.

These four biologically-based regions capture the broad spatial and productivity domains of the population. Distributing the TCEY among them would continue to protect the geographic life-history variability and possible biodiversity in the Pacific halibut population, but would not force arbitrary delineation among areas with evidence of strong stock mixing. In addition, estimates of the proportion of biomass in each region (Figure 20) would be more stable than estimates for each IPHC Regulatory Area. Further distributing the TCEY to IPHC Regulatory Areas would be done through the distribution procedures component (Figure 19) or as part of the decision-making process (Figure 1).

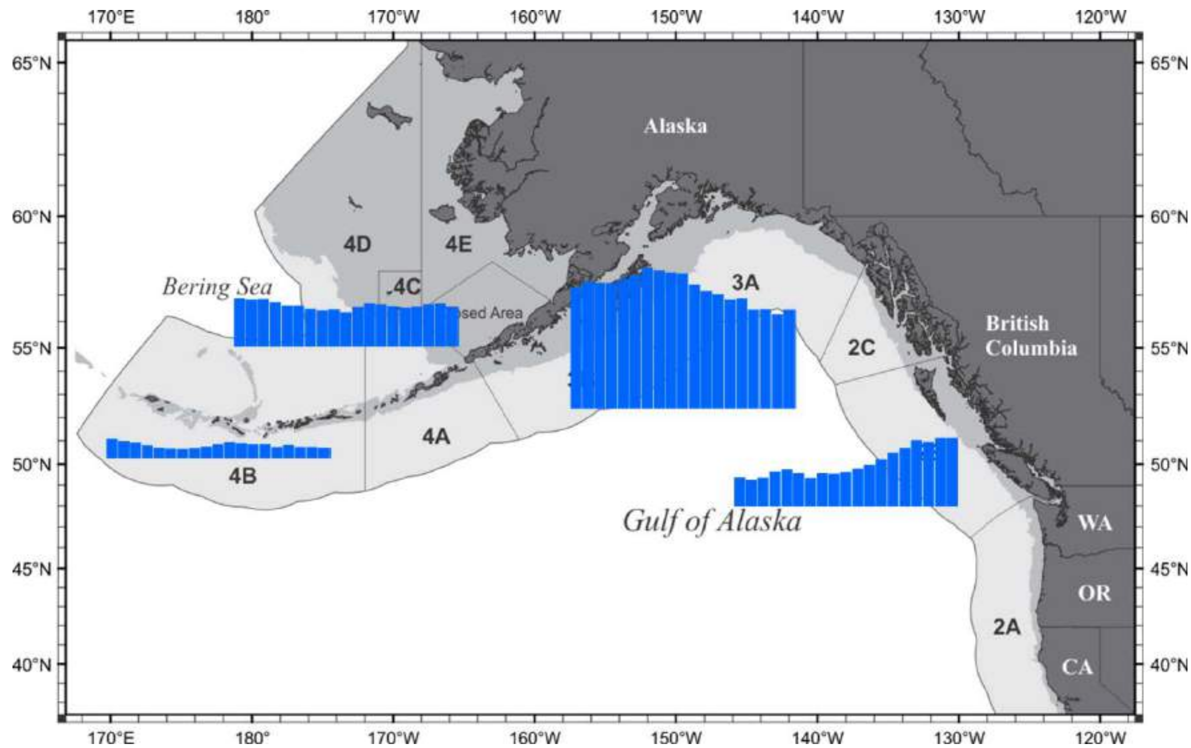

Figure 20: Estimated percentage of the stock in each region (2, 3, 4, and 4B) from 1998–2016. The scale in each region is relative to each other and the four bars from all regions in a particular year sum to one.

Distribution Procedures

The distribution procedures component is the process of further modifying the distribution of the TCEY among regions and then distributing the TCEY among IPHC Regulatory Areas within geographic regions. Modifications at the region or IPHC Regulatory Area level may be based on differences in production between areas, observations in each area relative to other areas (e.g., WPUE), uncertainty of data or mortality in each area, defined allocations, or national shares, for example. Data may be used as indicators of stock trends in each Region or IPHC Regulatory Area, and are included in the TCEY distribution component because they may be subject to certain biases and include factors that may be unrelated to biomass in that Region or Area. For example, commercial weight-per-unit-effort (WPUE) is a popular source of data used to indicate trends in a population and fishery performance, but may not always be proportional to biomass. Types of data that may be used include fishery WPUE, survey observations (not necessarily the setline survey), age-compositions, size-at-age, and environmental observations.

A final step in the distribution of TCEY may be to make further discretionary adjustments, or to simply allocate the TCEY from regional areas to Regulatory Areas based on management decisions (Decision box in Figure 1) that take social, economic, national, and other factors into consideration. The final distribution of TCEY among Regulatory Areas would be input into the stock assessment to determine the adopted SPR and coastwide fishing intensity, which may differ from the procedural SPR due to these final management decisions.

Potential Procedures for Distributing TCEY Across the Coast

The harvest strategy policy begins with the coastwide TCEY determined from the stock assessment and procedural fishing intensity (Figure 1). When distributing the TCEY among regions, stock distribution would likely occur first to distribute the harvest in proportion to biomass, although may occur at a later stage. Adjustments across Regions and Regulatory Area based on TCEY distribution, and the key to these adjustments is that they are relative adjustments such that the overall fishing intensity is maintained (i.e., a constant SPR after each step). Departing from this may be a desired outcome for a particular year (short-term, tactical decision making based on current trends estimated in the stock assessment), but would deviate from the management procedure and the long-term management objectives. Departures from the management procedure may result in undesirable outcomes, but could also take advantage of current situations.

There are many other management procedures that would be worth evaluating as part of the Management Strategy Evaluation and we suggest using the regional framework described above as part of a biologically-based distribution procedure. Stock distribution is a science product and the MSAB's task is to develop TCEY distribution elements. However, where a science product fits into the management procedure is an element that could be evaluated in the MSE. Additionally, assumptions implicit in any of the procedures can be part of the uncertainty by introducing variability related to those assumptions. Elements of the TCEY distribution component may include the following.

- Use additional data, other than the fishery-independent data used to estimate stock distribution, to inform additional adjustments to the distribution of the TCEY to regions or IPHC Regulatory Areas within a Region.
- Assign a specific allocation when distributing the TCEY to IPHC Regulatory Areas within a Region.

MSE PROGRAM OF WORK FOR MSAB RELATED ACTIVITIES FOR 2018-2022

IPHC-2017-MSAB10-11 described a work plan consisting of seven tasks for the next five years. These tasks are described briefly below.

TASK 1: VERIFY THAT GOALS ARE STILL RELEVANT AND FURTHER DEFINE OBJECTIVES.

Relevant goals and measurable objectives are essential to the MSE process. They are necessary to determine what types of models are needed and how to evaluate the management strategies. Current goals and objectives defined by the MSAB are listed in Appendix A. This is an ongoing task since goals and objectives may change or expand over time.

TASK 2: DEVELOP PERFORMANCE METRICS TO EVALUATE OBJECTIVES

Measurable objectives guide the development of the simulation framework for a MSE, and performance metrics are needed to gauge the performance of a management strategy relative to those objectives. The outcome of this task is a list of performance metrics that would be informative to stakeholders, managers, and scientists to effectively evaluate the performance of different management strategies and the trade-offs between them. It is linked to the goals and objectives, thus is also an ongoing task.

TASK 3: IDENTIFY STRENGTHS AND WEAKNESSES OF SINGLE-AREA AND MULTI-AREA MODELS FROM A MSE PERSPECTIVE

The complexity of an operating model is an important factor to consider in a MSE. This task is to describe what is needed to develop single-area and multi-area operating models for use in closed-loop simulations, the resources needed to do so, and how much time it may take. Additionally, the strength and weaknesses of the coast-wide and multi-area operating models in relation to each measurable objective will also be presented. This task should be completed in early 2019.

TASK 4: IDENTIFY REALISTIC MANAGEMENT PROCEDURES OF INTEREST TO EVALUATE WITH A CLOSED-LOOP SIMULATION FRAMEWORK

The purpose of MSE is to evaluate management procedures by examining and comparing the performance and trade-offs of each. This task will be to identify realistic management procedures that are of interest to stakeholders, managers, and scientists, thus ensuring that the results of the MSE are pertinent and useful to managing the Pacific halibut stock. This is also an ongoing task, but outcomes are already being realized.

TASK 5: DESIGN A CLOSED-LOOP SIMULATION FRAMEWORK AND CODE A COMPUTER PROGRAM TO EXTEND THE PAST EQUILIBRIUM MODEL APPROACH

The majority of this document describes a framework for performing a MSE that extends on the past equilibrium model approach. Further work is needed to improve this framework (e.g., adding an estimation model) and a good design will ensure that the code is suitable to address current questions and flexible to accommodate future questions. Progress has been made on this task and the framework and code will continue to be developed in the future.

TASK 6: DEVELOP EDUCATIONAL TOOLS THAT WILL ENGAGE STAKEHOLDERS AND FACILITATE COMMUNICATION

For a stakeholder driven process to be effective, an understanding of the process and how to interpret results is necessary. These educational tools will facilitate communication and allow users to understand trade-offs between performance metrics given alternative management procedures. This is an ongoing task with collaboration between IPHC staff, stakeholders, and managers.

TASK 7: FURTHER THE DEVELOPMENT OF THE OPERATING MODELS

Currently, the operating model consists of coastwide models and cannot be used to evaluate area-specific objectives, which can only be answered with a multi-area model. Development of a multi-area model to evaluate area-specific objectives will occur over the next two years.

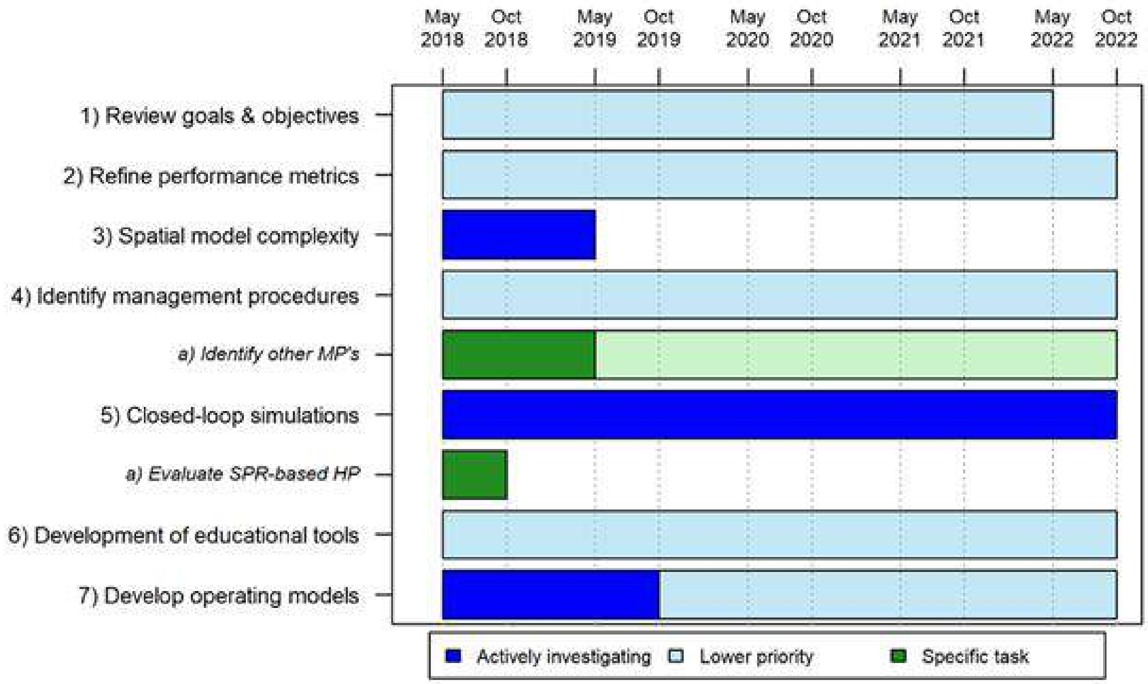

Figure 21: Gantt chart for the five-year work plan. Tasks are listed as rows. Dark blue indicates when the major portion of the main tasks work will be done. Light blue indicates when preliminary or continuing work on the main tasks will be done. Dark green indicates when the work on specific sub-topics will be done and light green shows when continuing work will be done. The end of the dark color shows when those results will be presented.

Discussions of this work plan with the MSAB resulted in the recommendation to prioritize the current work on evaluating the scale component of the harvest strategy policy to produce recommendations at AM095 in January 2019 (Table 6). After that it is expected that recommendations related to the TCEY distribution component (and updates to the scale component) will occur at AM097 in January 2021.

Table 6: MSAB recommended timeline of work and topics to present between 2018 and 2021. From IPHC-2017-MSAB10-R.

May 2018 Meeting
Review Goals
Look at results of SPR
Review Performance Metrics
Identify Scale MP's
Review Framework
Identify Preliminary Distribution MP's
October 2018 Meeting
Review Goals
Complete results of SPR
Review Performance Metrics
Identify Scale MP'S
Verify Framework
Identify Distribution MP's
Annual Meeting 2019
Recommendation on Scale Present possible distribution MP's
May 2019 Meeting
Review Goals
Spatial Model Complexity
Identify MP's (Distn Scale)
Review Framework
October 2019 Meeting
Review Goals
Spatial Model Complexity
Identify MP's (Distn Scale)
Review Framework
Review multi-area model development
Annual Meeting 2020
Update on progress
May 2020 Meeting
Review Goals
Review multi-area model
Review preliminary results
October 2020 Meeting
Review Goals
Review preliminary results
Annual Meeting 2021
Recommendations on Scale and Distribution

RECOMMENDATION/S

That the Commission:

1) **NOTE** paper IPHC-2018-AM094-12 which provided an update of MSE related activities in 2017, including a review of goals and objectives defined by the MSAB, an overview of the simulation framework to evaluate the fishing intensity and harvest control rules in the IPHC harvest strategy policy, results from the closed-loop simulations, ideas for distributing the TCEY to Regulatory Areas, and a five-year work plan.
2) **CONSIDER** the simulation framework and assumptions as described, including introducing variability to the Operating Model, simulating weight-at-age and an environmental regime, and allocation of the Total Mortality to sectors.
3) **CONSIDER** the long-term results looking at the outcomes of various management procedures and the trade-offs between them.
4) **RECOMMEND** management procedures (e.g. values of SPR in combination with a control rule threshold) that would meet the goal and objectives important to the Commission, based on the results shown, and additional procedures that may be of interest to evaluate in 2018.
5) **AGREE** whether the clear separation of stock distribution, and distribution procedures satisfies the Commission's recommendation to replace *apportionment* with a more suitable term.
6) **ENDORSE** the concept of distributing the TCEY to biological regions defined here as a method to satisfy the Commission's request to "*initiate a process to develop alternative, biologically based stock distribution strategies.*"

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APPENDIX A: GOALS, OBJECTIVES, AND PERFORMANCE METRICS

Table A1: Measurable objectives and associated performance metrics, as reported in the MSAB09 Report (IPHC-2017-MSAB09-R). Median operates on the independent simulations, while average refers to the average over a specific period of years in each simulation (e.g., the last 10 years). RSB refers to dynamic relative spawning biomass, a measure of stock status. Limit is the lower point of the control rule where fishing intensity is set to zero, and threshold is the upper point where fishing intensity begins to be adjusted downward. These are defined as values of RSB.

Biological Sustainability				
Measurable Objective	**Outcome**	**Time-frame**	**Probability**	**Performance Metrics**
Maintain a minimum of number of mature female halibut coast-wide	Number of mature female halibut less than a threshold	10 year period, long-term	0.01	Median average number of mature female halibut
Avoid very low stock sizes	RSB < Limit of control rule	10 year period, long-term	0.05	Probability that RSB is less than the limit
Mostly avoid low stock sizes	RSB < Threshold of control rule	10 year period, long-term	0.25	Probability that RSB is less than the threshold
When Limit < Estimated Biomass < Threshold, limit the probability of declines	SSB declines when Limit < RSB < Threshold	10 year period, long-term	0.05 – 0.5, depending on est. stock status	Probability that spawning biomass declines in the next year given that RSB is between the limit and threshold
Spawning Biomass	An absolute measure	10 year period, long-term	NA	Median average RSB

Minimize discard mortality				
Measurable Objective	**Outcome**	**Time-frame**	**Probability**	**Performance Metrics**
Discard mortality in the longline fishery	<10% of annual catch limit	10 year period, Long-term	0.25	Probability that discard mortality is greater than 10% of the directed fishery catch limit
Absolute	Discard mortality	10 year period, Long-term		Median average discard mortality

Fishery Sustainability, Stability, and Access				
Measurable Objective	**Outcome**	**Time-frame**	**Probability**	**Performance Metrics**
Maintain directed fishing opportunity	Fishery is open	Each year	0.05	Probability that the directed fishery catch limit is equal to zero
Maximize yield in each regulatory area		Each year	0.5	
Maintain median catch	Within ±10% of 1993-2012 average (72.3 Mlbs)	Within 5 yrs, 10 yr per, long term		Probability that the directed fishery catch limit (FCEY) is greater than 79.5 Mlbs and less than 65.1 Mlbs
Maintain average catch	> 70% of historical 1993-2012 average	10 year period, long-term	0.1	Probability that the directed fishery catch limit is less than 50.6 Mlbs
Limit annual changes in TAC, coast-wide and/or by Regulatory Area	Change in FCEY < 15%	10 year period, long-term		Probability that the change in directed fishery catch limit is more than 15%
Absolute	FCEY	10 year period, long-term	NA	Median average directed fishery catch limit
Absolute	Variability in FCEY	10 year period, long term		The average percent change in catch. Often called Average Annual Variability (AAV)

Minimize bycatch and bycatch mortality				
Measurable Objective	**Outcome**	**Time-frame**	**Probability**	**Performance Metrics**

Serve consumer needs				
Measurable Objective	**Outcome**	**Time-frame**	**Probability**	**Performance Metrics**

Preserve biocomplexity				
Measurable Objective	**Outcome**	**Time-frame**	**Probability**	**Performance Metrics**

IPHC 5-year Biological and Ecosystem Science Research Program: update

PREPARED BY: IPHC SECRETARIAT (J. PLANAS, 6 DECEMBER 2017)

PURPOSE

To provide the Commission with a description of the new and continuing research projects proposed by IPHC Secretariat and contemplated within the 5-year Biological and Ecosystem Science Research Program.

BACKGROUND

Since its inception, the IPHC has had a long history of research activities devoted to describing and understanding the biology of the Pacific halibut (*Hippoglossus stenolepis*). At the present time, the main objectives of the Biological and Ecosystem Science Research Program at IPHC are to:

1) identify and assess critical knowledge gaps in the biology of the Pacific halibut;
2) understand the influence of environmental conditions; and
3) apply the resulting knowledge to reduce uncertainty in current stock assessment models.

Traditionally, IPHC staff propose new projects annually that are designed to address key biological issues as well as the continuation of certain projects initiated in previous years. Proposals are based on their own input as well as input from the Commissioners, stakeholders, and specific subsidiary bodies to the IPHC such as the Scientific Review Board (SRB) and the Research Advisory Board (RAB). Proposed research projects are presented to the Commissioners for feed-back and subsequent approval. Importantly, biological research activities at IPHC are guided by a Five-Year Research Plan that is put forward by the Program Head identifying key research areas that follow Commission objectives. As described in the Five-Year Research Plan for the period 2017-2021, the primary biological research activities at IPHC can be summarized in five main areas:

1) Reproduction
2) Growth and Physiological Condition
3) Discard Mortality and Survival
4) Distribution and Migration
5) Genetics and Genomics

These research areas have been selected for their important management implications. The studies conducted on Reproduction are aimed at providing information on the sex ratio of the commercial catch and to improve current estimates of maturity. The studies conducted on Growth are aimed at describing the role of some of the factors responsible for the observed changes in size-at-age and to provide tools for measuring growth and physiological condition in Pacific halibut. The proposed work on Discard Mortality and Survival is aimed at providing updated estimates of discard mortality rates in both the longline and the trawl fisheries. The studies conducted on Distribution and Migration are aimed at further understanding larval and juvenile dispersal, distribution of all life stages in relation to the environment, and reproductive and seasonal migration and identification of spawning times and locations. The studies conducted on Genetics and Genomics are aimed at describing the genetic structure of the Pacific halibut population and at providing the means to investigate rapid adaptive changes in response to fishery-dependent and fishery-independent influences.

In this document, we present an outline of the new and continuing projects proposed by IPHC staff for the coming year.

DISCUSSION

For 2018, four new projects are proposed that cover specific research needs (Appendix I).

Project 2018-01 ("*Influence of thermal history on growth*") proposes to study the thermal profile experienced by fish at sea as assessed by archival tagging and otolith microchemistry in order to investigate the relationship between growth patterns (or productivity) and both spatial and temporal variability in environmental conditions for growth.

Project 2018-02 ("*Adult captive holding studies*") proposes performing studies on captive adult Pacific halibut to establish or validate measures or protocols required for other ongoing projects, such as (1) determining the permanence of individual tail markings for tracking individual movement rates, (2) calibrating measures of fat content for condition factor determinations and of stable isotope (C^{13} and N^{15}) ratios for inferring growth and dietary information and (3) calibrating O^{18} otolith signatures with environmental temperature.

Project 2018-3 ("*Whale detection methods*") proposes testing electronic monitoring-based methods to detect whale presence in the directed longline Pacific halibut fishery.

Project 2018-04 ("*Larval connectivity*") proposes to study the movement and connectivity of Pacific halibut larvae both within and between the Gulf of Alaska and the Bering Sea.

In addition to the new projects, thirteen continuing projects are proposed (Appendix I).

Project 621.16 ("*Development of genetic sexing techniques*") is the continuation of the project dealing with genetic sex identification of the commercial catch that will entail the testing and application of the recently developed genetic assays for sex identification.

Projects 642.00 ("*Assessment of mercury and other contaminants*") and **661.11** ("*Ichthyophonus incidence monitoring*") represent the continuation of projects monitoring the prevalence of heavy metal contamination and *Ichthyophonus* infection in the Pacific halibut population, respectively.

A total of four projects will continue migration-related studies. Three of these projects involve tagging and include: **Project 650.18:** "*Archival tags: tag attachment protocols*", **Project 650.21:** "*Investigation of halibut dispersal in Area 4B*"; and **Project 670.11:** "*Wire tagging of halibut on NMFS trawl and setline surveys*". A fourth migration-related project, **Project 675.11** ("Tail pattern recognition"), is investigating the identification of individual tail markings in U32 fish through the collection of tail images from IPHC's fishery-independent setline survey.

Project 669.11 ("*At-sea collection of halibut weight to reevaluate conversion factors*") will continue to collect weights at sea to improve estimation of the weight-length relationship in adult Pacific halibut.

Project 672.12 ("*Condition Factors for Tagged U32 Fish*") will continue to study the relationship between the physiological condition of fish and migratory performance and growth as assessed by tagging in U32 fish in order to better understand the potential use of quantitative physiological indicators in predicting migratory performance and growth.

Project 673.13 (“*Sequencing the Pacific halibut genome*”) will continue to characterize for the first time the genome of the Pacific halibut and provide genomic resolution to genetic markers for sex, reproduction, and growth that are currently being investigated.

Project 673.14 (*"Identification and validation of markers for growth in Pacific halibut"*) will continue to identify and validate molecular and biochemical profiles that are characteristic of specific growth patterns and that will be used to identify different growth trajectories in the Pacific halibut population and evaluate potential effects of environmental influences on growth patterns. This project has also received funding from the North Pacific Research Board under project number 1704 (Appendix II).

Project 672.13 ("*Discard mortality rates and injury classification profile by release method*") will continue to study the relationship between hook release methods in the longline fishery and associated injuries with the physiological condition of fish and with post-release survival in order to update current estimates of discard mortality rates in the directed longline Pacific halibut fishery. This project has also received funding from the Saltonstall-Kennedy NOAA grant program under project number NA17NMF4270240 (Appendix II).

Project 674.11 will continue to characterize the annual reproductive cycle of male and female Pacific halibut in order to improve our understanding of sexual maturation in this species and to improve maturity assessments and maturity-at-age estimates.

In addition to the new and continuing proposed projects at IPHC, we note the participation of IPHC in an externally-funded and coordinated project entitled “*Survival of Pacific halibut released from Bering Sea flatfish trawl catches through expedited sorting*”. This project will continue to study the efficacy of expedited release as a method for reducing Pacific halibut discard mortality following trawl capture and the development of methods for the estimation of discard mortality rates without the need for fish-by-fish vitality estimation. This project is funded by the Saltonstall-Kennedy program under project number 15AKR013 and by the North Pacific Research Board under project number NPRB 1510.

RECOMMENDATION/S

That the Commission:

1) **NOTE** paper IPHC-2018-AM094-13 which outlined the research projects proposed by IPHC staff and provided an overview of the 5-year research program.
2) **ENDORSE** the proposed new and continuing research projects.

APPENDICES

Appendix I: Summary of research projects proposed for 2018.

Appendix II: Summary of research projects awarded for external funding in 2017.

APPENDIX I

Summary of research projects proposed for 2018

Project #	Project Name	Priority	Budget ($US)	External funding for FY2018 ($US)	Management implications
New Projects					
2018-01	Influence of thermal history on growth	High	136,004	-	Changes in biomass/size-at-age
2018-02	Adult captive holding studies	High-Medium	58,395	-	Changes in biomass/size-at-age/distribution
2018-03	Whale detection methods	High	37,511	-	Mortality estimation
2018-04	Larval connectivity	High	20,000	-	Larval distribution
Continuing Projects					
621.16	Development of genetic sexing techniques	High	33,928	-	Sex composition of catch
642.00	Assessment of mercury and other contaminants	Medium	8,600	-	Environmental effects
650.18	Archival tags: tag attachment protocols	High	800	-	Adult distribution
650.21	Investigation of halibut dispersal in Area 4B	High	6,800	-	Spawning areas
661.11	*Ichthyophonus* incidence monitoring	Medium	8,755	-	Environmental effects
669.11	At-sea collection of halibut weight to reevaluate conversion factors	High	7,645	-	Length-weight relationship
670.11	Wire tagging of halibut on NMFS trawl and setline surveys	High	12,840	-	Juvenile and adult distribution
672.12	Condition factors for tagged U32 Fish	High	9,116	-	DMR estimates
672.13	Discard mortality rates and injury classification profile by release method	High-Medium	1,037	255,402	DMR estimates
673.13	Sequencing the Pacific halibut genome	High	32,500	-	Environmental effects
673.14	Identification and validation of markers for growth	High	25,681	57,773	Changes in biomass/size-at-age
674.11	Full characterization of the annual reproductive cycle	High	121,488	-	Maturity assessment
675.11	Tail pattern recognition	High	3,900	-	Juvenile and adult distribution
	Total - New Projects ($US)		**$251,910**		
	Total - Continuing Projects ($US)		**$273,090**		
	Overall Total (all projects) ($US)		**$525,000**		
	External Funding (for FY2018) ($US)			**$313,175**	

APPENDIX II

Summary of research projects awarded for external funding in 2017

Project #	Grant agency	Project name	Partners	IPHC Budget ($US)	PI	Management implications	Grant period
1	**S-K NOAA**	Improving discard mortality rate estimates in the Pacific halibut by integrating handling practices, physiological condition and post-release survival (Award No. NA17NMF4270240)	Alaska Pacific University, Anchorage, AK	$286,121	Planas (lead PI) Dykstra Loher Stewart Hicks	Bycatch estimates	September 2017 – August 2019
2	**NPRB**	Somatic growth processes in the Pacific halibut (*Hippoglossus stenolepis*) and their response to temperature, density and stress manipulation effects (Award No. 1704)	AFSC-NOAA-Newport, OR	$131,891	Planas (lead PI) Rudy Loher	Changes in biomass/size-at-age	September 2017 – August 2019
			Total awarded ($)	**$418,012**			

Evaluation of the IPHC's 32" minimum size limit

PREPARED BY: IPHC SECRETARIAT (I. STEWART & A. HICKS; 1 DECEMBER 2017)

PURPOSE

To provide a response to the Commission request made during the 2016 Interim Meeting (IPHC 2016):

*"**IM092–Req.07 (para. 73)** The Commission **REQUESTED** that a review of the analysis of the effectiveness of size limits be undertaken by the IPHC Staff throughout 2017, for consideration by the Commission at its annual meeting in 2018."*

BACKGROUND

This paper reflects review by the Scientific Review Board (SRB) during meetings SRB10 (IPHC 2017a) and SRB11 (IPHC 2017b) as well as feedback received during the IPHC's 2017 Work Meeting.

Included is an evaluation of relevant information for the Commission to consider the current 32" (81.3 cm) Minimum Size Limit (MSL) in the directed commercial Pacific halibut (*Hippoglossus stenolepis*) fishery. This document includes the following sections:

Introduction: summary of historical analyses.

Scope: context on the estimated magnitude of Pacific halibut captured and discarded in all relevant fisheries in 2015.

Survey information: catch information by size and sex from the IPHC's 2016 setline survey

Observer information: catch information by size from the North Pacific Observer Program's 2016 at-sea sampling program.

Yield calculations: change in short term-yield associated with removal of the MSL and alternative fishery responses, estimated using the 2016 stock assessment ensemble.

Other considerations: Non-quantitative factors relevant to the MSL.

Summary: condensed overview of positive, negative and unknown responses to a reduced or eliminated MSL relative to the *status quo*.

Additional and/or more detailed information for each major analysis section is contained in the associated appendices.

INTRODUCTION

The IPHC first imposed a size-limit on the Pacific halibut fishery in 1940 (Myhre 1973). At that time, the limit (5 pounds; 2.27 kg) was based on "dressed" weight (gilled and gutted). This limit was converted to length (26"; 66 cm) in 1944 in order to facilitate easier compliance at sea. Based on historical analyses (Myhre 1973) and more recently reconstructed trajectories of size-at-age (Stewart 2017), the percentage of small fish encountered by the fishery likely declined steadily from the 1940s through the 1970s. For most of this period, catches of fish smaller than the Minimum Size Limit (MSL) were likely low, based on contemporary reports (Myhre 1974), and historical age composition data. In 1973, the MSL was revised to 32” (81 cm; Myhre 1973), still likely not causing substantial amounts of discard due to large size-at-age. Yield-Per-Recruit (YPR) analysis in the 1960s indicated that, at that time, the age of entry to the fishery was near optimal under equilibrium conditions based on the landed catch from the 26” MSL (IPHC 1960). It is not clear that discard mortality (‘wastage’; fish that are captured, discarded, and subsequently die) was a significant concern at that time.

After an apparent peak in the late 1970s, the average Pacific halibut size-at-age declined steadily through around 2010, after which is has been relatively stable, although the coastwide trend masks differences among geographic regions (Stewart 2017). The largest declines in size-at-age have been observed in the Gulf of Alaska (GOA). During this period of decline in size-at-age, there have been several analyses evaluating the effects on the stock and fishery of the MSL. Myhre (1974) found that a 32” MSL was ‘optimal’ (with regard to fishery yield) only under the lowest discard mortality rates, and that rates above 25% would indicate a 75 cm or lower MSL even at the very high size-at-age observed at that time. He argued that the fishery would likely adjust selectivity by moving away from areas of smaller fish and thus reduce the magnitude of discard mortality. He further noted that the value of larger fish would be higher, and thus the fishery would benefit from the 32” MSL.

Clark and Parma (1995) also used equilibrium methods (YPR and Spawning Biomass Per Recruit, SBPR) to evaluate the MSL based on sampled landings in 1990-91 with more detail in the specific IPHC Regulatory Areas considered. Their analysis found that the 32” MSL was near optimal, but noted that revised analysis was already underway due to observations in the early 1990s of continued decline in size-at-age. Of note was the result that removing the MSL in IPHC Regulatory Area 2B would result in no loss in YPR.

Parma (1999) updated the previous MSL analysis, and reached similar conclusions: that there were small gains in YPR with smaller MSLs, but these were slightly offset by losses in SBPR; she recommended retaining the 32” MSL. That analysis suggested the conservation benefit of a ‘reproductive refuge’, created by the use of a MSL for management, a concept that is widely used as justification for MSLs in species from crustaceans to reef fish (e.g., Hilborn and Walters 1992).

Valero and Hare (2012) used female maturity-at-age, YPR, SBPR, and a migratory model to evaluate the 32” MSL. They found that YPR and SBPR would both decrease with greatly reduced size-limits under the assumption that the fishery selectivity would resemble that of the IPHC’s fishery-independent setline survey. Small reductions (3-12 cm) in the MSL were found to have a slight positive effect on YPR (<=3%), and only modest effects on the sex-ratio of the catch (increasing the proportion male by <10%), while larger reductions in the MSL were found to produce reduced YPR and SBPR. The migratory analysis was the first to clearly identify differential effects among the Regulatory Areas. Their analysis conserved the Spawning Biomass Per Recruit ratio ($SBPR_{ratio}$), and concept similar to the Spawning Potential Ratio (SPR) on which the IPHC’s current harvest policy is based; however, it appears that their calculation of $SBPR_{ratio}$ took into consideration long-term average conditions rather than only current size-at-age and selectivity such that the absolute values are not comparable to recent estimates (Stewart and Hicks 2017). They further noted that ‘precise control’ over harvest rates would be more important under younger female age-of-entry into the landed catch (the management buffer concern), and focused much of the discussion on the precautionary nature of retaining the MSL, and risks to spawning biomass of eliminating it.

The most recent evaluations of the MSL occurred in 2014-15 (Martell et al. 2015a, Martell et al. 2015b). The Commission requested the IPHC Secretariat to evaluate specifically the implications of reducing the MSL from 32” to 30”. A response was presented by the IPHC Secretariat (Martell et al. 2015a) at the IPHC’s Annual Meeting in 2015 (AM091). That analysis used an equilibrium model (loosely based on Pacific halibut dynamics) to compare long-term average yield at the stock size and fishing mortality rate that is estimated to produce Maximum Sustainable Yield (MSY). Importantly, that approach is adjusting the harvest policy and size limit simultaneously in order to maximize yield. One salient result, found in Table 1(of that document; Martell et al. 2015a) was that both total and directed fishery average yield were estimated to be larger, and discard mortality lower, for incremental reductions in the MSL down to 26”. Based on an assumed price-per-pound of small Pacific halibut (due to the reduction in average weight of the landed catch) reducing the MSL below 30” was found to result in a slight loss in total fishery value. The authors noted that potential changes in fishery selectivity of smaller Pacific halibut would be highly important in determining the relative changes in yield, discard mortality, and profitability. Both the Discard Mortality Rate (DMR) as well as the level of bycatch in non-Pacific halibut fisheries were also found to have a substantial scaling effect of the equilibrium yield (Martell et al. 2015b); however, a 30” MSL was always found to produce a larger yield than a 32” MSL given constant selectivity. The authors also reported that equilibrium female spawning biomass would be reduced with a lower MSL. The yield curves, particularly for scenarios where selectivity is shifted toward smaller fish, became more peaked under a reduced size limit, illustrating that managing precisely at the optimal harvest rate would become more important (the management buffer concern again).

In aggregate, despite using differing methods and data sets, these historical studies provide a reflection of the contemporary fishery and biological properties, and suggest a shift in optimal MSLs from small (26”) to larger (32”), and then progressively greater benefits estimated for smaller size limits in the more recent studies.

This working paper provides an extension to previous efforts, using data sources updated to be as current as possible, and bases yield calculations on the ensemble of stock assessment models currently used to inform management decisions. By focusing on current fishery and biological conditions, the emphasis is on potential gains or losses realized in the short-term, rather than those under equilibrium or long term projections.

SCOPE

This section presents estimates of recent commercial Pacific halibut catch, landings, and discard mortality, and compares them to the estimates of recreational and bycatch (non-Pacific halibut fisheries) catch, discards, and mortality. Because the observer data for non-Pacific halibut fisheries generally lags at least one year in complete reporting (Jannot et al. 2016, NMFS 2016), all estimates included in this section are based on 2015 for comparability across all sources.

In any fishery that does not require full retention of the catch some fish will be discarded at sea. Trip limits, size-limits, and other regulatory actions all create discards; and some of the fish that are discarded ultimately die. As a conceptual framework, total catch can be divided into three portions: 1) the retained catch (which may be zero for fisheries prohibited from retaining Pacific halibut), 2) the discarded catch that survives, and 3) the discarded catch that subsequently dies due to catch related injuries (a function of the total discards and the DMR). Only the retained catch is effectively known without significant observation uncertainty, and uncertainty in both the magnitude of discards as well as the DMRs applying to those discards. Figure 1 provides a representation of these components.

There are several sources of mortality[1] from the Pacific halibut population in the Northeast Pacific Ocean: the directed commercial Pacific halibut fishery (Goen et al. 2017a), the recreational fisheries (Dykstra 2017a), the personal use and subsistence fisheries (Goen 2017; not summarized in this section), and the non-Pacific halibut fisheries capturing but not retaining Pacific halibut (Dykstra 2017b). In order to simplify this detailed comparison of the sources of mortality, they are summarized by regions specific to the management agencies responsible for each: the Bering Sea and Aleutian Islands (BSAI), and the GOA. More detail on IPHC Regulatory Area-specific components is available in the references noted above, as well as the overview of data sources produced each year (Stewart 2017, Stewart and Monnahan 2016).

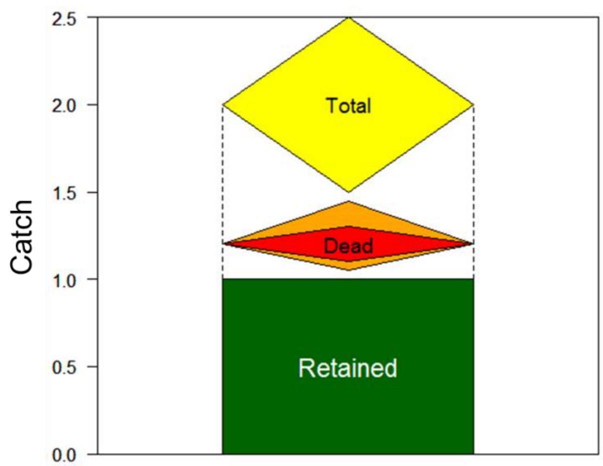

FIGURE 1. Schematic representation of total catch indicating the portions that were retained, discarded and subsequently died, and discarded and subsequently survived. Polygons denote relative uncertainty due to discard mortality rates (red), observer coverage (yellow), and discard mortality rates combined with observer coverage (orange). See Appendix A for calculation details.

The sum of the retained catch, the fish that were discarded and died, and the fish that were discarded and survived represents the total catch handled (Table 1). Across all these sources, roughly half of the total Pacific halibut catch is landed, with nearly 1/3rd of the total catch estimated to have survived the capture process. The magnitude of each component varies substantially by fishery and region, with the directed Pacific halibut fishery in the GOA handling roughly twice the catch of any other source in 2015 (Figure 2).

[1] This term is used interchangeably with removals in this document; both reflect the total quantity of dead Pacific halibut.

TABLE 1. Disposition of all estimated Pacific halibut catch (millions net pounds) estimated for 2015. See Appendix A for calculation details.

Fishery	Retained	Discarded and died	Discarded and survived	Total catch handled	Aggregate DMR	Aggregate observer coverage[7]
BSAI Commercial halibut[1]	3.68	0.16	0.82	4.66	0.16	0.13[8]
GOA Commercial halibut[2]	14.44	0.85	4.48	19.77	0.16	0.16[8]
B.C. Commercial halibut[3]	5.99	0.24	1.25	7.48	0.16	100%
2A Commercial halibut	0.57	0.03	0.16	0.77	0.16	0%
Alaska Recreational[4]	5.81	0.14	2.21	8.13	0.06	0%
B.C. Recreational	1.00	0.06	0.91	1.96	0.06	0%
2A Recreational	0.45	<0.01	0.05	0.49	0.07	0%
BSAI Trawl	0	3.69	0.76	4.44	0.83	94%
BSAI Non-trawl	0	0.60	4.87	5.47	0.11	87%
GOA Trawl	0	2.33	1.25	3.58	0.65	37%[9]
GOA Non-trawl	0	0.45	4.01	4.45	0.10	19%[9]
B.C. Trawl	0	0.33	0.35	0.68	0.48[6]	100%
2A All gears	0	0.10	0.27	0.36	0.27	69%[10]
Total	31.89 (51%)	8.97 (14%)	21.39 (34%)	62.24	0.30	36%

[1] BSAI includes Regulatory Areas 4A, 4B, and 4CDE.
[2] GOA includes Regulatory Areas 2C, 3A, and 3B.
[3] Includes a small quantity of legal halibut not landed but counted against quota.
[4] Includes GAF.
[5] Includes XRQ.
[6] No direct estimate available; estimated via aggregated 2015 2A bottom trawl rates.
[7] Estimated via pounds observed/total estimated pounds as reported in observer summaries.
[8] Rate based on the ratio of observed retained pounds to total retained pounds in order to exclude non-Individual Fishing Quota (IFQ) fishing.
[9] Rate includes both directed and non-directed, as IFQ halibut fishing was not separated from other hook-and-line fishing in observer reports.
[10] A 25% average coverage rate was assumed for non-IFQ fishing in Area 2A.

For the purposes of evaluating the Minimum Size Limit (MSL), it is helpful to compare across only the discards of Pacific halibut (Figure 3). Here, it can be seen that the largest sources of discards include the directed fishery in the GOA, the Alaskan recreational fisheries, and the BSAI and GOA Trawl and Hook and Line (H&L) bycatch fisheries. Relative uncertainty is greatest for those fisheries with low observer coverage: the GOA directed H&L and Trawl bycatch fisheries as well as the recreational fishery in Alaska (See Appendix A for detail on the calculation of relative uncertainty).

In this context, it is clear that the current MSL is producing a substantial magnitude of Pacific halibut handled and discarded each year, although the mortality of these discards is estimated to be relatively low. Low observer coverage rates in combination with uncertainty in the DMRs (Leaman and Stewart 2017), result in the directed fishery's handled catch representing an important source of uncertainty in overall removals.

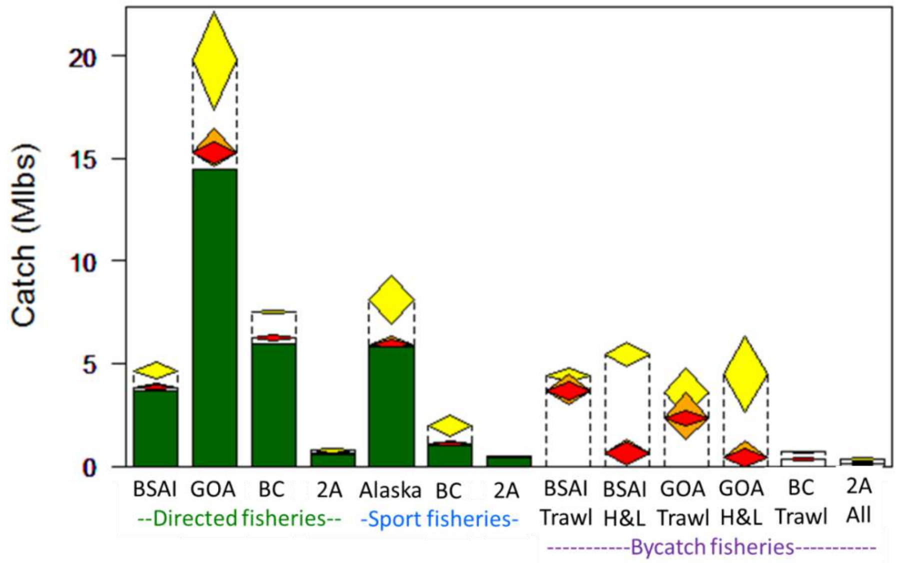

FIGURE 2. Disposition of estimated Pacific halibut catch by source and region in 2015. See Appendix A for calculation details.

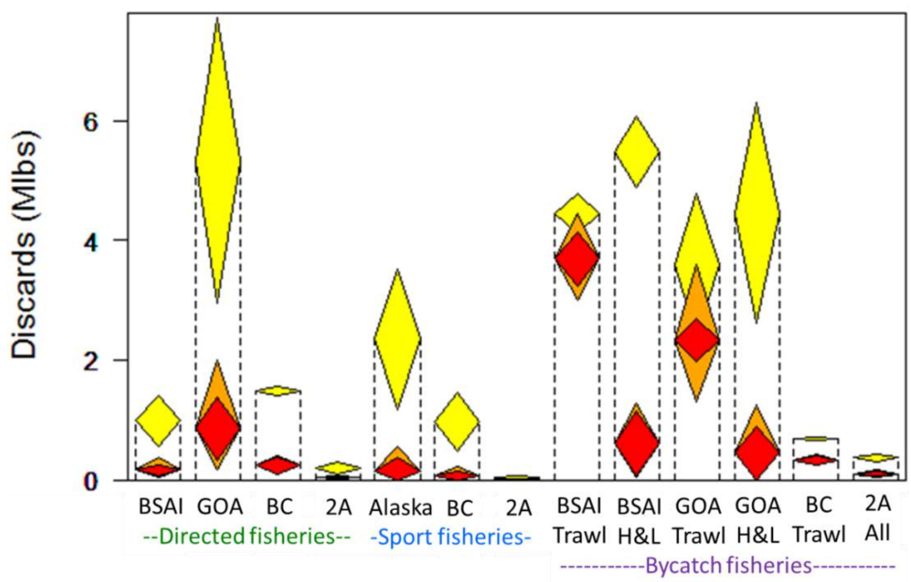

FIGURE 3. Disposition of estimated Pacific halibut discards by source and region in 2015. See Appendix A for calculation details.

SURVEY INFORMATION

The IPHC fishery-independent setline survey (setline survey) is used annually to estimate both the magnitude and size/age structure of halibut discarded by the directed commercial fishery in most IPHC Regulatory Areas (Goen et al. 2017b). IPHC Regulatory Area 2B is the exception, where comprehensive mandatory logbook reporting of sublegal Pacific halibut discards results in a count of individual fish that is used to determine the magnitude of discards (See Appendix B for a comparison of these data with survey estimates). Because all Pacific halibut captured on the setline survey are measured (Henry et al. 2017), the catch can be partitioned into size bins, and evaluated as a proxy for potential encounter rates in the directed commercial fishery.

Summarizing these data in one-inch (2.54 cm) increments reveals three important salient results (Table 2):

1) A substantial portion of the setline survey catch (by weight) across all IPHC Regulatory Areas occurs between 26" and 32".
2) The variability across IPHC Regulatory Areas is large, with 45% of the catch (by weight) below 32" in Area 3B, but only 13.5% in 2C.

A more detailed breakdown of the setline survey catch by both weight and numbers is provided in Appendix B. Because these fish < 32" are light relative to larger individuals the proportions are much larger in numbers than in weight. This may be a consideration for fishery efficiency as small and large fish still occupy a hook.

TABLE 2. Percentage of the 2016 setline survey catch (net weight) that would be discarded in each IPHC Regulatory Area for MSLs from 26 to 32 inches.

	Size limit (inches)						
	26	**27**	**28**	**29**	**30**	**31**	**32**
2A	0.3	0.9	3.0	5.1	10.4	13.9	20.4
2B	0.7	1.8	4.7	7.4	12.7	17.0	22.9
2C	0.6	1.2	2.8	4.2	6.8	9.4	13.5
3A	2.5	3.9	6.9	10.5	16.9	20.6	26.7
3B	10.7	15.0	21.7	26.5	33.6	38.7	45.0
4A	6.3	8.3	11.8	14.0	18.2	21.4	26.1
4B	2.5	4.0	7.4	10.4	16.4	20.7	26.0
4CDE	2.4	4.1	7.6	11.0	17.3	21.2	27.3

Because all of the Pacific halibut randomly sampled for age are also sampled for sex, the change in sex ratio of the retained catch above various MSLs can be summarized. This calculation is provided in Table 3. Similar to the change in weight, there are also two salient points with regard to sex-ratio:

1) The ratio of females in the catch can be reduced by reducing or removing the MSL, however the magnitude of this change in some IPHC Regulatory Areas is modest.
2) The ratio of females in the catch is also highly variable among IPHC Regulatory Areas, with a very high proportion female in IPHC Regulatory Area 2 regardless of MSL, and IPHC Regulatory Area 4B showing a lower proportion female with a 32" MSL than any of the other IPHC Regulatory Areas, even with the MSL removed.

Age composition data from the setline survey indicate generally older males (including some greater than age-20) in the setline survey catch less than 32" (Appendix B). This suggest that some of the change in sex ratio estimated from the setline survey data under reduced MSLs may serve to include males in the retained catch that may not have been available during their average life-span.

TABLE 3. Percent female in the retained 2016 setline survey catch (net weight) in each IPHC Regulatory Area for size-limits from 26 to 32 inches.

	Size limit (inches)							
	None	**26**	**27**	**28**	**29**	**30**	**31**	**32**
2A	81.3	81.4	81.8	83.0	84.1	86.1	87.3	89.3
2B	75.9	76.4	76.9	78.5	79.8	82.3	83.6	85.9
2C	82.9	83.3	83.6	84.3	84.9	85.7	86.2	87.2
3A	73.7	75.1	75.7	77.0	78.6	81.5	83.2	85.9
3B	58.1	62.9	64.9	68.5	71.4	74.8	76.8	79.6
4A	70.3	73.3	74.2	75.7	76.5	78.1	79.1	80.9
4B	45.7	46.2	46.6	47.5	48.3	49.9	51.1	52.4
4CDE	81.0	81.8	82.3	83.1	84.0	86.0	86.8	87.8

OBSERVER INFORMATION

Prior to 2013, there were no observers deployed by the North Pacific Observer Program in the directed commercial fishery in Alaska. Since then, although coverage has been expanded, rates of catch observed remain low (Table 1), and no vessels under 40' (12.2m) in length are currently observed (NMFS 2016). Because the under 40' portion of the directed Pacific halibut fishery is large, and tends to fish in different areas and, on with a different mix of fishing gears than the larger vessels, it is not possible to draw unbiased statistical inference through expansion of the sampled portion of the fleet to the total. However, because the observer data represent the only direct observations of the size structure of the entire catch for the fishing fleet, these data may be useful for comparison with the estimates produced from the IPHC's setline survey. Through a data-sharing agreement between the National Marine Fisheries Service (NMFS) and the IPHC, the observed length frequencies from IFQ fishing in Alaska were provided for this analysis. By converting lengths to weights via the IPHC's standard equation (Stewart 2017), the percentage of the catch in weight was summarized for each IPHC Regulatory Area in Alaska (See Appendix C for more details on these calculations and comparable summaries in numbers). It is not possible to partition these estimates into males and females, because sex-specific information is not currently collected at-sea.

The Pacific halibut commercial fishery observer data suggest a much lower fraction of the catch occurring between 26 and 32" (Table 4). The magnitude of these estimates is roughly half that estimated from the setline survey, although the relative patterns across IPHC Regulatory Areas and sizes is similar. It is not clear to what degree these estimates are representative of the fishery as a whole; however, the reduced catch at smaller sizes is consistent with avoidance of spatial and temporal fishing opportunities that would be sampled more uniformly by the setline survey.

TABLE 4. Percentage of the observed 2016 catch (net weight) that would be discarded in each IPHC Regulatory Area for size-limits from 26 to 32 inches.

	Size limit (inches)						
	26	**27**	**28**	**29**	**30**	**31**	**32**
2A	NA	NA	NA	NA	NA	NA	NA
2B	NA	NA	NA	NA	NA	NA	NA
2C	0.7	1.1	2.0	2.8	4.6	5.8	9.1
3A	1.6	2.5	4.6	6.9	11.1	14.6	21.7
3B	4.4	5.8	9.1	11.2	15.0	17.6	22.0
4A	2.5	3.4	5.2	6.4	8.6	10.1	13.4
4B	0.7	1.1	2.6	3.9	6.9	8.9	12.2
4CDE	1.1	1.4	2.6	3.9	6.7	8.6	13.2

YIELD CALCULATIONS

Previous Minimum Size Limit (MSL) analyses spent considerable effort addressing how the IPHC's harvest policy might change in order to accommodate a change to the MSL. For 2017, the Commission decided to base the reference level of removals in the decision table (the interim harvest policy) on a constant SPR target of 46%. This section evaluates how the yield and yield characteristics could change given a change in the MSL. Further, as in most historical analyses, we consider the possibility that targeting of smaller Pacific halibut could increase under a reduced or removed MSL.

Briefly, the 2016 stock assessment (an ensemble of four individual models) was used to project the removals consistent with fishing at a level corresponding to $SPR_{46\%}$ in 2017. With this level of removals as a baseline, the removals were rescaled to continue to achieve $SPR_{46\%}$ under four alternative cases: removing the MSL with no response in fishery selectivity (noting that the mortality of U32 fish increases by a factor of 6.25, from 16% of those handled to 100% of those handled), and under targeting of the directed fishery increasing the U32 component of the catch by 10%, 20% and 30%. Targeting of smaller Pacific halibut could be achieved via changes in spatial fishing effort, hook size and/or bait size, and may be expected in some IPHC Regulatory Areas where catch rates could be increased to the greatest degree. From each of these cases, the change in total retained catch (Figure 4), as well as the change in the proportion of the retained catch comprised by U32 Pacific halibut (Figure 5) was estimated. Further details of these calculations are provided in Appendix D.

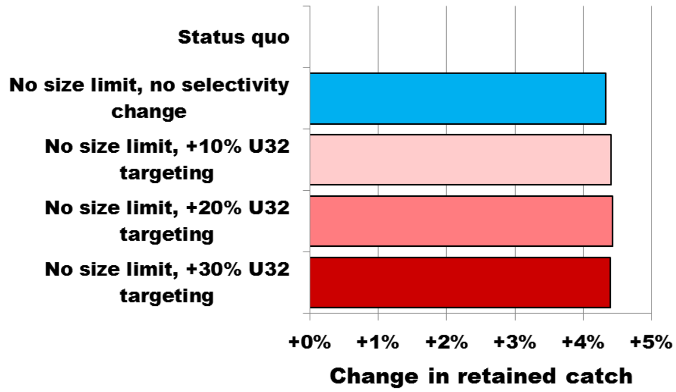

FIGURE 4. Change in yield associated with the *status quo* (*SPR*) harvest policy based on the 2016 assessment ensemble.

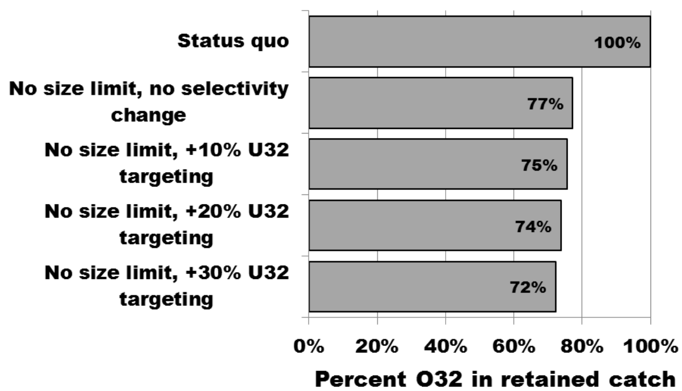

FIGURE 5. Change in directed commercial Pacific halibut fishery catch composition associated with the *status quo* ($SPR_{46\%}$) harvest policy based on the 2016 assessment ensemble.

These results suggest an increase in retained catch of just over 4% regardless of increased targeting of small Pacific halibut. However, the retained catch for all four cases consists of around 25% U32 Pacific halibut, which means that the magnitude of O32 retained catch would decrease relative to recent limits for a similar stock size.

OTHER CONSIDERATIONS

There are a number of considerations relevant to the evaluation of Minimum Size Limits (MSL) that are difficult or impossible to quantify given current information. These can be divided into two categories: those that are primarily biological and those that are largely technical and/or operational.

Biological.

Biological considerations include implications for stock distribution, density dependence, observed size-at-age, and biological-management interactions. Potential effects on the spatial distribution of the stock may be created by taking more or less small/young Pacific halibut in each IPHC Regulatory Area. Our broad understanding of movement rates by age (Stewart 2017) suggests that reducing the MSL without adjusting the management distribution may result in a larger proportion of the catch occurring in the western portions of the stock (parts of 3A, 3B and parts of 4A in particular). This is where most of the juvenile habitat and production is believed to occur, and where the highest proportion of small/young Pacific halibut is encountered by the survey. However, the management (or catch) is also a function of management decisions, so this potential effect is difficult, if not impossible to predict.

Female and especially male Pacific halibut are more numerous at smaller sizes (as seen in the analyses above). Density dependence within the Pacific halibut stock has been suggested as a potential factor contributing to changes in size-at-age (Clark and Hare 2002, Clark et al. 1999); however there appear to be additional (or alternative) factors (Loher 2013) influencing recent trends that have resulted in relatively low size-at-age even after a decade of declining number in the early 2000s. Although fishery effects on size-at-age due to the MSL are likely present (Martell et al. 2015b, Sullivan 2016), there is currently no evidence for fishery induced evolution, or genetic effects on size at age. In fact, the variability of size-at-age remains high, despite changes in the average, and historical trends indicate increasing size-at-age over much of the 1900s during intense fishery exploitation. Further, longline gear is inherently size selective (e.g., Kaimmer 2015) even in the absence of a MSL, and it is unclear whether a change in the MSL would have clear effects on density dependent processes or size-at-age.

A MSL provides a reduction in the fishing mortality on immature Pacific halibut that would be reduced under a lower or no MSL. Higher survival results in a larger spawning biomass, on average (and especially under equilibrium conditions) as has been identified by several previous analyses of the MSL (Clark and Parma 1995, Martell et al. 2015a, Martell et al. 2016, Valero and Hare 2012). However, the current understanding of the stock and recruitment dynamics suggest only a weak relationship between spawning biomass and subsequent cohort strengths (Clark and Hare 2006, Clark et al. 1999), with the most dominant covariate being the environmental conditions, as referenced by the Pacific Decadal Oscillation (PDO; Stewart and Hicks 2017). Perhaps more important for consideration, is the shape of estimated yield curves under differing MSLs. Reducing or removing the MSL would result in equilibrium yields maximized over a more narrow range of fishing intensities (upper middle panel of Figure 3 in Martell et al. 2015a), potentially amplifying the variability in estimation and observation errors in stock size and productivity translated into realized yield. However; it is unclear that the magnitude of these uncertainties would be appreciable relative to the many other sources of uncertainty in the assessment and implementation of the IPHC's previous harvest policy.

Operational.

Operational considerations include technical aspects of implementing a change in the MSL in the stock assessment and harvest policy, as well as data needs and effects on non-biological aspects of the fishery such as market structure and price.

The use of an SPR target does not pose a technical impediment to a change in the MSL, in contrast to previous evaluations of the MSL where a revision to the harvest policy would have been necessitated by any change to the MSL. However, the current metric for describing stock distribution, relative O32 setline survey catch (Webster and Stewart 2017) would retain little meaning under a reduced or no MSL. In that case (and perhaps for the 32" MSL as well), it may be preferable to describe stock distribution via total survey catch. There are already, and would be further removals of U32 Pacific halibut under any change to the MSL. YPR and other harvest policy calculations relating to the relative harvest rates among IPHC Regulatory Areas depend on the selectivity of the fishery, and so would need to be adjusted, likely over several years, if the MSL were changed and the fishery subsequently adapted. There would be a lag in this response, due to the need for data with which to estimate the change in selectivity: if there were rapid changes, they would not be reflected in these calculations until the following year when data became available. The stock assessment already includes time-varying selectivity for the directed commercial fishery. A reduced MSL could be modelled with no technical changes to this approach, and removal of the MSL would simplify the assessment framework and assumptions in creating the data sources, as the commercial catch would be comprehensively sampled in port. This sampling would be dependent on full retention of all fish caught in the fishery.

For reduced MSLs, and particularly for removal of the MSL, there likely would be fewer Pacific halibut which are not retained; therefore, the importance of DMRs and the uncertainty in DMRs for the directed commercial Pacific halibut fishery is reduced or eliminated. It is unknown how the processing industry and the market for Pacific halibut would respond to a change in the average size and the introduction of much smaller Pacific halibut to the landed catch. Finally, there is a potential public perception benefit in increasing fishery efficiency and reducing wasted fish even if there is a net reduction in overall fishery value (depending on price).

SUMMARY

This analysis suggests the following general conclusions (Table 5):

- Discard mortality (wastage) – the quantity of Pacific halibut discarded which is either dead or dies from catch related injuries, as a function of having a Minimum Size Limit (MSL) would remain unknown under a reduced size limit (as it is currently), but would be eliminated (and observed) if all Pacific halibut were retained and the MSL were removed.
- Total yield – the retained catch in pounds is predicted to increase slightly given a constant SPR target of 46%, under a reduced or no MSL.
- Harvest of male Pacific halibut – the yield (retained catch) from male Pacific halibut would increase under a reduced or no MSL. This catch does not influence the SPR.
- Selectivity – the response of the directed commercial Pacific halibut fishery to a reduced or no MSL is unknown, and would likely depend on how the ex-vessel price for U32 fish compares to the current price structure.
- Biological data – the size/age composition of the entire directed commercial Pacific halibut fishery catch is currently estimated only indirectly. Under full retention of Pacific halibut and no MSL these fish could be sampled directly in port (assuming an absence of high-grading).
- Management buffer - MSLs provide a management ‘buffer’, flattening yield curves (producing near-optimal yields over a broader range of harvest rates), and reducing the potential effects of harvest rates that differ modestly from those that would be optimal, either by design or due to observation and estimation error.
- Recruitment refuge – the current 32” MSL appears to provide for a reduction in harvest rates on immature fish. The degree to which it benefits stock and recruitment dynamics or serves as a precautionary tool has not been determined.
- Fishery efficiency – fishing efficiency would increase with a reduced or no MSL, as less gear would be required to land the same volume of catch in all IPHC Regulatory Areas; however, this change would differ in magnitude among areas, with some (e.g., 3B), likely showing the greatest response.
- Price – The value/price for U32 Pacific halibut would become known if the MSL were reduced (for some sizes) or removed entirely. It is unclear how long this would take and what specific factors may be relevant.
- Fishery value – The net value of the directed commercial Pacific halibut fishery may change in a positive or negative direction depending on the emergent price for U32

Pacific halibut. If the price were comparable to current prices, the increased yield (~4%) would suggest increased fishery value; however, the projected proportion of U32 fish in the catch is large enough (~25%) to offset the increased yield if the value of these fish is low.

TABLE 5. Summary of MSL considerations.

	Status quo 32" MSL	Reduced MSL	No MSL
Discard mortality	No change	unknown	Down
Total yield	No change	Up	Up
Harvest of males	No change	Up	Up
Selectivity	No change	unknown	unknown
Biological data on total catch	Incomplete	Incomplete	Sampled in port
Management buffer	No change	Down	Down
Recruitment refuge	No change	Down	Down
Fishery efficiency (retained catch-rate)	No change	Up	Up
Price	No change	Emergent	Emergent
Fishery value	No change	Depends on price	Depends on price

Development of Adaptive Management Options

During SRB10 (IPHC 2017a), the IPHC's Scientific Review Board made the following request:

"***SRB10–Req.02 (para. 28)*** *The SRB REQUESTED an evaluation of the potential to try different size limits in different regions given the diversity of impacts on Pacific halibut fishing sectors and areas. MSL changes may need an adaptive management experiment approach that considers the biological, economic, and sociological consequences MSL changes. Indeed, predictions of consequences in each IPHC Regulatory Area should be a pre-requisite to any proposed MSL changes.*"

The IPHC Secretariat subsequently developed several options for adaptive management approaches that are included in Appendix E.

During SRB11 (IPHC 2017b), after reviewing the options developed by the Secretariat, the IPHC's Scientific Review Board made an additional recommendation:

"***SRB11–Req.05 (para. 21)*** *NOTING the thoughtful and detailed presentation on the potential impacts of changing the minimum size limit presented in Appendix E (Evaluation of adaptive management approaches) of paper IPHC-2017-SRB11-07, the SRB REQUESTED that the IPHC Secretariat, between now and SRB12, seek feedback from the Commissioners, Conference Board, Processors Advisory Board, and the Management Strategy Advisory Board,* *on a modified version of Appendix E. In particular, a modified version would include (i) a process for starting and possibly ending an experiment, (ii) performance metrics, and (iii) criteria for making conclusions based on the experimental outcomes.*"

The IPHC Secretariat recommends that if further work is to be done on adaptive management approaches, one or more of the options presented in Appendix E (or others yet to be developed) could be more fully analyzed to address and provide recommendations for the three specific aspects noted above. Discussion of this topic and input from the IPHC's Advisory Bodies during the 2018 Annual Meeting (AM094) would be helpful in that effort.

RECOMMENDATION/S

That the Commission:

a) **NOTE** paper IPHC-2018-AM094-14 which provides an evaluation of the '*effectiveness'* of a range of size limits in the directed commercial Pacific halibut fishery.
b) **RECOMMEND** whether there is a need for further evaluation of the MSL by the Secretariat, or whether the current evaluation meets the Commissions needs.

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APPENDICES

Appendix A: Distribution of all Pacific halibut catch estimates in 2015.

Appendix B: Distribution of 2016 setline survey Pacific halibut catch by size, sex, and age.

Appendix C: Distribution of 2016 observed commercial Pacific halibut catch by size.

Appendix D: Yield calculations.

Appendix E: Evaluation of adaptive management approaches.

APPENDIX A
Distribution of all Pacific halibut catch estimates in 2015

There are two important aspects to the disposition of the catch as estimated in this document, these are: 1) the basis for the estimates, and 2) the uncertainty in these estimates that is assumed.

The estimates in Table 1 for the retained catch and the discarded and died (D_d) catch all come from the best available estimates used in the 2016 stock assessment as referenced in the main text. The discarded and survived (D_s) estimates were calculated from the dead discards (D_d) and the DMR via:

$$D_s = \left(\frac{D_d}{DMR}\right) - D_d$$

In several cases, the DMR values are based on literature review and/or historical analyses. These include the 16% DMR applied to the directed commercial Pacific halibut fishery (Leaman and Stewart 2017), and the DMR underlying the recreational estimates from Alaskan waters (Meyer 2007). The aggregate DMRs also represent the combination of several components. For the recreational estimates from Alaska, the aggregate DMR was calculated from the sum of the component (c) specific DMRs:

$$DMR = \left(\frac{\sum_c DMR_c * \left(D_{d,c} + D_{s,c}\right)}{\sum_c \left(D_{d,c} + D_{s,c}\right)}\right)$$

In some cases, the observer coverage was reported directly for the fishery of interest, and in others, such as the aggregate trawl fisheries in the BSAI and GOA, the aggregate was approximated based on the relative magnitude of catch for each of the reported component fisheries contributing. For this reason, the estimates in Table 1 should be considered merely approximations, for use in a broad comparison among sources of Pacific halibut discards and mortality.

The second important aspect of this analysis is the degree of uncertainty assumed to arise from the DMRs and from the rate of observer coverage. The estimates reported here should not be mistaken for statistical variance estimates. The largest impediment to statistically-based variance estimates is the ‘observer effect’, whereby fishing behavior can differ in the presence or absence of an observer on the vessel, and therefore an unknown degree of bias exists in the expansion from observed to unobserved activity. Recent observer reports indicate that this effect does exist (Faunce and Barbeaux 2011, Faunce et al. 2016). There is currently no method for estimating the variance in observer estimates due to lack of coverage (<40’ vessels), non-random coverage (e.g., vessels making longer trips, landing more fish, etc. when not carrying an observer), and statistical variance associated with subsampling of fish, fishing events, and fishing trips.

In order to qualitatively evaluate which sources have more or less uncertainty related to the level of observer coverage, a simple relationship was used for graphical analysis. The Coefficient of Variation (CV) in the quantity of halibut discarded is assumed to be a simple linear function of the observer coverage (O, pounds landed and observed/total pounds landed):

$$CV = 5\% + [45\% * (100\% - O)]$$

This relationship results in the following: 100% observer coverage corresponds to a 5% CV, 50% observer coverage corresponds to a 27.5% CV, and 0% observer coverage corresponds to a 50% CV.

Uncertainty in DMRs is assumed to be +/- 10% regardless of scale or source. We currently have no method for quantifying this uncertainty in either static values (e.g., the 16% assumed for the directed commercial halibut fishery) or values based on viability assessments by at-sea observers which are subject to measurement error, as well as including uncertainty in the underlying survival rates associated with the measured condition of the sampled Pacific halibut at the point of release.

As all of the inputs to Table 1 have inter-annual variability, and are representative of 2015, their applicability to future years is uncertain. For this reason, the information is just intended to provide a general guide to the magnitude of sources and uncertainty for comparative purposes.

APPENDIX B
Distribution of 2016 setline survey Pacific halibut catch by size, sex, and age

All Pacific halibut captured on the IPHC's fishery independent setline survey are measured to the nearest centimeter (Henry et al. 2017). However, only a portion of the sublegal halibut captured are sacrificed for otolith sampling (the rest are released alive whenever possible). Sex determination is done after the fish have been sacrificed, therefore only those Pacific halibut that have been fully sampled have an age, length and sex estimate. For this analysis only the random sample of Pacific halibut with this complete information has been included.

The results are summarized in terms of both numbers of fish as well as weight of fish in each one-inch (2.54 cm) size-increment from 26" to 32". Individual fish weights were estimated via the IPHC's length-weight relationship (Stewart 2017) between fork length (L_f), and individual net (headed and gutted) weights (W_n):

$$W_n = 0.00000692 \cdot {L_f}^{3.24}$$

Although there are ongoing projects to evaluate this relationship (Planas 2017), the direct information is not yet comprehensive enough to allow for the use of measured weights for survey catch at this point. However, this is a potential source of bias in the analysis, as measured weights from commercially captured halibut have shown some evidence of divergence from the length-weight relationship (Webster and Erikson 2017).

The weight and number of fish discarded in each size-increment and cumulatively from 26" to 32" were calculated for each regulatory area, with males and females separated (Tables B1-B8 and figures B1-B8). Although the sex-ratio for each size-increment is reported in the main text, a related question regards the partial recruitment of males to the survey and fishery catch. Specifically, given the variability in size-at-age, it is possible that some male halibut may not exceed the current MSL during their average life-span. The distribution of ages for male and female Pacific halibut less than 32" captured by the setline survey indicates, in some areas (particularly 3A), as many as 10% of sublegal male halibut may be older than 15 years (Figure B10).

An alternative method for summarizing the sublegal catch-rates from the setline survey is used each year for the calculation of discard mortality (Goen et al. 2017b). In that approach, the catch at each survey station is summarized as the ratio of numbers of sublegal fish to total numbers of fish captured. Then, the distribution of survey stations within a Regulatory Area is characterized by the median, 25th and 75th percentiles of this ratio. The results indicate similar encounter rates among Regulatory Areas, and considerable variability within Areas which could translate to differences between these survey-based estimates and actual catch encountered by the directed commercial fishery (Figure B10). This is an important consideration for the interpretation of this analysis all survey-based approaches assume that the setline survey is encountering and selecting the same size distribution of Pacific halibut as the commercial fishery. Differences in spatial and seasonal fishing patterns, as well as fishing gear and bait could all lead to differences in the total catch encountered by the directed commercial fishery relative to the setline survey. Because the IPHC's sampling program occurs when the fish are landed, there are no direct and unbiased estimates of the total fishery catch currently available.

TABLE B1. Percentage of the 2016 survey catch that would be discarded in Area 2A for size-limits from 26 to 32 inches based on numbers of fish and weight of fish. For comparison, the percentage of the catch by sex greater than the current 32-inch minimum size limit is reported at the right margin.

	Size limit (inches)							
	26	**27**	**28**	**29**	**30**	**31**	**32**	**> 32**
Numbers								
Males	0.7	1.3	3.4	2.9	4.9	2.7	3.7	9.3
Females	0.1	0.3	1.4	1.4	4.8	3.3	6.0	53.9
Cumulative males	0.7	2.0	5.4	8.3	13.2	15.8	19.5	
Cumulative females	0.1	0.4	1.8	3.3	8.1	11.3	17.3	
Cumulative total	0.8	2.4	7.2	11.6	21.2	27.1	36.8	
Weight								
Males	0.2	0.5	1.5	1.4	2.6	1.6	2.4	8.5
Females	0.0	0.1	0.6	0.7	2.6	2.0	4.0	71.2
Cumulative males	0.2	0.7	2.2	3.6	6.3	7.9	10.3	
Cumulative females	0.0	0.1	0.8	1.5	4.1	6.1	10.1	
Cumulative total	0.3	0.9	3.0	5.1	10.4	13.9	20.4	

TABLE B2. Percentage of the 2016 survey catch that would be discarded in Area 2B for size-limits from 26 to 32 inches based on numbers of fish and weight of fish. For comparison, the percentage of the catch by sex greater than the current 32-inch minimum size limit is reported at the right margin.

	Size limit (inches)							
	26	**27**	**28**	**29**	**30**	**31**	**32**	**> 32**
Numbers								
Males	2.0	2.2	5.2	3.9	6.1	3.3	4.1	11.3
Females	0.2	0.8	1.7	1.8	4.1	4.1	5.0	44.1
Cumulative males	2.0	4.3	9.4	13.3	19.4	22.7	26.9	
Cumulative females	0.2	1.0	2.6	4.5	8.6	12.7	17.7	
Cumulative total	2.2	5.2	12.1	17.8	28	35.4	44.6	
Weight								
Males	0.6	0.8	2.2	1.8	3.2	1.9	2.7	10.9
Females	0.1	0.3	0.7	0.9	2.1	2.4	3.2	66.3
Cumulative males	0.6	1.5	3.6	5.4	8.6	10.5	13.2	
Cumulative females	0.1	0.4	1.1	1.9	4.1	6.5	9.7	
Cumulative total	0.7	1.8	4.7	7.4	12.7	17	22.9	

TABLE B3. Percentage of the 2016 survey catch that would be discarded in Area 2C for size-limits from 26 to 32 inches based on numbers of fish and weight of fish. For comparison, the percentage of the catch by sex greater than the current 32-inch minimum size limit is reported at the right margin.

	Size limit (inches)							
	26	**27**	**28**	**29**	**30**	**31**	**32**	**> 32**
Numbers								
Males	1.8	1.4	3.0	1.8	2.7	1.6	2.6	13.5
Females	0.5	0.7	1.5	1.6	3.5	3.7	5.1	55.0
Cumulative males	1.8	3.2	6.1	8.0	10.7	12.3	14.9	
Cumulative females	0.5	1.2	2.7	4.4	7.8	11.5	16.6	
Cumulative total	2.3	4.4	8.9	12.4	18.5	23.8	31.5	
Weight								
Males	0.5	0.4	1.0	0.7	1.2	0.8	1.4	11.1
Females	0.1	0.2	0.5	0.6	1.5	1.8	2.7	75.3
Cumulative males	0.5	0.9	1.9	2.7	3.8	4.6	6.0	
Cumulative females	0.1	0.3	0.9	1.5	3.0	4.8	7.5	
Cumulative total	0.6	1.2	2.8	4.2	6.8	9.4	13.5	

TABLE B4. Percentage of the 2016 survey catch that would be discarded in Area 3A for size-limits from 26 to 32 inches based on numbers of fish and weight of fish. For comparison, the percentage of the catch by sex greater than the current 32-inch minimum size limit is reported at the right margin.

	Size limit (inches)							
	26	**27**	**28**	**29**	**30**	**31**	**32**	**> 32**
Numbers								
Males	6.0	2.2	4.0	4.4	6.3	3.1	4.1	10.4
Females	1.5	1.0	2.4	2.3	4.5	2.4	4.3	41.1
Cumulative males	6.0	8.2	12.2	16.6	22.9	26	30.1	
Cumulative females	1.5	2.5	4.9	7.2	11.7	14.1	18.4	
Cumulative total	7.5	10.7	17.1	23.8	34.6	40.2	48.5	
Weight								
Males	2.0	0.9	1.9	2.3	3.7	2.1	3.0	10.3
Females	0.5	0.4	1.1	1.2	2.6	1.6	3.1	63.0
Cumulative males	2.0	3.0	4.9	7.2	11.0	13.0	16.0	
Cumulative females	0.5	0.9	2.0	3.3	5.9	7.5	10.6	
Cumulative total	2.5	3.9	6.9	10.5	16.9	20.6	26.7	

TABLE B5. Percentage of the 2016 survey catch that would be discarded in Area 3B for size-limits from 26 to 32 inches based on numbers of fish and weight of fish. For comparison, the percentage of the catch by sex greater than the current 32-inch minimum size limit is reported at the right margin.

	Size limit (inches)							
	26	**27**	**28**	**29**	**30**	**31**	**32**	**> 32**
Numbers								
Males	19.1	5.6	7.7	4.9	5.2	2.7	3.0	8.3
Females	4.3	1.6	2.4	1.6	3.3	2.8	3.3	24
Cumulative males	19.1	24.8	32.5	37.4	42.6	45.4	48.3	
Cumulative females	4.3	6.0	8.3	9.9	13.2	16.1	19.3	
Cumulative total	23.5	30.7	40.8	47.4	55.9	61.4	67.7	
Weight								
Males	8.8	3.3	5.1	3.7	4.3	2.5	3.0	11.2
Females	1.9	1.0	1.6	1.2	2.7	2.6	3.3	43.8
Cumulative males	8.8	12.1	17.2	20.9	25.2	27.7	30.7	
Cumulative females	1.9	2.9	4.4	5.6	8.4	11.0	14.3	
Cumulative total	10.7	15	21.7	26.5	33.6	38.7	45.0	

TABLE B6. Percentage of the 2016 survey catch that would be discarded in Area 4A for size-limits from 26 to 32 inches based on numbers of fish and weight of fish. For comparison, the percentage of the catch by sex greater than the current 32-inch minimum size limit is reported at the right margin.

	Size limit (inches)							
	26	**27**	**28**	**29**	**30**	**31**	**32**	**> 32**
Numbers								
Males	14.2	3.2	4.5	2.2	3.8	2.2	3.0	11.9
Females	5.3	1.4	2.6	1.9	3.0	2.5	3.3	35.0
Cumulative males	14.2	17.4	22.0	24.2	28.0	30.2	33.2	
Cumulative females	5.3	6.7	9.2	11.1	14.1	16.6	19.8	
Cumulative total	19.5	24.1	31.2	35.3	42.1	46.8	53.0	
Weight								
Males	4.6	1.4	2.2	1.2	2.3	1.5	2.3	14.1
Females	1.6	0.6	1.3	1.0	1.8	1.7	2.4	59.8
Cumulative males	4.6	6.0	8.3	9.5	11.8	13.3	15.6	
Cumulative females	1.6	2.2	3.5	4.5	6.4	8.1	10.5	
Cumulative total	6.3	8.3	11.8	14	18.2	21.4	26.1	

TABLE B7. Percentage of the 2016 survey catch that would be discarded in Area 4B for size-limits from 26 to 32 inches based on numbers of fish and weight of fish. For comparison, the percentage of the catch by sex greater than the current 32-inch minimum size limit is reported at the right margin.

	Size limit (inches)							
	26	27	28	29	30	31	32	> 32
Numbers								
Males	5.7	2.9	5.9	4.6	7.7	4.9	5.0	27.8
Females	2.0	0.7	1.5	1.3	2.8	1.8	2.5	22.8
Cumulative males	5.7	8.7	14.5	19.1	26.8	31.7	36.7	
Cumulative females	2.0	2.8	4.3	5.6	8.4	10.2	12.7	
Cumulative total	7.8	11.4	18.8	24.7	35.2	41.9	49.4	
Weight								
Males	1.9	1.2	2.7	2.3	4.4	3.1	3.5	35.3
Females	0.7	0.3	0.7	0.7	1.6	1.1	1.8	38.8
Cumulative males	1.9	3.1	5.8	8.1	12.5	15.6	19.1	
Cumulative females	0.7	1.0	1.6	2.3	3.9	5.1	6.8	
Cumulative total	2.5	4.0	7.4	10.4	16.4	20.7	26.0	

TABLE B8. Percentage of the 2016 survey catch that would be discarded in Area 4CDE for size-limits from 26 to 32 inches based on numbers of fish and weight of fish. For comparison, the percentage of the catch by sex greater than the current 32-inch minimum size limit is reported at the right margin.

	Size limit (inches)							
	26	27	28	29	30	31	32	> 32
Numbers								
Males	3.8	1.9	2.9	2.6	4.5	1.9	2.1	7.7
Females	3.6	2.1	4.6	3.9	6.3	4.2	6.4	41.6
Cumulative males	3.8	5.7	8.6	11.2	15.7	17.6	19.7	
Cumulative females	3.6	5.7	10.3	14.2	20.5	24.7	31.1	
Cumulative total	7.3	11.4	18.9	25.4	36.2	42.3	50.7	
Weight								
Males	1.2	0.8	1.4	1.4	2.6	1.2	1.5	8.9
Females	1.2	0.9	2.2	2.1	3.7	2.7	4.6	63.8
Cumulative males	1.2	2.0	3.4	4.7	7.3	8.6	10.1	
Cumulative females	1.2	2.1	4.2	6.3	9.9	12.6	17.2	
Cumulative total	2.4	4.1	7.6	11	17.3	21.2	27.3	

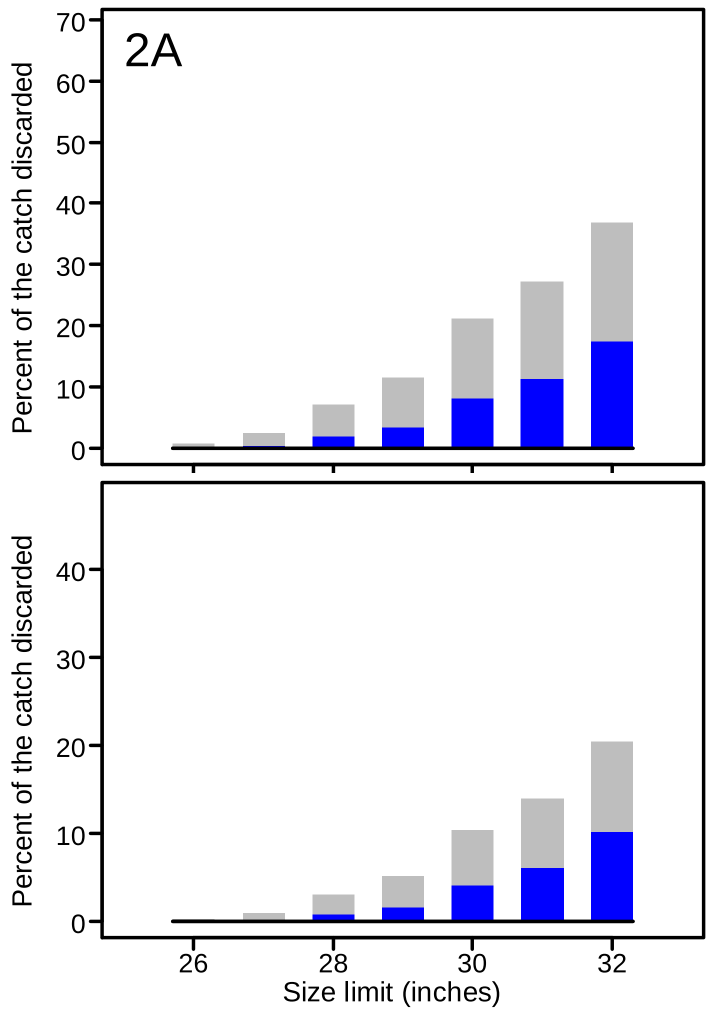

FIGURE B1. Percentage of the 2016 survey catch discarded in Area 2A for size-limits from 26 to 32 inches, based on the number of fish (upper panel) and the weight of fish (lower panel). Height of the bars represents the total, and the darker (lower) portion the contribution of male halibut. Note that the y-axes differ. See tables for percentage values.

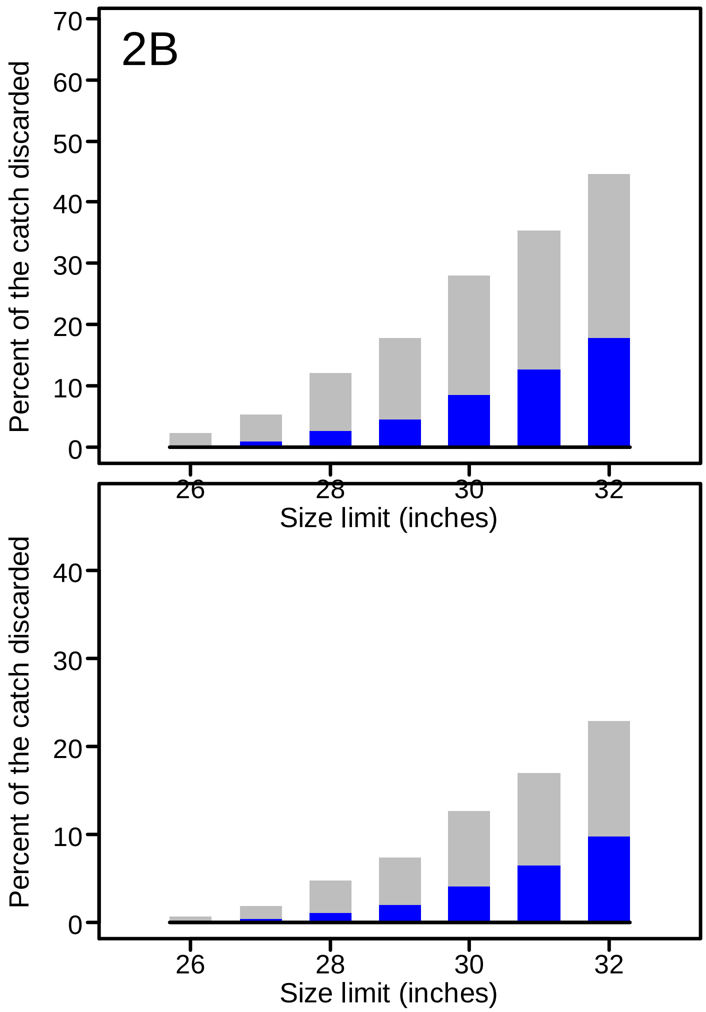

FIGURE B2. Percentage of the 2016 survey catch discarded in Area 2B for size-limits from 26 to 32 inches, based on the number of fish (upper panel) and the weight of fish (lower panel). Height of the bars represents the total, and the darker (lower) portion the contribution of male halibut. Note that the y-axes differ. See tables for percentage values.

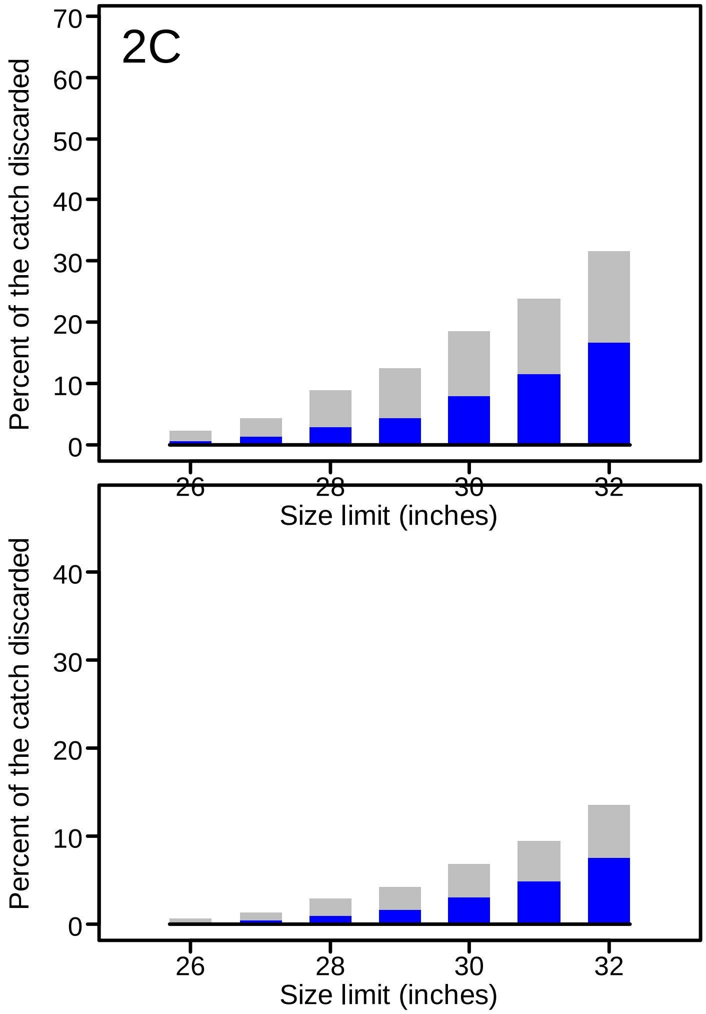

FIGURE B3. Percentage of the 2016 survey catch discarded in Area 2C for size-limits from 26 to 32 inches, based on the number of fish (upper panel) and the weight of fish (lower panel). Height of the bars represents the total, and the darker (lower) portion the contribution of male halibut. Note that the y-axes differ. See tables for percentage values.

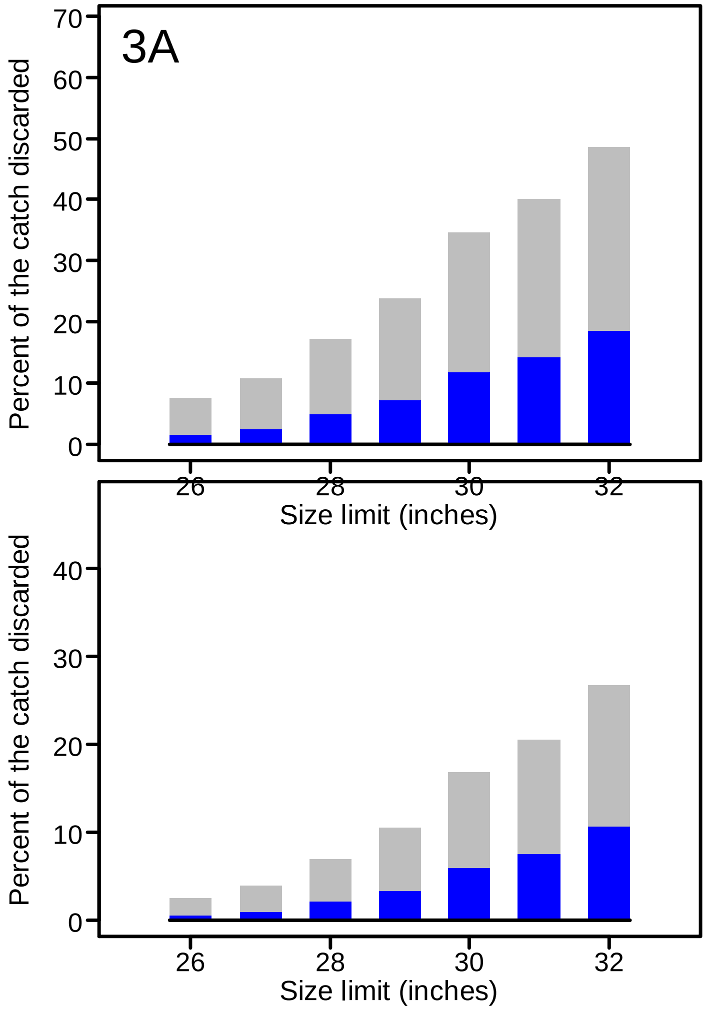

FIGURE B4. Percentage of the 2016 survey catch discarded in Area 3A for size-limits from 26 to 32 inches, based on the number of fish (upper panel) and the weight of fish (lower panel). Height of the bars represents the total, and the darker (lower) portion the contribution of male halibut. Note that the y-axes differ. See tables for percentage values.

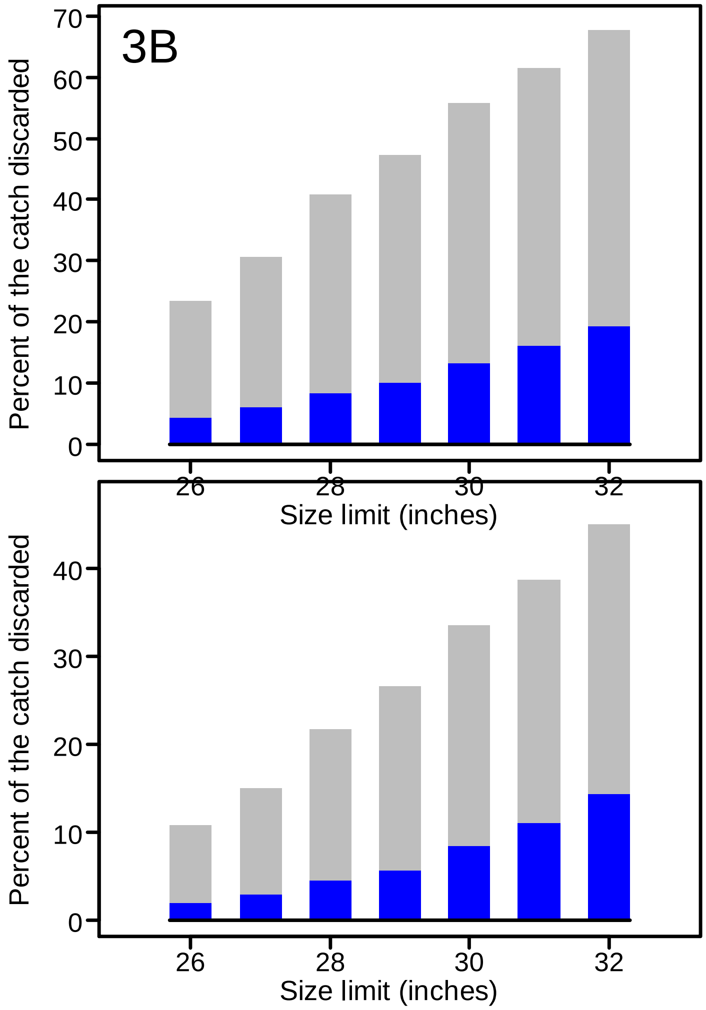

FIGURE B5. Percentage of the 2016 survey catch discarded in Area 3B for size-limits from 26 to 32 inches, based on the number of fish (upper panel) and the weight of fish (lower panel). Height of the bars represents the total, and the darker (lower) portion the contribution of male halibut. Note that the y-axes differ. See tables for percentage values.

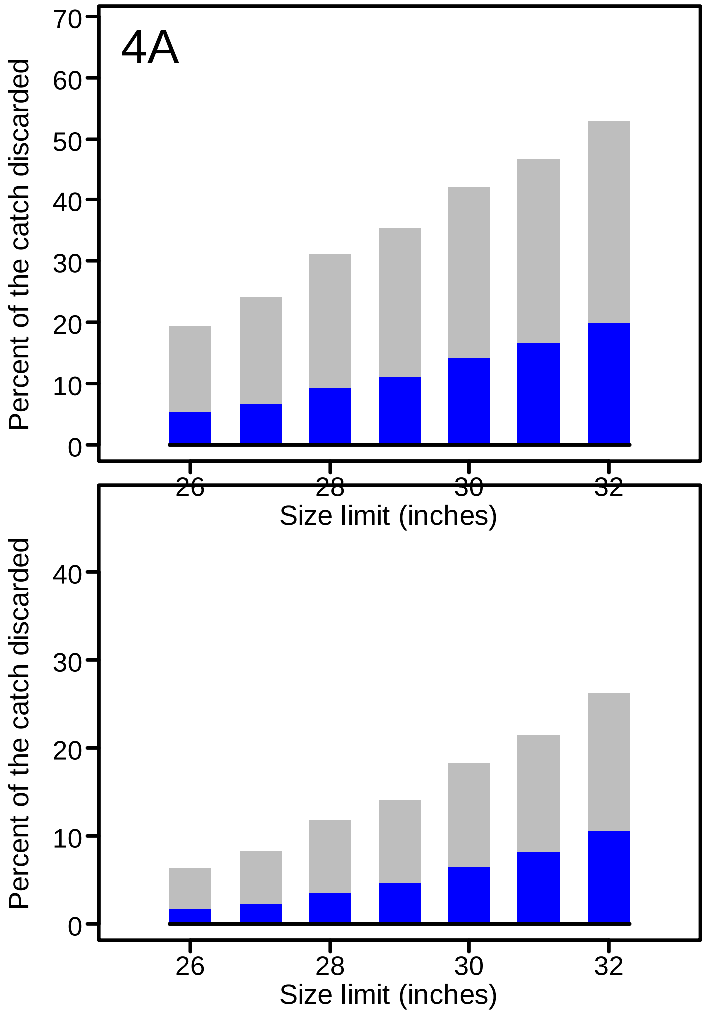

FIGURE B6. Percentage of the 2016 survey catch discarded in Area 4A for size-limits from 26 to 32 inches, based on the number of fish (upper panel) and the weight of fish (lower panel). Height of the bars represents the total, and the darker (lower) portion the contribution of male halibut. Note that the y-axes differ. See tables for percentage values.

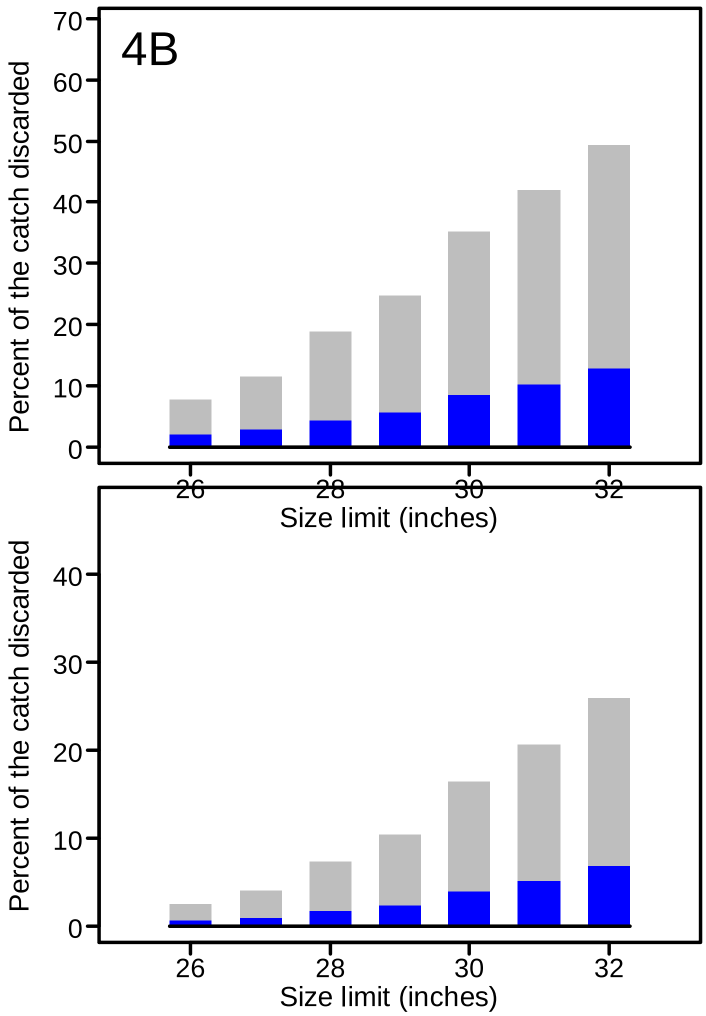

FIGURE B7. Percentage of the 2016 survey catch discarded in Area 4B for size-limits from 26 to 32 inches, based on the number of fish (upper panel) and the weight of fish (lower panel). Height of the bars represents the total, and the darker (lower) portion the contribution of male halibut. Note that the y-axes differ. See tables for percentage values.

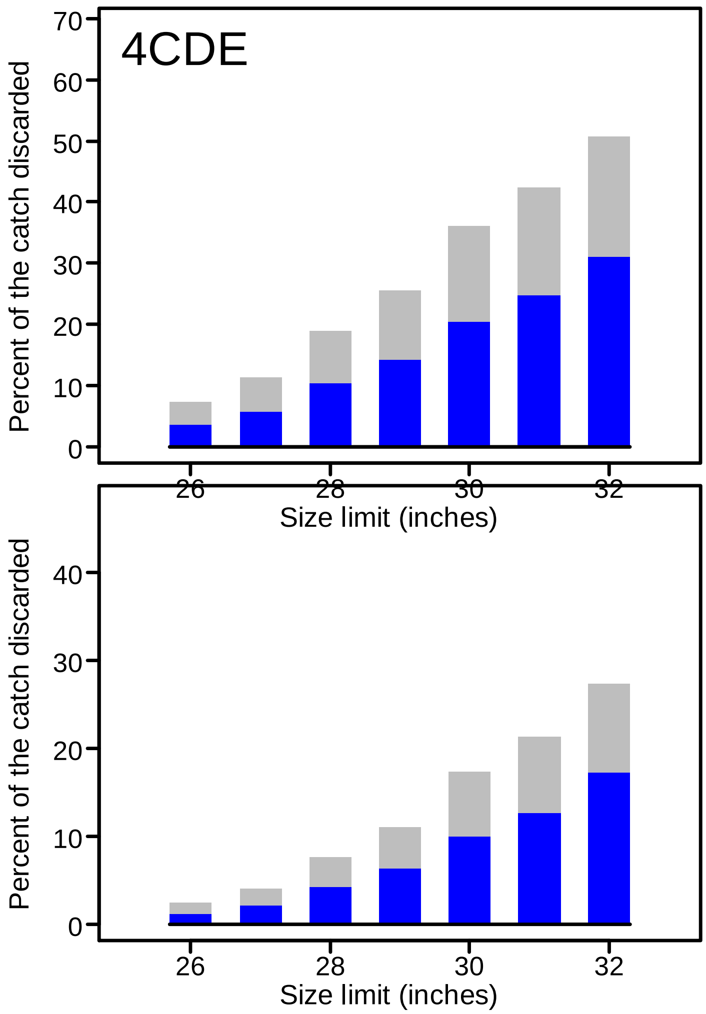

FIGURE B8. Percentage of the 2016 survey catch discarded in Area 4CDE for size-limits from 26 to 32 inches, based on the number of fish (upper panel) and the weight of fish (lower panel). Height of the bars represents the total, and the darker (lower) portion the contribution of male halibut. Note that the y-axes differ. See tables for percentage values.

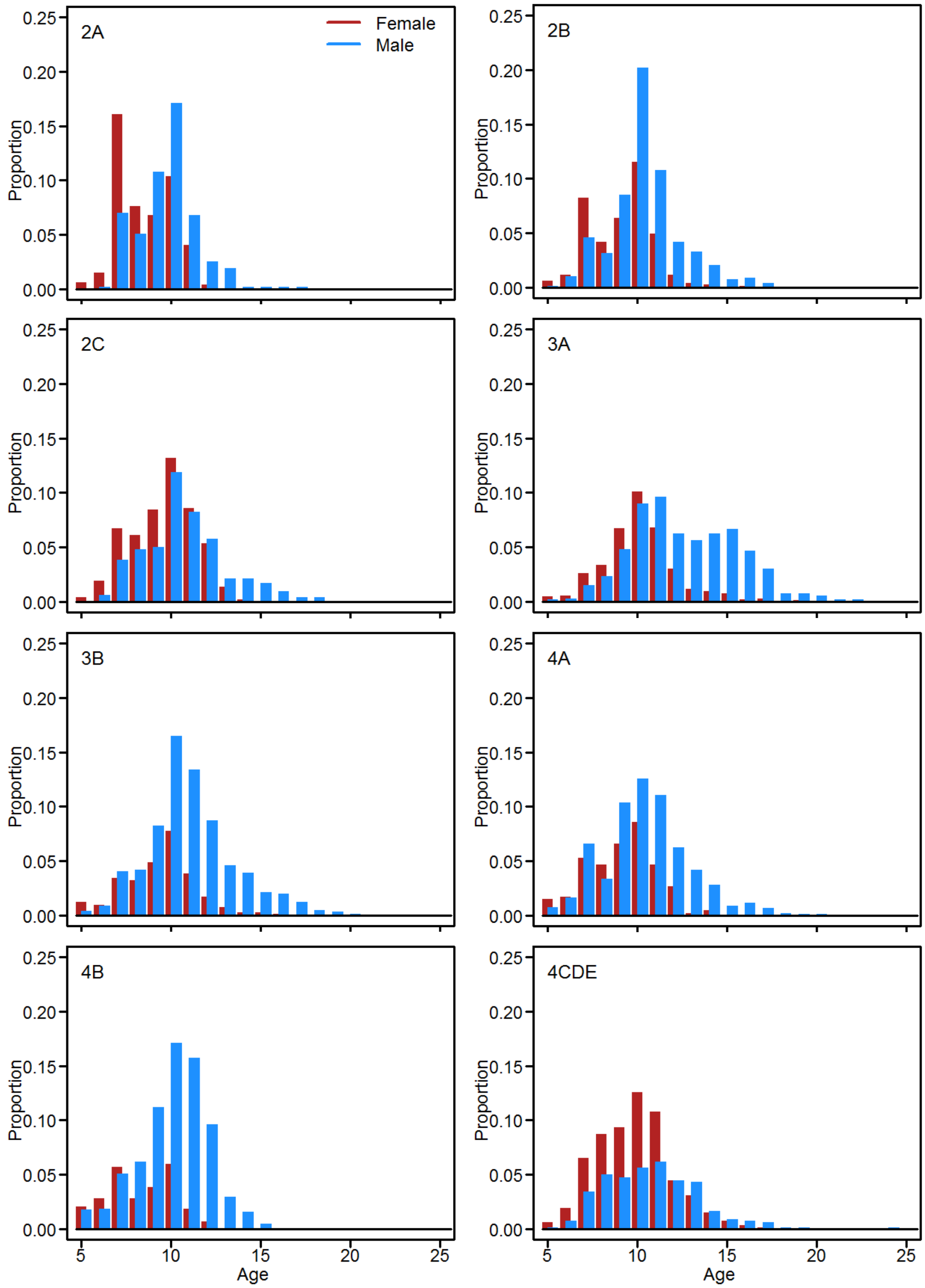

FIGURE B9. Proportions-at-age of sublegal (< 32”) Pacific halibut by Regulatory Area captured by the 2016 setline survey. Blue bars denote male halibut, red bars denote female halibut; all bars in each panel sum to a value of 1.0 (From: Stewart 2017).

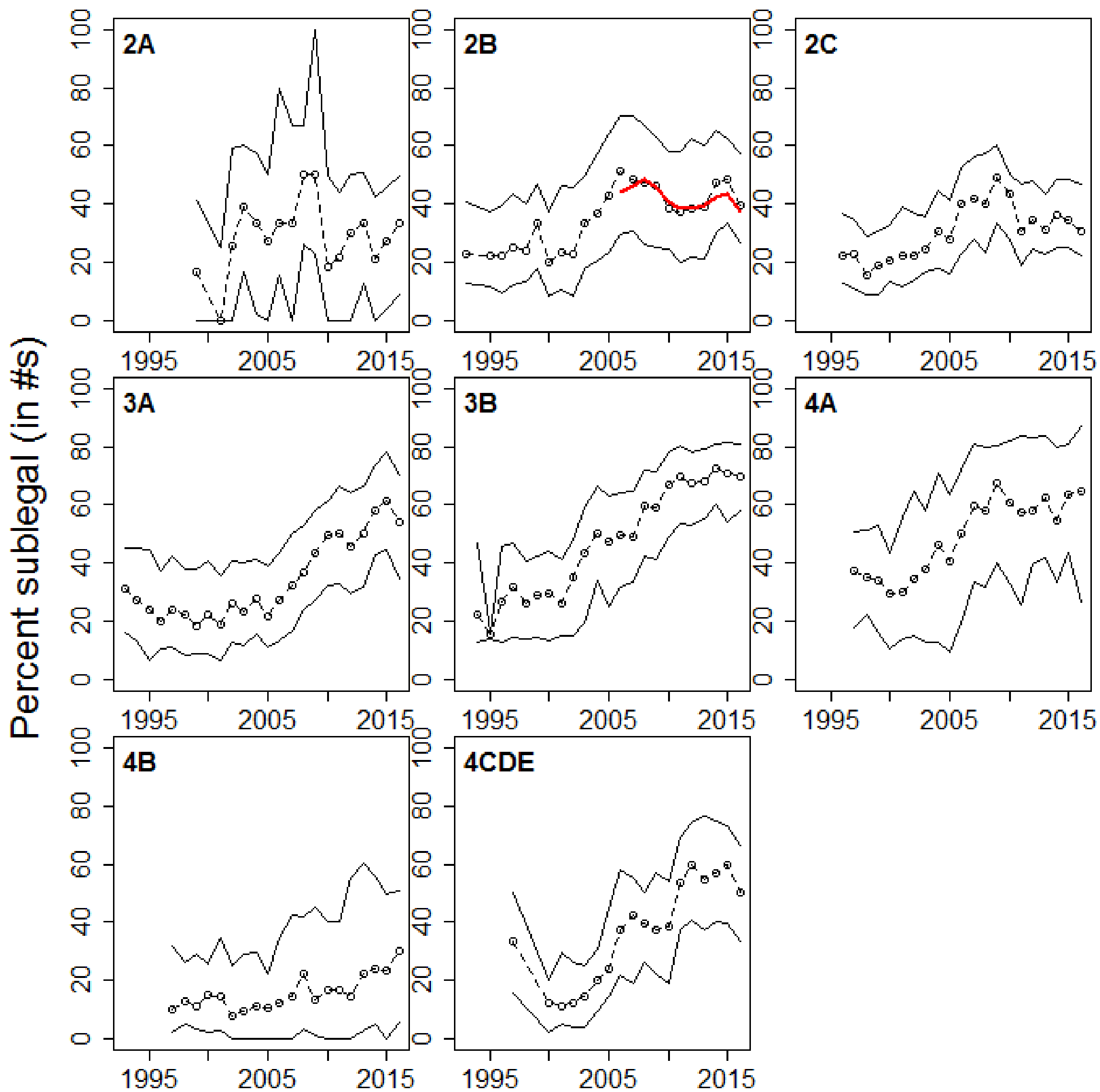

FIGURE B10. Trends in percent sublegal (<32") halibut catch by the setline survey 1993-2016 (From: Goen et al. 2017b). Circles denote median survey station percent sublegal; lines denote the 25th and 75th percentiles. Solid line in Area 2B denotes the percent sublegal reported in directed commercial Pacific halibut fishery logbooks

APPENDIX C
Distribution of 2016 observed commercial Pacific halibut catch by size

The methods used to describe the directed Pacific halibut fishery observer data are very similar to those used for the setline survey. These data are only available for Regulatory Areas in Alaska, as the Area 2A fishery is not observed, and the Area 2B fishery is observed electronically (with audited logbooks) and there is no length-frequency data collected for sublegal Pacific halibut during the directed commercial fishery for Pacific halibut. Randomly sampled halibut with measured lengths are summarized in number and weight, based on the length-weight relationship. There is no sex-specific information, as the observers do not do any internal sampling of Pacific halibut. In earlier drafts of this analysis a simple assignment to IPHC Regulatory Area based on NMFS statistical areas was applied. This approach, while consistent with historical IPHC analyses results in a poor match at some boundaries, particularly for statistical area 610 straddling the Western portion of IPHC Regulatory Area 3B and the Eastern portion of IPHC Regulatory Area 4A. Further investigation resulted in partitioning this statistical area at 165º West Longitude, which resulted in slightly higher estimates of discarded catch for IPHC Regulatory Area 3B

Interpretation of these data requires caution: as noted in the main text, the unobserved majority of the commercial Pacific halibut fishery is assumed to be encountering and selecting the same size frequency of halibut as the observed portion of the fishery. This is unlikely to be strictly true, given that smaller unobserved vessels are more likely to use snap gear and fish in inshore waters than larger vessels that are included in the partial observer coverage pool. However, the information available provides an alternative to the setline survey-based approach which is at least based directly on commercial fishery data.

The observer program does not stratify deployment or sampling by target species, and there is considerable mixing between fishing activity targeting sablefish and Pacific halibut. Further, under scenarios of a reduced or no MSL, if the current requirement to retain all legal halibut were maintained, then some fishing for sablefish that does not result in landings of appreciable quantities of halibut may include a greater quantity of landings. For these reasons, all halibut observations collected during IFQ fishing (sablefish, halibut or both) were included in the analysis.

To provide additional detail in catch-rates by number of Pacific halibut in addition to weight, the directed fishery observer data have been summarized similarly to the setline survey (Table C1).

TABLE C1. Percentage of observed halibut in 2016 that would be discarded in Area XX for size-limits from 26 to 32 inches based on numbers of fish and weight of fish. For comparison, the percentage of the catch greater than the current 32-inch minimum size limit is reported at the right margin.

Regulatory Area		Size limit (inches)							
		26	27	28	29	30	31	32	> 32
2C	**Numbers**								
	Percentage	4.2	1.7	3.3	2.5	5.1	3.3	7.8	72.1
	Cumulative	4.2	5.9	9.1	11.7	16.8	20.1	27.9	
	Weight								
	Percentage	0.7	0.4	0.9	0.8	1.8	1.3	3.3	90.9
	Cumulative	0.7	1.1	2.0	2.8	4.6	5.8	9.1	
3A	**Numbers**								
	Percentage	5.4	2.3	4.6	4.8	7.5	5.7	10.5	59.2
	Cumulative	5.4	7.7	12.3	17.1	24.6	30.3	40.8	
	Weight								
	Percentage	1.6	0.9	2.0	2.4	4.2	3.5	7.1	78.3
	Cumulative	1.6	2.5	4.6	6.9	11.1	14.6	21.7	
3B	**Numbers**								
	Percentage	16.7	3.8	7.7	4.5	7.3	4.4	6.8	48.7
	Cumulative	16.7	20.6	28.3	32.8	40.0	44.5	51.3	
	Weight								
	Percentage	4.4	1.4	3.2	2.1	3.8	2.6	4.4	78.0
	Cumulative	4.4	5.8	9.1	11.2	15.0	17.6	22.0	
4A	**Numbers**								
	Percentage	10.4	2.9	4.8	3.0	4.8	2.9	5.8	65.5
	Cumulative	10.4	13.3	18.1	21.1	25.9	28.7	34.5	
	Weight								
	Percentage	2.5	0.9	1.8	1.2	2.2	1.5	3.3	86.6
	Cumulative	2.5	3.4	5.2	6.4	8.6	10.1	13.4	
4B	**Numbers**								
	Percentage	3.3	1.4	4.7	3.6	7.3	4.5	6.5	68.8
	Cumulative	3.3	4.7	9.3	12.9	20.2	24.7	31.2	
	Weight								
	Percentage	0.7	0.4	1.5	1.3	2.9	2.0	3.2	87.8
	Cumulative	0.7	1.1	2.6	3.9	6.9	8.9	12.2	
4CDE	**Numbers**								
	Percentage	4.0	1.0	3.0	3.0	5.8	3.7	7.8	71.6
	Cumulative	4.0	5.0	8.0	11.0	16.8	20.5	28.4	
	Weight								
	Percentage	1.1	0.3	1.1	1.3	2.8	2.0	4.6	86.8
	Cumulative	1.1	1.4	2.6	3.9	6.7	8.6	13.2	

APPENDIX D
Yield calculations

Historical MSL analyses have relied heavily on equilibrium models to determine the relative yield under differing sizes, and assumptions of fishery selectivity and stock productivity. A detailed consideration of the performance of alternative MSLs could be undertaken as part of the ongoing Management Strategy Evaluation (MSE). However, the MSE process is ongoing, and will be gradually increasing in complexity over the next several years, precluding a comprehensive analysis in time for this working paper. Further, many of the concerns regarding the current MSL relate to factors outside the scope of an MSE, or are related very specifically to current conditions rather than the long-term behavior of the stock and fishery under a wide range of conditions. For these reasons, just as the annual stock assessment produces tactical information for annual management, the approach taken to yield calculations in this working paper is intended to provide tactical information regarding the current stock and fishery, specific to the biological conditions at this time. This approach represents a departure from historical analyses, providing immediate utility and interpretation, but it should not be misconstrued as a long-term harvest policy analysis.

In order to estimate the change in yield and the catch characteristics arising from a reduced or no MSL the following procedure was applied to the 2016 stock assessment ensemble:

1) Begin with the yield (all directed fishery landings, recreational and personal use catch) equating to the application of the *status quo* harvest policy ($SPR_{46\%}$) for 2017. This level of yield provides the baseline for comparisons.
2) Inflate the estimated discard mortality (U32) to reflect a removal of the MSL, such that all fish captured by the directed commercial Pacific halibut fishery are retained. The magnitude of this source of mortality increases substantially from those fish discarded dead (D_d), based on the DMR of 16%, to all fish in this size range that have been captured (D_d /0.16).
3) Because the total removals are now greater, all sources of mortality must be scaled downward to achieve the *status quo* harvest policy ($SPR_{46\%}$) for 2017. However, fish less than 32" are now included in the yield as they would be retained and landed. After iteratively finding the scale of the new set of removals, the yield is stored for comparison with (1) from above. The fraction of the yield comprised of fish less than 32" is also retained for comparison.
4) Because the response of the fishery to removal of the MSL is unknown, it may be important to consider how the yield and catch composition may vary if a greater degree of targeting of U32 Pacific halibut occurs. Several alternative ratios of sublegal to legal harvest were considered with regard to yield and catch characteristics as described below.

To evaluate whether additional targeting of U32 halibut might reduce or increase the overall yield from the fishery, three alternative configurations were considered: inflating the U32 catch by 10, 20, and 30% relative to the O32 catch. For each alternative, the total mortality was rescaled to meet the SPR target, and yield was summarized. This differs from making an explicit assumption regarding the shape of selectivity for the smallest halibut, in that it implicitly assumes that no halibut smaller than the smallest currently observed would be captured, but that all U32 catch would increase proportionally. However, because the current stock assessment ensemble models selectivity in terms of age (rather than size explicitly) any change in average size-at-age due to the change in MSL (i.e., the potential size-selective fishing effect) would result in these alternatives representing some effective shift in selectivity toward smaller fish.

Based on discussion with the SRB, this sensitivity analysis was further evaluated via inspection of the modelled mortality at age for the short coastwide stock assessment model. Results showed that removing the MSL increased the mortality at age of male halibut from approximately ages 8-15, and slightly reduced the mortality of older male halibut (Figure D1). In contrast, female mortality was increased over younger ages (~6-12) and decreased the mortality to a greater degree for the older demographic components of the stock. Additional targeting of U32 Pacific halibut only slightly increased these predicted effects.

This approach to yield calculation does not require a stock-recruitment relationship, nor does it consider the potential for recruitment overfishing, where the long-term yield of the stock could be reduced if the average level of spawning biomass is reduced and there exists a relationship between spawning biomass and recruitment over the range of stock sizes considered. This approach does very clearly reflect the current age- and size-structure in the population and interaction between this structure and the current fishery.

An important distinction between the approach provided by this working paper and that in Martell et al. (2015) is that it is conditioned on the current SPR target of 46%. The 2015, and some previous analyses solved for a new target fishing intensity as each MSL considered such that MSY was obtained in all cases.

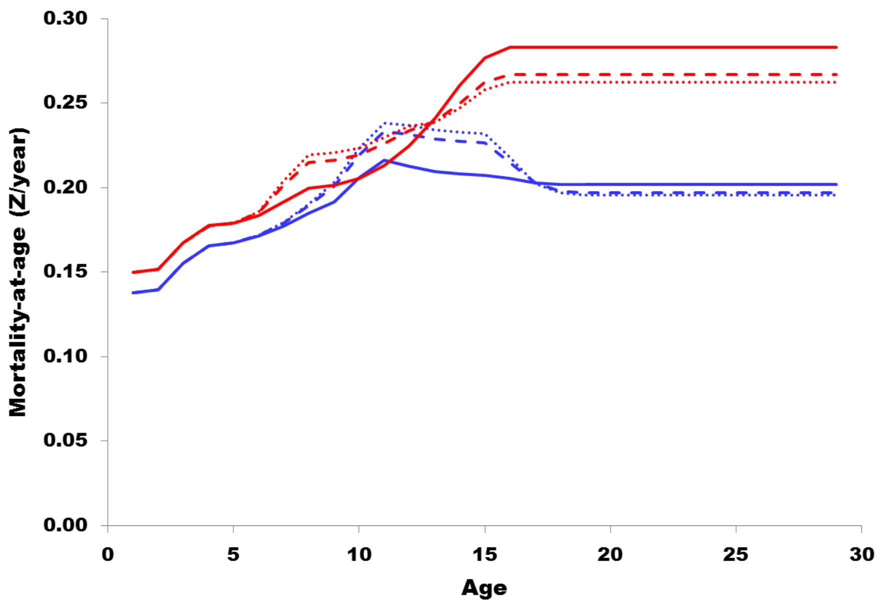

FIGURE D1. Total mortality (*Z*; including estimated natural and fishing mortality from all sources) at age for female (red upper series) and male (blue, lower series) Pacific halibut projected for the *status quo* (32" MSL; solid lines), a 10% increase in U32 targeting (thick dashes) and a 30% increase in U32 targeting (dotted series).

APPENDIX E
Evaluation of adaptive management approaches

During the June, 2017 Meeting (SRB10), the SRB made the following request:

"***SRB10–Req.02 (para. 28)*** *The SRB REQUESTED an evaluation of the potential to try different size limits in different regions given the diversity of impacts on Pacific halibut fishing sectors and areas. MSL changes may need an adaptive management experiment approach that considers the biological, economic, and sociological consequences MSL changes. Indeed, predictions of consequences in each IPHC Regulatory Area should be a pre-requisite to any proposed MSL changes.*"

The IPHC Secretariat agrees that if the Commission chooses to modify the MSL, an adaptive approach should be taken given the range of potential objectives, many unknown biological and operational responses, and dynamic nature of the Pacific halibut stock. This section therefore expands upon that request to provide a range of options for adaptive approaches at differing spatial and temporal scales.

Adaptive management consists of a decision that is made in order to learn specific information that will subsequently improve future management (Walters 1986). In some cases, such a decision may be sub-optimal in the short term, but may allow for improved performance (e.g., yield) in the long term. An important aspect of adaptive management is that the focus of the action is on gaining information about the system and not on the specific results of that action.

Potential management actions can be divided into four general categories based on: the time-frame for the proposed change, the rate at which the change is introduced, the interaction between a change and the monitoring of the fishery, and the spatial scale of the change. Each of these is illustrated with one or more examples below, but other options could be considered within this general framework.

Single year action: Remove the MSL for one year, with the potential to maintain this change for a longer duration depending on the results.

1) What would be learned:
   - The price that would be paid for fish <32"; this would represent the general market response (over a short time frame) and would be important relative to incentives toward targeting or avoidance (see above).
   - The degree of fishery catch-rate (efficiency) improvement in each of the IPHC Regulatory Areas.
   - The age distribution of the fish currently encountered but not retained under the 32" MSL.

2) Predicted outcomes:
   - Discard mortality would be reduced to just those fish associated with lost gear. Although the magnitude of this reduction would depend on the coastwide catch limit as well as the distribution of this catch among the regulatory areas, this could

be 1.1 to 1.6 million pounds based on the last five years of fishery estimates of sublegal discard mortality.
- Landed catch rates (and therefore fishery efficiency) would increase in all areas, likely to a level intermediate between that suggested by observer data (Table 3) and survey data (Table 2).

3) Potential negative effects:
   - Price and market responses may not stabilize over a single year.
   - Similarly, fishing behavior could take longer than one year to reflect the change in MSL.
   - A temporary change could cause a processing/marketing burden.
   - The transition from and back to an MSL could cause an enforcement and regulatory burden in the short term.
   - Although a single year would not be long enough to detect (with any appreciable certainty) a biological response, there would be an improvement in the age data available from port sampling, as it would much more closely represent the directed fishery mortality, rather than just the landings.

Incremental action: Reduce the MSL by 1” per year, with the potential to discontinue all changes or making additional changes at any point.

1) What would be learned:
   - The incremental price that would be paid for fish <32”; this would represent the general market response (over a short time frame) and would be important relative to incentives toward targeting or avoidance (see above).
   - The incremental degree of fishery catch-rate (efficiency) improvement in each of the Regulatory Areas.
   - The incremental age distribution of the fish currently encountered but not retained under the 32” MSL.

2) Predicted outcomes:
   - Would allow for gradual fishery and market responses to change, such that there would be less disruption of current practices.
   - Discard mortality would be reduced by only a small degree (~1-5%) in each year, depending on the coastwide catch limit and distribution among areas.
   - In many areas, there would likely be little fishery response in efficiency or targeting/avoidance.
   - It would be difficult to determine whether small changes in landed catch rates (and therefore fishery efficiency) were a function of the change in MSL or stock dynamics.

3) Potential negative effects:
   - This approach would likely take several to many years before any clear information was gained from the changes, and it would therefore be more confounded with other changing factors.
   - Price and market responses, as well as fishing behavior may not stabilize under constant change.
   - Ongoing change could cause a processing/marketing burden.
   - Ongoing change to the MSL could cause an enforcement and regulatory burden.

Monitoring-based action: Remove the MSL for all directed commercial fishing activity that is monitored at sea (observed via people or electronically).

1) What would be learned:
   - The price that would be paid for fish <32"; these fish would likely be widely available and encountered in large enough numbers to elicit a market response.
   - The degree of fishery catch-rate (efficiency) improvement in each of the Regulatory Areas. Some degree of monitoring is in place in all regions.
   - The age distribution of the fish currently encountered but not retained under the 32" MSL; monitoring would ensure that for the trips without an MSL al fish captured would be landed.

2) Predicted outcomes:
   - Would allow for gradual fishery and market responses to change, such that there would be less disruption of current practices.
   - Discard mortality would be reduced by only a small degree (<5%), depending on the coastwide catch limit and distribution among areas, as monitoring rates remain low relative to the coastwide removals.

3) Potential negative effects:
   - There would likely be little biological information generated due to the limited overall scope of the change under current monitoring.
   - This could create differing (and potentially unexpected) incentives relative to existing monitoring programs.
   - Mixed fishing within and among Regulatory Areas could cause a processing/marketing burden.
   - Mixed fishing within and among Regulatory Areas could cause an enforcement and regulatory burden.

Spatially restricted action: Remove the MSL for only a single biological region (i.e., Area 2, Area 3, Area 4, and Area 4B) or an individual IPHC Regulatory Area.

1) What would be learned:

<u>Area 3</u>

   - Area 3 (3A and 3B) would provide the largest biological impact of any region, and therefore the largest increase in information relevant to the coastwide stock dynamics.
   - This region is likely to produce sufficient landings to evaluate market and price response to smaller Pacific halibut.

<u>Area 3B</u>

   - Selecting only Area 3B would provide the greatest biological impact of any single Regulatory Area.
   - Area 3B is likely to have the greatest potential change in targeting/fishing behavior as this area is estimated to have the highest encounter rates for fish <32".
   - This Area is likely to produce sufficient landings to evaluate market and price response to smaller Pacific halibut.

Area 2

- Area 2 would have the lowest biological impact of any region, such that little information on the effect of the MSL on the coastwide stock would be generated.
- Price and market information may be emergent; however it may not be generalizable to other Regions.

Area 2B

- Area 2B has 100% electronic monitoring, such that full accounting of all fish captured would be achieved, and the age data collected via port sampling would represent the total catch

Area 4CDE

- This region is likely to produce sufficient landings to evaluate how markets and price will respond to smaller Pacific halibut although these conditions already differ in this Area due to its geographic location.
- Fishery catch rates, market response and other dynamics could be of utility in informing ongoing analysis of abundance-based management in the Bering Sea.

2) Predicted outcomes:

Area 3

- Based on the survey results, retained catch rates would likely increase by 26.7-45.0%, and the percent male in the catch would increase by 12.2-21.5%, and discard mortality would decrease by 0.65 million pounds for catch limits similar to those in 2017.

Area 3B

- Based on the survey results, retained catch rates would likely increase by as much as 45.0%, the percent male in the catch would increase by 21.5%, and discard mortality would decrease by 0.24 million pounds for catch limits similar to those in 2017.

Area 2

- Based on the survey results, retained catch rates would likely increase by 13.5-22.9%, the percent male in the catch would increase by 4.3-10.0%, and discard mortality would decrease by 0.31 million pounds for catch limits similar to those in 2017.

Area 2B

- Based on the survey results, retained catch rates would likely increase by as much as 22.9%, the percent male in the catch would increase by 10.0%, and discard mortality would decrease by 0.23 million pounds for catch limits similar to those in 2017.

Area 4CDE

- Based on the survey results, retained catch rates would likely increase by 27.3%, the percent male in the catch would increase by 6.8%, and discard mortality would decrease by 0.07 million pounds for catch limits similar to those in 2017.
- Improvements in fishery efficiency may assist in ongoing management concerns over all sources of halibut removals.

3) Potential negative effects:

Any region or Area

- Changes in fishery behavior observed in any single region or Area will not be representative of other regions, and so information will not be useful in predicting response to further spatial changes.
- With the exception of Area 2B, changing the MSL in any single region or Area would create regulatory differences within a single enforcement program and potentially within the operations of a single vessel.

Area 3

- The directed commercial fishery is not fully monitored in this region; therefore there could be differences between the total catch and landings.

Area 3B

- The directed commercial fishery is not fully monitored in this Area; therefore there could be differences between the total catch and landings.

Area 2

- The directed commercial fishery is not fully monitored in all parts of this Region; therefore there could be differences between the total catch and landings.
- Changing the MSL in Area 2 would require enforcement and regulatory changes in all three jurisdictions (Alaska, Canada, and the U.S. west coast).

Area 2B

- The integrated fishery in Area 2B would need to account for Pacific halibut <32” in quota calculations during all activity in which they are encountered.

Area 4CDE

- The directed commercial fishery is not fully monitored in this region; therefore there could be differences between the total catch and landings.

INTERNATIONAL PACIFIC HALIBUT COMMISSION

UPDATE ON PROGRESS REGARDING THE IMPLEMENTATION OF THE 1ST IPHC PERFORMANCE REVIEW RECOMMENDATIONS

PREPARED BY: IPHC SECRETARIAT (S. KEITH & D. WILSON; 1 DECEMBER 2017)

PURPOSE

To provide the Commission with an opportunity to review and update the current status of implementation for each of the recommendations arising from the Report of the 1st IPHC Performance Review Panel (PRIPHC01).

BACKGROUND

In response to calls from the international community for a review of the performance of Regional Fisheries Management Organizations (RFMOs), the International Pacific Halibut Commission (IPHC) agreed in 2011 to implement a process of Performance Review. The IPHC contracted with CONCUR, Inc., a U.S.-based firm, to undertake the review. CONCUR performed its work independently of IPHC Commissioners and staff, and concluded its report to the Commission in April 2012.

In undertaking the Performance Review, the contractor relied on the following approaches to assess the Commission's work and practices, track effectiveness, and gauge the need for revised approaches:

1) Conducting a set of 43 in-depth interviews with a representative and diverse set of stakeholders;
2) Observing the 2011 Interim and 2012 Annual Meetings and reviewing Commission background materials;
3) Reviewing practices at other regional fishery management organizations; and
4) Drawing on its professional judgment and experience.

In 2012, the contractor published a report outlining 12 recommendations (containing 39 parts) to improve the functioning of the IPHC (McCreary & Brooks, CONCUR, Inc. 2012).

In January 2014, the Commission issued a Progress Report, documenting the Commission's response to the 1st IPHC Performance Review (PERFORMANCE REVIEW 2012: A Progress Report).

DISCUSSION

At the 93rd Session of the Commission held in January 2017 (AM093), Contracting Parties noted the status of implementation of each of the recommendations arising from the report of the 1st IPHC Performance Review.

The Recommendations arising from the 1st Performance Review of the IPHC are provided at Appendix A, with responsibilities, updates, timelines for implementation, and proposed priorities, incorporated for the Commission's consideration. All but two of the original recommendations have now been completed.

RECOMMENDATION/S

That the Commission:

1) **NOTE** paper IPHC-2018-AM094-15 which details the status of each of the recommendations from the 1st IPHC Performance Review (PRIPHC01).
2) **REVIEW** the status table, including the program of work, with proposed timelines and priorities for each recommendation.

APPENDICES

Appendix A: Update on progress regarding the implementation of the 1st IPHC Performance Review recommendations

APPENDIX A

UPDATE ON PROGRESS REGARDING THE IMPLEMENTATION OF THE 1ST IPHC PERFORMANCE REVIEW RECOMMENDATIONS

GOVERNANCE	RESPONSIBILITY	UPDATE/STATUS	WORKPLAN / TIMELINE	PRIORITY
1. Adopt clear and comprehensive protocols / rules of procedure 1.1 Update and expand the existing Rules of Procedure for the Commission, Secretariat and each current stakeholder body (PAG, Conference Board and RAB).	*Commission, IPHC Staff, Advisory Bodies*	**Completed**: The Commission's Rules of Procedure were updated in 2017 and incorporate a requirement for review and revision every two (2) years. They contained formal process for each of its subsidiary bodies (IPHC Rules of Procedure (2017)).	2013-2014 - 2016/2017	High
2. Improve Commission transparency 2.1 Conduct the bulk of the Commission's deliberations at the Interim and Annual meetings in public.	*Commission*	**Completed**: The Commission decided to treat all meetings as open unless specifically closed (meetings pertaining to personnel or financial discussions are expected to be closed). This would include the opportunity for attendees and web audience participants to engage the Commission in two-way dialogue during the meeting. These changes were put into effect on a trial basis for the 2012-2013 public meeting cycle. The agendas for those meetings were changed to incorporate more time for public comment and discussion, and the web broadcast was modified to allow submission of comments and questions from the on-line audience. In addition, more meeting materials and updates were posted, and posted earlier, at the IPHC website than had been previous practice. This greatly increased the information available to the public before, during, and after the meetings. The Commission also directed the CB and PAG to open their meetings to the public.	2012 +	High
2.2 The Commission should retain the flexibility to conduct Commission-only retreats to foster candid deliberations on its own internal mechanisms and effectiveness.	*Commission*	**Completed**: The Commissioners meet daily at the Annual and Interim Meetings for brief planning Sessions. In addition, the Commissioners meet once per year for a 2-day closed Work Meeting to plan for the Interim and Annual Sessions.	2013 +	High

2.3 Discussion summaries from any in camera sessions – whether as part of the Interim/Annual meeting cycle or as a separate retreat – should be produced and made available (within four to six weeks) to any interested party. Exceptions should be made for those items (i.e., personnel and contractual matters) appropriately deemed confidential.		**Completed**: Commission reports are now draft, adopted and published within 2 weeks of the close of the session.	2013 + 2016 +	High
2.4 Refrain from taking policy actions in executive session. Aside from personnel matters, contractual issues and/or pending litigation, the Commission should refrain from taking policy actions in executive session.	*Commission*	**Completed**: The Commissioners reserve the right to hold closed Sessions when discussing sensitive matters. However, wherever possible, the rationale for making decisions in closed session is communicated during public sessions, as noted in the IPHC Circular series.	2013 +	High
3. Revisit Stakeholder Engagement Structure 3.1 Adopt a multi-step process over the next two years to transition the current stakeholder advisory arrangement into a unified, integrated body.	*Commission; IPHC Secretariat*	**Completed**: The Commission assessed that it would be better served by retaining the current CB, PAB, and RAB structures, and decided against consolidating its subsidiary bodies into one.	2013 +	Medium
Research	Responsibility	Update/Status	Workplan/Timeline	Priority
4. Develop Strategic Approach to Research 4.1 Develop a strategic Five Year Research Plan that links research projects to Commission objectives, with an accompanying and predictable budget. The Research Plan should address the specific organizing questions that structure the research, as well as the timeline of projects and deliverables. The Research Plan should also address specific objectives of cooperative research. Some specific topics to address may include size at age, migration, and impacts of bycatch, but these should be revised and confirmed as the Research Plan is drafted.		**Completed**: The IPHC Secretariat continues to refine the Commission's research planning and execution, to include clear linkage between the 5-Year Research Plan and annual planning. In addition, the annual research planning process has been revised to add rigor and strengthen its connection to long-term research goals and priorities.		High

4.2 Bolster and formalize RAB. The RAB currently lacks any written Protocols/Rules of Procedure nor does it have any formal composition. Consistent with the steps outlined above to have clear guidelines and balanced participation, we recommend the Commission take steps to formally establish the RAB with associated objectives, participation criteria and other operational aspects.		**Completed**: IPHC Rules of Procedure (2017) adopted at the 93rd Session of the Commission.		High
4.3 Consider periodic peer review. As the Commission moves forward, it should consider the need for periodic peer review of its long-term and annual research plan. We also recommend it expand commitments to pursue cooperative research.		**Completed**: The IPHC Scientific Review Board (SRB) was formalized in the IPHC Rules of Procedure (2017) and contain peer review elements by independent experts in a range of fields covering IPHC research and assessment activiites.		Medium
STOCK ASSESSMENT	RESPONSIBILITY	UPDATE/STATUS	WORKPLAN/TIMELINE	PRIORITY
5. Strengthen Stock Assessment Process				
5.1 Foster regular peer review of stock assessment model and outputs, as well as the associated apportionment process. 5.2 Ensure adequate time and predictable process for stakeholder and Commissioner discussion of proposed changes to the assessment model and the associated apportionment methodology.	*IPHC Secretariat*	**Completed**: The Commission has instituted the SRB as a regular ongoing peer-review mechanism, and has adopted a regular sequence of annual SRB meetings to support the assessment, the management strategy evaluation, and the research program. As an indication of the state of IPHC science, IPHC scientists are regularly invited to present and instruct on assessment modeling and methods at international conferences.		
5.3 Augment Secretariat assessment staff.	*IPHC Secretariat*	**Completed**: Since the 1st Performance Review, the Secretariat has hired top-level assessment and harvest policy scientists. The Commission has also brought in the services of graduate interns at appropriate points in the analytical process, and has budgeted for programming support of the management strategy evaluation.		
CONVENTION	RESPONSIBILITY	UPDATE/STATUS	WORKPLAN/TIMELINE	PRIORITY

6. Expand Commission Composition		**Completed**: Aside from incremental improvements to the Commissioner orientation process incorporating the feedback and experience of new Commissioners, the Commission has indicated that it does not intend to take further action on this recommendation.		
6.1 Add alternates to broaden representation on Commission.		**Completed**: The Commission has decided that it does not anticipate any expansion of the Commission at this time, which is a matter for the Contracting Parties and would require renegotiation of the Convention governing the IPHC.		
6.2 Articulate Commissioner recruitment criteria. 6.3 Press national government for more timely appointments. 6.4 Incorporate continuity as a consideration in revising Commission appointments.		**Completed**: This is a matter for the Contracting Parties. The Commission notes that the Contracting Parties are cognizant of the need for timely appointments and succession planning, and that the Commission will make all possible effort with both Canada and the United States of America to ensure timely appointments, as well as to facilitate smooth transitions through succession planning.		
6.5 Revise Rules of Procedure to accommodate alternates.		**Completed**: IPHC Rules of Procedure (2017) adopted at the 93rd Session of the Commission.		
PLANNING	RESPONSIBILITY	UPDATE/STATUS	WORKPLAN/TIMELINE	PRIORITY
7. Build Long-Term Strategic Plan 7.1 Articulate Overarching Goals and Objectives. Develop a concise statement of goals and objectives that takes the Commission forward over the next decade and beyond. 7.2 Identify implementation strategies to fulfill Overarching Goals and Objectives. Develop an Annual Plan and budget that fits within the framework of the longer-term strategic plan. 7.3 Identify milestones and performance measures to track progress. 7.4 Consider budgetary implications of priorities identified in the strategic planning process.		**Pending**: The Commission postponed action on this recommendation until after higher-priority activities were complete. The Secretariat intends to act on this recommendation during 2018 for presentation to the Commission in 2019.		

ADVICE	RESPONSIBILITY	UPDATE/STATUS	WORKPLAN/TIMELINE	PRIORITY
8. Structure Staff Advice to Strengthen the Delineation Between Scientific Analysis and Policy Options 8.1 Clarify the respective roles and responsibilities of Commissioners and staff for each step of the analysis and policy development cycle. 8.2 Present options for Commission consideration.		**Completed**: The Commission noted that the approach to delineation between science advice and policy options should follow accepted national and international best practices, and that as a first step towards implementation, an approach should be developed for risk-based harvest advice. The Commission has adopted a new structure for harvest advice proposed by the IPHC Secretariat, including a decision-table presentation format to support risk-based decision-making. This new advice structure clearly separates the scientific analysis from the management decisions, and was thoroughly examined and revised as part of the stock assessment review by outside scientific reviewers. The Commission also decided to implement the MSE process to better inform its policy analysis and choices, and chartered the MSAB in 2013 to oversee the MSE process and to advise the Commission and IPHC Secretariat on the development and evaluation of candidate objectives and strategies for managing the fishery.		
LEADERSHIP	**RESPONSIBILITY**	**UPDATE/STATUS**	**WORKPLAN/TIMELINE**	**PRIORITY**
9. Commissioners Should Seek and Take Advantage of Opportunities to Model and Exert Leadership 9.1 Take an active role in articulating a vision for the IPHC and engaging in actions to carry out that vision. 9.2 Exercise and model a stance of principled negotiation in deliberations over Commission matters. 9.3 Provide clear guidance to Commission executive staff on functions ranging from conducting assessments, to developing options for catch limits, to providing advice to member governments and other organizations.		**Completed**: The Commissioners agreed that their role is to exercise leadership with regard to the work of the IPHC, and as such are demonstrating leadership through key initiatives. The Commission intends to continue to lead and make progress on key initiatives, as determined in consultation with stakeholders.		

COMMISSION STRUCTURE	RESPONSIBILITY	UPDATE/STATUS	WORKPLAN/TIMELINE	PRIORITY
10. Elevate the Importance of Tribes and First Nations 10.1 Ensure any revamping of the Commission structure, including but not limited to the industry advisors, RAB and Commissioner seats, accommodates tribal and First Nations participation along with other interested parties. 10.2 Actively include First Nations and tribal scientists in structured peer reviews of the current assessment and apportionment methodologies, in particular when considering implementation of Recommendation #5. 10.3 Ensure that Commission recommendations and consultations by national sections are consistent with the spirit and letter of U.S. and Canadian law and any associated rights of tribes and First Nations.		**Completed**: The Commission notes the importance of Tribes and First Nations within the domestic processes of Canada and the United States of America, and that issues pertaining to Pacific halibut and these groups are domestic responsibilities of the two Governments. The Commission noted that the Contracting Parties consult directly with the Tribes and First Nations. The Commission also stressed that the Tribes and First Nations have a very important existing participatory role in Commission processes, along with other stakeholders, and that it continues to value their participation, and to consider the interests of the Tribes and First Nations in its actions. The Commission notes that the effort to define roles and responsibilities (in response to recommendation #1) should help articulate the current avenues of engagement and the relationship of the IPHC to U.S.A. and Canadian domestic processes. The Commission welcomes suggestions on how its interaction with Tribes and First Nations can be facilitated and improved.		
MEETING CYCLE	**RESPONSIBILITY**	**UPDATE/STATUS**	**WORKPLAN/TIMELINE**	**PRIORITY**
11. Strengthen Interim and Annual Meeting process		**Completed**: Beginning with the 2012 Interim Meeting and the 2013 Annual Meeting, the Commission decided to open both meetings to the public as much as possible, including steps noted in the sub-items below. The Commission instituted these changes on a trial basis for the 2012-13 meeting cycle, and solicited feedback from the on-site and web audiences, noting that development of appropriate and workable formats and procedures for public participation is an iterative process. All IPHC meetings are now open the public as determined in the IPHC Rules of Procedure (2017).		

11.1 Add a third meeting to the Annual Meeting cycle.		**Completed**: The Commission decided not to add the proposed third meeting to the annual cycle at present, but rather, continue with an information 'Work Meeting' as the third meeting to discuss with staff and direct activities accordingly, prior to formal discussion at the Interim Meeting and Annual Meeting.		
11.2 Foster stronger internal preparation for public meetings	*IPHC Secretariat*	**Completed**: The Secretariat continues to refine its internal processes and timelines in order to develop and publish meeting materials as far in advance of the meeting as possible.		
11.3 Provide meeting materials as early as possible, even if that means posting materials in batches on-line rather than waiting until a comprehensive set of back-up documents can be produced in a single comprehensive package.	*IPHC Secretariat*	**Completed**: These were clarified in the IPHC Rules of Procedure (2017), including deadlines of papers to be published 30 days prior to the commencement of a meeting.		
11.4 Expand the existing "Navigating the IPHC Meeting This Week" document to flesh out meeting objectives and protocols.	*IPHC Secretariat*	**Completed**: Meeting handouts are reviewed each year with an eye to making them more informative and useful for meeting participants.	2012 +	
11.5 Increase opportunities for public comment.		**Completed**: The Commission has opened all sessions at the Interim and Annual meetings to the public, both in person and via a webcast. Only human resources discussions are now held in private.		
11.6 Make greater use of webinars to streamline meetings.	*IPHC Secretariat*	**Completed**: All IPHC meetings are now webcast. Only human resources discussions are held in private. The webcasts at both meetings have been expanded to include the ability for the web audience to submit questions or comments during the proceedings.		
COMMUNICATION	RESPONSIBILITY	UPDATE/STATUS	WORKPLAN/TIMELINE	PRIORITY
12. Improve Communications				
12.1 Improve timeliness and use of meeting summaries – both in real-time and post-meeting.	*IPHC Secretariat*	**Completed**: IPHC Rules of Procedure (2017) adopted at the 93rd Session of the Commission. Meeting reports are now being published soon after a Session closes.		

12.2 Develop agreed upon written policy to guide staff comment – in writing or in testimony – on policies under consideration before other bodies.	*IPHC Secretariat*	**Completed**: The Secretariat has developed an internal process for comment, testimony, or written inputs to outside organizations or meetings, including internal and external briefing notes.		
12.3 Improve outreach to and discussions with non-traditional constituencies such as bycatch users and sport fishermen.	*IPHC Secretariat*	**Completed**: The IPHC Commissioners and Secretariat have continued to reach out to users of the Pacific halibut resource outside the commercial fishery. The Commission is extensively engaged with the North Pacific Fishery Management Council on bycatch issues, at both the scientific and the management levels. This process has will be ongoing.		
12.4 Explore opportunities to make better use of technologies – including from RSS feeds to social media forms such as Twitter and/or Facebook – to keep interested stakeholder apprised of recent IPHC-related news.	*IPHC Secretariat*	**Completed**: The IPHC Secretariat has developed a robust social media protocol and makes extensive use of Facebook and Twitter to reach stakeholders. The "live tweeting" of the Annual Meeting has become the favored means for news organizations to gather data for their reporting.		

2nd IPHC Performance Review (PRIPHC02): Update

PREPARED BY: IPHC SECRETARIAT (D. WILSON; 1 DECEMBER 2017)

PURPOSE

To provide the Commission with an update on progress regarding the 2nd Performance Review of the IPHC (PRIPHC02) and an opportunity to direct the IPHC Secretariat regarding its completion.

BACKGROUND

At the 93rd Session of the IPHC Annual Meeting (AM093) in January 2017, the Commission noted paper IPHC-2017-AM093-18, which outlined planning for the 2nd IPHC Performance Review, and provided the following direction to the IPHC Secretariat:

> AM093–Rec.13 (para. 153) *The Commission **RECOMMENDED** that the IPHC Secretariat finalise the draft performance review terms of reference and criteria to conduct the review, and implement the 2nd Performance Review throughout 2017, for presentation to the Commission at its 94th Annual Meeting in 2018.*

DISCUSSION

Paper IPHC-2017-AM093-18 outlined the "*Terms of Reference and Criteria to Conduct the 2nd Performance Review of the IPHC*," including six specific criteria for the review. Criteria 1, "*Legal analysis of the Convention to ensure its adequacy relative to current global best practice principles of fisheries management*," is the foundation element, upon which the rest of the review rests.

Subsequent to the 93rd Annual Meeting, and comments received at the 93rd Interim Meeting, the IPHC Secretariat finalised the terms of reference and criteria to conduct the 2nd Performance Review as provided at **Appendix I**.

On 27 June 2017, the IPHC Secretariat widely circulated a call for expressions of Interest (EOI) for a '*Consultancy to undertake a legal analysis of the Convention between Canada and the United States of America for the preservation of the halibut fishery of the northern Pacific Ocean and Bering Sea*.' The EOI is provided at **Appendix II** for reference. The deadline for submissions of EOI's was 12 July 2017.

The IPHC Secretariat received a total of five (5) EOI's by the deadline, and one (1) after the deadline which was not considered. The selection panel unanimously endorsed Mr Terje Løbach of Norway, to undertake the consultancy.

The three (3) key deadlines for project delivery were as follows:

1) *25 August 2017* Draft report submitted to the IPHC Secretariat for comment.
2) *01 September 2017* Comments from the IPHC Secretariat forwarded to contractor for consideration.
3) *11 September 2017* Contract work completed and final report submitted.

The final report was submitted to the IPHC Secretariat on 5 September 2017 and is provided at **Appendix III**.

The IPHC Secretariat will undertake and complete the 2nd Performance Review in 2017 and throughout 2018, with the intention of presenting the final report and associate recommendations at the 94th Interim Meeting in November 2018, and for final adoption at the AM093 in January 2019.

RECOMMENDATIONS

That the Commission:

1) **NOTE** paper IPHC-2018-AM094-16 which outlines progress on the 2nd IPHC Performance Review (PRIPHC02); and
2) **COMMENT** on the Legal analysis of the IPHC Convention undertaken by the consultant.

APPENDICES

Appendix I Terms of Reference, Criteria, Process, and Budget to Conduct the 2nd Performance Review of the International Pacific Halibut Commission (IPHC)

Appendix II Expressions of Interest: Consultancy to undertake a legal analysis of the '*Convention Between Canada and the United States of America for the Preservation of the Halibut Fishery of the Northern Pacific Ocean and Bering Sea*'

Appendix III Legal analysis of the IPHC Convention against relevant international instruments

TERMS OF REFERENCE, CRITERIA, PROCESS, AND BUDGET TO CONDUCT THE 2ND PERFORMANCE REVIEW OF THE INTERNATIONAL PACIFIC HALIBUT COMMISSION (IPHC).

LAST UPDATED: 1 DEC 2017

1. Terms of reference for the implementation of the 2nd Performance Review of the International Pacific Halibut Commission (PRIPHC02)

1.1 Scope of the review:

The review will evaluate progress made on the recommendations arising from the 1st performance review of the IPHC. In addition, it will focus on the effectiveness of the Commission to fulfil its mandate, in accordance with the criteria set forth below. In conducting the review, the strengths, weakness, opportunities and risks to the organisation shall also be evaluated.

1.2 Composition of the Review Panel:

Chairperson: An independent Chairperson with legal fisheries background and a good understanding of Regional Fisheries Management Organisations (RFMO). The Chairperson should not be directly affiliated with any IPHC Contracting Party.

Contracting Parties: 1 representative of each IPHC Contracting Party.

Science Advisor: A science expert not affiliated with the IPHC Contracting Parties, and with expertise on groundfish and the ecosystems affected by Pacific halibut fisheries.

RFMOs: At least two members from other Regional Fisheries Management Organisations: e.g. Inter-American Tropical Tuna Commission (IATTC), North Pacific Fisheries Commission (NPFC), North Pacific Anadromous Fish Commission (NPAFC).

NGOs: Two Non-Governmental Organisations: e.g. PEW Charitable Trust, Birdlife International (BL)).

IPHC Secretariat: The IPHC Secretariat will not be a part of the Review Panel but it will act as a facilitator of its activities, providing access to information and facilities that the Review Panel will require to conduct its work.

1.3 Meeting locations:

At least two (2) in-person Review Panel meetings will take place, one in the USA (at the seat of the Commission in Seattle or in Alaska) and one in Canada (location to be decided by Canada).

Contracting Parties will cover the costs associated with the participation of their representative. However, the attendance of other Panel Members to the Review Panel meetings shall be funded under the Commission's budget. Additional meetings may be required, as determined by the Panel, and will be conducted via electronic means facilitated by the IPHC Secretariat.

1.4 Work schedule

The report of the Review Panel will be completed and made available no later than 30 days prior to the 95th Session of the IPHC Annual Meeting (AM095) in 2019, and published on the IPHC website so as to maximize transparency.

1.5 Budget

Budget Item	Details	Costs US$
	FY2017	
Legal review of the IPHC Convention	Desk analysis of the legal framework of the IPHC (5 days) by an International Fisheries Legal Expert	4,500
	Sub-Total	**4,500**
	FY2018 & FY2019	
1st Meeting of the PRIPHC02	4-day meeting: Catering (breaks/lunch) Meeting room	5,000
Independent Chairperson: fees	5 days	5,000
Travel: 6 independent Panel members	Flights [$6,000], accommodation [$9,000]; meals [$1,650])	16,650
	Sub-Total	**26,650**
2nd Meeting of the PRIPHC02	4-day meeting: Catering (breaks/lunch) Meeting room/equipment provided by hosts.	5,000
Independent Chairperson: fees	5 days	5,000
Travel: 6 independent Panel members	Flights [$6,000]; accommodation [$9,000]; meals [$1,965])	16,965
	Sub-Total	**26,650**
	Total	**57,800**

2. Criteria for the 2nd Performance Review of the International Pacific Halibut Commission (PRIPHC02)

Criteria 1: ***1st Performance Review***: to evaluate progress made on the implementation of the recommendations arising from the 1st performance review of the IPHC

Criteria 2: ***Legal analysis of the Convention*** to ensure its adequacy relative to current global best practice principles of fisheries management

Criteria 3: ***Conservation and management*** (status of living marine resources; quality and provision of scientific advice; data collection and sharing; adoption of fishery Regulations, also known in other RFMO's as Conservation and Management Measures, including measures adopted at the national level; compatibility of fishery Regulations)

i. Status of living marine resources
   - Status of Pacific halibut stock under the purview of the IPHC in relation to relevant biological standards.
   - Trends in the status of the stock.
   - Status of species that belong to the same ecosystems as, or are associated with or dependent upon, Pacific halibut (hereinafter "non-target species").
   - Trends in the status of non-target species.

ii. Quality and provision of scientific advice
   - Extent to which the IPHC receives and/or produces the best scientific advice relevant to the fish stocks and other living marine resources under its purview, as well as to the effects of fishing on the marine environment.
   - Extend to which the IPHC obtains and evaluates scientific advice, reviews the status of the stock, promotes the conduct of relevant scientific research and disseminates the results thereof.

iii. Data collection and sharing
   - Extent to which the IPHC has agreed formats, specifications and timeframes for data submission, taking into account UNFSA Annex I.
   - Extent to which IPHC Contracting Parties, individually or through the IPHC, collect and share complete and accurate fisheries data concerning target stocks and non-target species and other relevant data in a timely manner.
   - Extent to which fishing data and fishing vessel data are gathered by the IPHC and shared among Contracting Parties and other relevant bodies.
   - Extent to which the IPHC is addressing any gaps in the collection and sharing of data as required.
   - Extent to which the IPHC has set standards for the collection of socio-economic data from the fisheries; and extent to which this information is used to inform decisions by the Commission.
   - Extent to which the IPHC has set security and confidentiality standards and rules for sharing of sensitive science and operational/compliance data.

iv. Consistency between scientific advice and fishery Regulations adopted;
   - Extent to which the IPHC has adopted fishery Regulations for both Pacific halibut, and proposed regulations for non-target species to relevant bodies, that ensure the long-term sustainability of the ecosystem as well as of such stocks and species and are based on the best scientific evidence available.
   - Extent to which the IPHC has applied the precautionary approach as set forth in UNFSA Article 6 and the Code of Conduct for Responsible Fisheries Article 7.5, including the application of precautionary reference points and harvest control rules.

- Extent to which the IPHC has adopted and implemented effective rebuilding plans for depleted or overfished stocks.
- Extent to which the IPHC has taken due account of the need to conserve marine biological diversity and minimise harmful impacts of fisheries on living marine resources and marine ecosystems.
- Extent to which the IPHC has adopted measures to minimise pollution, waste, discards, catch by lost or abandoned gear, catch of non-target species, both fish and non-fish species, and impacts on associated or dependent species, in particular endangered species, through measures including, to the extent practicable, the development and use of selective, environmentally safe and cost-effective fishing gear and techniques.

v. Compatibility of management measures
- Extent to which measures have been adopted as reflected in UNFSA Article 7.

vi. Fishing allocations and opportunities
- Extent to which the IPHC agrees on the allocation of allowable catch or levels of fishing effort, including taking into account requests for participation from new Contracting Parties or participants as reflected in UNFSA Article 11.

Criteria 4: ***Compliance and enforcement*** (flag State duties; monitoring, control and surveillance activities; port State measures; follow-up on infringements; cooperative mechanisms to detect and deter non-compliance; market-related measures)

i. Flag State duties
- Extent to which IPHC Contracting Parties are fulfilling their duties as flag States under the Convention establishing the IPHC, pursuant to measures adopted by the IPHC, and under other international instruments, including, *inter alia*, the 1982 Law of the Sea Convention, and the UNFSA, as applicable.

ii. Port State measures
- Extent to which the IPHC has adopted measures relating to the exercise of the rights and duties of its members as port States, as reflected in UNFSA Article 23 and the Code of Conduct for Responsible Fisheries Article 8.3 and the FAO Port State Agreement.
- Extent to which these measures are effectively implemented.

iii. Monitoring, control and surveillance (MCS)
- Extent to which the IPHC has adopted integrated MCS measures (e.g. required use of VMS, observers, catch documentation and trade tracking schemes, restrictions on transhipment, boarding and inspection schemes).
- Extent to which these measures are effectively implemented.

iv. Follow-up on infringements
- Extent to which the IPHC Contracting Parties follow up on infringements to management measures.

v. Cooperative mechanisms to detect and deter non-compliance

- Extent to which the IPHC has established adequate cooperative mechanisms to both monitor compliance and detect and deter non-compliance (e.g. compliance committees, vessel lists, sharing of information about non-compliance, joint patrols, common Minimum Terms and Conditions for access, harmonised regulatory mechanisms, boarding schemes, regional/compatible VMS equipment and operational criteria, observer schemes, with common training standards for inspectors and observers, intra-regional cooperation, etc.).
- Extent to which these mechanisms are being effectively utilised.
- Extent to which the IPHC has adopted new measures to foster (reward/penalise) compliance within IPHC and effectiveness of such measures.

vi. Market-related measures
- Extent to which the IPHC has adopted measures relating to the exercise of the rights and duties of its Members as market States.
- Extent to which these market-related measures are effectively implemented.

Criteria 5: ***Decision-making and dispute settlement***

i. Decision-making
- Extent to which IPHC has transparent and consistent decision-making procedures that facilitate the adoption of management regulations in a timely and effective manner.

ii. Dispute settlement
- Extent to which the IPHC has established adequate mechanisms for resolving disputes among Contracting Parties.

Criteria 6: ***International cooperation*** (transparency; relationship to non-Contracting Parties; cooperation with other RFMOs)

i. Transparency
- Extent to which the IPHC is operating in a transparent manner, as reflected in UNFSA Article 12 and the Code of Conduct for Responsible Fisheries Article 7.1.9.
- Extent to which IPHC decisions, meeting reports, scientific advice upon which decisions are made, and other relevant materials are made publicly available in a timely fashion.

ii. Relationship to non-Contracting Parties
- Extent to which the IPHC facilitates cooperation among Contracting Parties and non-Contracting Parties which exploit the Pacific halibut stock, including through the adoption and implementation of procedures for granting Cooperating Non-Contracting Party status.
- Extent of fishing activity by vessels of non-Contracting Parties that are not cooperating with the IPHC, as well as measures to deter such activities.

iii. Cooperation with other RFMOs
- Extent to which the IPHC cooperates with other RFMOs, including through the network of Regional Fishery Body Secretariats.
- Extent to which IPHC works intra-regionally to adopt common regulatory principles, standards and operational schemes, and processes where appropriate, e.g. observer coverage, gear management, access rules and appropriate financial mechanisms.

iv. Participation
- Extent to which all fishing entities active in the Convention area, and the stock range, discharge their obligations in line with the UNFSA.

Criteria 7: ***Efficiency and transparency of financial and administrative management***

i. Availability of resources for IPHC activities
- Extent to which financial and other resources are made available to achieve the aims of the IPHC and to implement the Commission’s decisions.

ii. Efficiency and cost-effectiveness
- Extent to which the IPHC is efficiently and effectively managing its human and financial resources.
- Extent to which the IPHC is managing its budget as well as its capacity to monitor and audit annual and multiannual expenditures.
- Extent to which the IPHC Rules of Procedure and the IPHC Financial Regulations comply with international best practice.

iii. Advisory structure
- Extent to which the IPHC has an adequate and effective set of subsidiary bodies which provide it with sound advice, and in accordance with best practice governance processes.

Expressions of Interest:

Consultancy to undertake a legal analysis of the '*Convention Between Canada and the United States of America for the Preservation of the Halibut Fishery of the Northern Pacific Ocean and Bering Sea*'

Issued: 27 June 2017
EOIs due: 12 July 2017

Basic administrative details

Timeline for EOI process and project delivery

27 June 2017	Request for Expressions of Interest (EOI) issued.
12 July 2017	Deadline for receipt of EOIs. • Please notify IPHC if you intend to respond to this EOI call.
19 July 2017	Completion of proposal review and notification of successful EOI.
28 July 2017	Contract finalized.
25 August 2017	Draft report submitted to the IPHC Secretariat for comment.
01 September 2017	Comments from the IPHC Secretariat forwarded to contractor for consideration.
11 September 2017	Contract work completed and final report submitted.

IPHC point of contact

The IPHC point of contact for this RFP is Dr. David Wilson at eoi@iphc.int. All communications with IPHC, including inquiries and submission of EOIs, will use this email address.

Project background

The International Pacific Halibut Commission (IPHC) is an intergovernmental organization established by a Convention between Canada and the United States of America. The IPHC Convention was concluded in 1923 and entered into force that same year. The Convention has been revised several times since, to extend the Commission's authority and meet new conditions in the fishery (Bell 1969). The most recent change occurred in 1979 and involved an amendment to the 1953 Halibut Convention. The amendment, termed a "protocol", was precipitated in 1976 by Canada and the United States of America extending their jurisdiction over fisheries resources to 200 miles. The 1979 Protocol along with the U.S. legislation that gave effect to the Protocol (Northern Pacific Halibut Act of 1982) has affected the way the fishery is conducted, and redefined the role of IPHC in the management of the fishery during the 1980s. (Note: Canada did not require specific enabling legislation to implement the protocol.)

The IPHC is mandated to undertake research on, and management of, the stocks of Pacific halibut (*Hippoglossus stenolepis*) within the Convention waters. The IPHC consists of three government-appointed Commissioners for each Contracting Party, who serve their terms at the pleasure of the President of the United States of America and the Canadian government respectively. The Commission employs a Secretariat staff to assist in carrying out its duties.

In the United States of America, the IPHC is considered a "public international organization" and is entitled to particular privileges, exemptions, and immunities conferred by the International Organizations Immunities Act (22 U.S.C. Sec. 288), by virtue of U.S. Presidential Executive Order 11059. In 1987, the IPHC was granted 503(c) status as a not-for-profit organization, and it is considered part of the U.S. Federal government for purchasing and travel.

Aims and Objectives

The legal review will evaluate the IPHC *Convention between Canada and the United States of America for the Preservation of the Halibut Fishery of the Northern Pacific Ocean and Bering Sea*, from an international fisheries legal framework point of view. Specifically, the desktop legal analysis shall document deficiencies in the IPHC Convention in terms of international best practice and principles, as well as the protocols the IPHC follows in implementing its Convention. This legal review will be incorporated into the 2nd Performance Review process being undertaken for the IPHC.

Deliverables

This project includes two (2) deliverables:

1. **Draft report**. **Deadline**: 25 August 2017.

2. **Final report**. The final report will present detailed findings that meet the project objectives. Supporting rationale must accompany the recommendations for modernizing the IPHC Convention and associated protocols. **Deadline**: 11 September 2017.

Expression of Interest (EOI) details

The EOI must include the following elements:
1. Cover letter detailing relevant experience for the project;
2. Confirmation that the proposed budget and delivery schedule is agreeable;
3. Listing of relevant international standards which the contractor will base the review upon;
4. Supporting documentation such as a full resume/CV for the nominated analyst(s).

Submission of EOI

Submit an electronic copy of the EOI by email to the IPHC at eoi@iphc.int by 12 July 2017. Only emailed submissions will be accepted. EOIs received after the scheduled date will not be accepted.

Budget

The IPHC is offering a consultancy rate of up to US$900 per day to undertake the desktop analysis and reporting. EOIs should include a proposed duration and daily rate.

Evaluation of proposals

The IPHC will evaluate EOIs received in response to this request and reserves the right to accept or reject any and all, in whole or in part. The IPHC may request more information from contractors as it evaluates their EOIs. The IPHC may amend this EOI after its release, with due notice given to all identified participants to modify their EOIs to reflect changes to the project.

Additional considerations

The IPHC reserves the right to award contract(s) for any or all parts of an EOI; and to award contract(s) to one or more responsive and responsible contractors.

By submitting an EOI, the contractor agrees to not make any claim for or have any right to damages because of any lack of information or misinterpretation of the information provided in this EOI.

Nothing in this EOI, the act of issuing it, or in any resulting contracts or agreements, is to be construed as a waiver of any rights or immunities granted the IPHC pursuant to the International Organizations Immunities Act, 22 U.S. Code Section 288 et seq.

Legal analysis of the IPHC Convention against relevant international instruments[1]

The International Pacific Halibut Commission (IPHC) was established in 1923 by the *Convention between Canada and the United States of America for the Preservation of the Halibut Fishery of the Northern Pacific Ocean and the Bering Sea*. Following a series of amendments, the legal framework currently in force is a protocol from 1979.

Since then, several global instruments concerning the conservation and management of world fishery resources have been agreed, many of them containing obligations and principles relevant to transboundary fish stocks. The key legally binding instrument is the 1982 United Nations Convention on the Law of the Sea (UNCLOS), which provides the framework for all maritime activities, including conservation and utilization of living marine resources. Among other treaties related to fishing, and relevant to IPHC include the 2005 UN Fish Stocks Agreement (UNFSA)[2] and the 2009 FAO Port State Measures Agreement (PSMA)[3]. In addition, a series of soft-law instruments have been adopted. Those relevant in this context include the 1995 FAO Code of Conduct on Responsible Fisheries (the Code of Conduct), the 1999 FAO International Plan of Action for the Management of Capacity (IPOA-Capacity), the 1999 FAO International Plan of Action for Reducing Incidental Catch of Seabirds in Longline Fisheries (IPOA-Seabirds), the 2001 FAO International Plan of Action to Prevent, Deter and Eliminate IUU Fishing (IPOA-IUU), the 2010 FAO Guidelines on Bycatch Management and Reduction of Discards (the Bycatch Guidelines), and the 2014 FAO Guidelines for Flag State Performance (the Flag State Guidelines). The UN General Assembly annually addresses fisheries issues, among other things calling upon States, individually or through regional fisheries management organisations (RFMOs), to address specific topics in order to achieve sustainable fisheries. Likewise, several declarations, both ministerial and other, have called for specific actions to address conservation and management of fisheries and the ecosystem in which they take place. While UNCLOS, UNFSA and the PSMA entail legally binding obligations on their parties, all these other instruments are voluntary. They serve as guidelines/toolboxes for conservation and management of fisheries, including some specific options for states and RFMOs.

Summaries of relevant instruments are contained in Annex I.

The role of RFMOs has been significantly strengthened over the last twenty years, in particular by UNFSA, and RFMOs are regarded as the appropriate mechanism for responding to the duties set out in UNCLOS for cooperation between states for fisheries management. Five of these RFMOs, the North Pacific Fisheries Commission (NPFC), the South East Atlantic Fisheries Organisation (SEAFO), the South Indian Ocean Fisheries Agreement (SIOFA), the South

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[1] This paper has been prepared by Terje Lobach, international legal consultant, to be incorporated into the 2nd Performance Review process being undertaken for the IPHC.
[2] Its full title is: «Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 to the Conservation and management of Straddling Fish Stocks and Highly Migratory Fish Stocks".
[3] Its full title is: »Agreement on port State Measures to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing".

Pacific Regional Fisheries Management Organization (SPRFMO) and the Western Central Pacific Fisheries Commission (WCPFC) have been established after the adoption of UNFSA, using that agreement and other international instruments as inspirations and models for developing their treaties. Most of the other RFMOs have revised and/or amended their legislative frameworks in order to be in line with principles set out in these instruments. Furthermore, in recent years, all RFMOs have used the global instruments as a basis and inspiration for the development and subsequent adoption of conservation and management measures within their areas of competence.

Thus new and/or amended RFMO treaties build on the global instruments developed under the auspices of the United Nations and the FAO. Many of the principles for management of fish stocks in those instruments overlap, and the major sources of inspiration seem to be found in the Code of Conduct and in UNFSA. In addition, to assess the IPHC Convention against these instruments, it would be appropriate to compare it with RFMO instruments developed after the adoption of UNFSA and the Code of Conduct in 1995. Both Canada and the USA are parties to the Antigua Convention,[4] which is the new legal framework of the Inter-American Tropical Tuna Commission (IATTC), and to the North Pacific Fisheries Commission (NPFC) Convention[5] established in 2015. Thus, it would be appropriate to examine the IPHC Convention also against standards set out in these two treaties.

The Antigua Convention was drafted to update the original IATTC from 1949, and entered into force in 2010. The initial idea was to amend the 1949 Convention in order to bring it into harmony with the principles of international law as reflected in UNCLOS, and with relevant provisions of other international instruments such as UNFSA and the Code of Conduct. But the gap was so great between these instruments and the 1949 Convention that very little could be preserved from the original text.[6] The institutional continuity of the IATTC was maintained, but the new instrument has filled a number of gaps and uncertainties. The Commission has been institutionally strengthened with the establishment of a compliance committee and a scientific advisory body. The functions of the Commission have been updated and expanded to enable it to perform its tasks and adopt appropriate conservation and management measures. These tasks now cover a broad range of areas, such as scientific research, data collection, application of the precautionary approach, ecosystem considerations, fishing capacity, and allocation. Rights and obligations concerning implementation, compliance, and enforcement have been specified, as well as duties of flag states. Furthermore, decisions are now made by consensus and provisions on the settlement of disputes have been included.

The NPFC Convention entered into force in 2015, and responds to calls from the United Nations to close international jurisdictional gaps for high seas fisheries and, in particular, to take measures to address impacts of fishing on vulnerable marine ecosystems (VMEs) on the high

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[4] See: https://www.iattc.org/PDFFiles2/Antigua_Convention_Jun_2003.pdf

[5] Its full title is: The Convention on the Conservation and Management of High Seas Fisheries Resources in the North Pacific Region. See: https://www.npfc.int/npfc-convention

[6] The Northwest Atlantic Fisheries Organization (NAFO) experienced similar challenges concerning the Convention dating back to 1978. NAFO chose, however, to amend its Convention, but in fact rewriting it completely, only keeping provisions on denunciation and registration unchanged.

seas. The Convention reflects many of the important developments in international fisheries law, including the precautionary approach, the ecosystem approach, and protecting biodiversity in the marine environment. The Convention sets out quite detailed provisions concerning conservation and management measures and strategies for both targeted species and species belonging to the same ecosystem, including by preventing significant adverse impacts on VMEs. Furthermore, the NPFC Convention focuses on effective monitoring, control, and surveillance, as well as compliance with enforcement both through measures to be adopted by the Commission and through special provisions in the Convention concerning flag-state duties, port-state duties, and compliance and enforcement.

Some relevant standards are also contained in the treaty between Canada and the United States concerning Pacific Salmon (PSC Convention) and the Convention on Great Lakes Fisheries between Canada and the United States (GLFC Convention).

Another interesting instrument is the Benguela Current Commission Convention (BCC Convention) from 2012,[7] which applies within the exclusive economic zones of Angola, Namibia and South Africa. The BCC Convention relates to all human activities, which thus also includes conservation and management of transboundary fishery resources.[8]

The structure of international cooperating frameworks developed over the last 25 years or so are quite similar. They include at least the following elements: preamble, use of terms, objective, area of application, general principles, establishment of a commission and its functions, subsidiary bodies and secretariat, decision-making, implementation, compliance, transparency, settlement of disputes, and final provisions (signature, ratification, acceptance, approval or accession, entry into force, reservations, relation to other instruments, amendments, annexes, withdrawal and depositary). This analysis of the IPHC Convention follows such a structure.

Preamble

Unlike other treaties, the IPHC Convention does not include a preamble stating the purpose and justification for the instrument, as well as commitments thereto. There is a preamble in the protocol amending the IPHC Convention, but its purpose is to explain the need for those amendments.

The Antigua Convention and the NPFC Convention recall the relevant provisions of UNCLOS. The Antigua Convention in particular refers to the sovereign rights of coastal states for the purpose of exploring and exploiting, conserving and managing living marine resources, as well as the duty to cooperate with other states. It furthermore stresses the need to implement the principles and standards in the Code of Conduct and the action plans established pursuant to

[7] See: http://www.benguelacc.org/index.php/en/about/the-benguela-current-convention
[8] The BCC shall also take all possible steps to prevent abate an d minimize pollution and take necessary measures to protect the marine ecosystem against any adverse impact, which may include measures related to shipping, mining, drilling etc.

it.[9] The NPFC Convention also refers to the Code of Conduct in general, focusing on steps to protect VMEs from significant adverse impact of destructive fishing practices as well as combatting IUU fishing.

The PSC Convention includes a preamble referring to the interests of the parties and their commitments to cooperate in management, research and enhancement, while the preamble of the GLFC Convention focuses on joint and coordinated efforts to maximise sustained productivity in the fisheries.

The BCC Convention preamble refers to UNCLOS and other global instruments concerning conservation and management of marine resources, the need for collective actions to ensure effective long-term transboundary co-operation, and to stable institutional arrangements.

Recommendation:

1) Incorporate a preamble setting forth the purpose of the Convention, and make references to relevant international instruments such as UNCLOS, the Code of Conduct and its action plans, etc.

Use of terms

The IPHC Convention does not, like other regional fisheries treaties, contain a specific provision on definitions/use of terms, but a few terms are explained in various provisions. In Article I the terms “Convention waters” and “maritime area” are introduced, and “the Commission” is referred to in article III. The purpose of definitions is to facilitate the understanding and not least the interpretation of the instrument. It is noted that some key terms used in the IPHC Convention such as “commercial fishing”, “fish”, “fishing”, “fishing operations”, “sport fishing,” and “fishing vessel”/”vessel” are not explained. The terms “commercial fishing,” “fishing,” and “sport fishing” are, however, defined in the Pacific Halibut Fishery Regulations 2017. “Fishing” is defined to mean “the taking, harvesting, or catching of fish, or any activity that can reasonably be expected to result in the taking, harvesting, or catching of fish, including specifically the deployment of any amount or component part of gear anywhere in the maritime area”.

The Antigua Convention includes in Article I.2 a very detailed and extensive definition of “fishing”, namely as “(a) the actual or attempted searching for, catching, or harvesting of the fish stocks covered by this Convention; (b) engaging in any activity which can reasonably be expected to result in the locating, catching, harvesting of these stocks; (c) placing, searching for or recovering any fish-aggregating device or associated equipment, including radio beacons; (d) any operation at sea in support of, or in preparation for, any activity described in sub-paragraphs (a), (b) and (c) of this paragraph, except for any operation in emergencies involving the health and safety of crew members or the safety of a vessel; (e) the use of any other vehicle,

[9] Those action plans are IPOA-Capacity, IPOA-Seabirds, IPOA-IUU, and the International Plan of Action for the Conservation and Management of Sharks (IPOA-Sharks).

air- or sea-borne, in relation to any activity described in this definition except for emergencies involving the health or safety of crew members or the safety of a vessel."

The NPFC Convention does not define "fishing," but pursuant to Article 1(i) "fishing activities" means "(i) the actual or attempted searching for, catching, taking or harvesting of fisheries resources; (ii) engaging in any activity that can reasonably be expected to result in locating, catching, taking or harvesting of these resources for any purpose; (iii) the processing of these resources at sea and the transshipping of these resources at sea or in port; and (iv) any operation at sea in direct support of, or in preparation for, any activity described in subparagraphs (i) to (iii) above, except for any operation related to emergencies involving the health and safety of crew members or the safety of fishing vessels."

The term "fishing vessel" is defined in Article 1(j) of the NPFC Convention to mean any vessel used or intended for use for the purpose of engaging in fishing activities, including fish processing vessels, support ships, carrier vessels and any other vessel directly engaged in such fishing activities, while the Antigua Convention use the term "vessel," which means any vessel used or intended for use for the purpose of fishing, including support vessels, carrier vessels and any other vessels directly involved in such fishing operations, (see Article I.3).

The PSC Convention contains a specific article for definitions of relevant terms used in the treaty.

In the most recent global fisheries treaty, the PSMA, both terms "fishing" and "fishing related activities" are used. "Fishing" means "searching for, attracting, locating, catching, taking or harvesting fish or any activity, which can reasonably be expected to result in the attracting, locating, catching, taking or harvesting of fish." "Fishing related activities" means "any operation in support of, or in preparation for, fishing, including the landing, packaging, processing, transshipping or transporting of fish that have not been previously landed at a port, as well as the provisioning of personnel, fuel, gear and other supplies at sea." The PSMA defines "vessel" as any vessel, ship of another type or boat used for, equipped to be used for, or intended to be used for, fishing or fishing related activities.

Recommendation:

2) Incorporate an article for "Definitions," thereby removing or reducing ambiguity in term usage and meaning.

Objective

Most RFMO treaties and most other international instruments contain specific provisions setting out their objectives. Such a provision is not included in the IPHC Convention. However, in Article I, paragraph 2 it is referred to "regulations promulgated pursuant to Article III of the Convention and designed to develop the stocks of halibut in the Convention waters to those levels which will permit the optimum yield from the fishery and to maintain the stocks at those levels," which might be interpreted to be the objective of the coordinated efforts by Canada and the USA pursuant to the IPHC Convention. Similar language is used in Article III, paragraph

3, where it is stated “for the purpose of developing the stocks of halibut of the Northern Pacific Ocean and Bering Sea to levels which will permit the optimum yield from that fishery, and for maintaining the stocks at those levels, the Commission may…..”,

The objective of the Antigua Convention is “to ensure the long-term conservation and sustainable use of fish stocks covered by the Convention, in accordance with relevant rules of international law”(see Article II). More recent treaties such as the NPFC Convention also focus on the possible environmental impact of fishing, as its objective is “to ensure the long-term conservation and sustainable use of the fisheries resources in the Convention Area while protecting the marine ecosystems of the North Pacific Ocean in which these resources occur” (see Article 2). As mentioned above, the BCC Convention sets out a broader mandate than RFMOs, and its objective is “to promote a coordinated regional approach to the long-term conservation, protection, rehabilitation, enhancement and sustainable use of the Benguela Current Large Marine Ecosystem, to provide economic, environmental and social benefits” (see Article 2).

Recommendation:

3) Incorporate an article for “Objective” reflecting international standards for conservation and management of living marine resources.

Application

Application relates to geographical area, target species, and activities.

The target species for IPHC is halibut (*Hippoglossus*), as referred to in Article 1, paragraph 1 of the Convention. Paragraph 4 states that fishing for other species in seasons closed to halibut fishing is not prohibited, which probably is not needed to be stated from a legal point, but it provides clarity.

There seems to be a deficiency with respect to the clarity of the authority under the Convention to regulate non-commercial fishing. From the outset, the Convention applies to all fishing for halibut, but pursuant to Article 1, paragraph 5 it applies to commercial halibut fishing,[10] with the exception of sport fishing addressed in that particular paragraph.[11]

The geographical area, i.e., “the Convention waters,” is described in Article 1, paragraph 3 to be “waters off the west coasts of Canada and the United States, including the southern as well as the western coasts of Alaska, within the respective maritime areas in which either Party exercises exclusive fisheries jurisdiction.”

It is understood that Pacific halibut also occur in the national waters of some other countries. In order to have a comprehensive management regime in place, all areas of distribution should be included in the geographical area of application. Options could be either to extend the

[10] “Commercial fishing” is defined in section 3, subparagraph (1)(d) of the Pacific Halibut Fishery Regulations 2017.
[11] “Sport fishing” is defined in section3, subparagraph (1) (r) of the Pacific Halibut Fishery Regulations 2017.

geographical area and thereby also the membership of the IPHC to include also these states, or to establish some kind of cooperating mechanisms between them and the Commission.[12]

Most treaties of regional fisheries bodies provide for a more prominent placement of such an important provision, i.e., a specific article clearly stating application, in particular the geographical areas covered by the treaty. Examples are Article III of the Antigua Convention, Article 4 of the NPFC Convention, Article I GLFC Convention and Article 3(1) of the BCC Convention. In addition to a stand-alone article there could be a cross-reference to the geographical area in a list of terms, as described above.

Recommendations:

4) Incorporate an article for "Area of application of the Convention," including a detailed map, noting that the northern boundary of the Convention area is vague.

5) Include explicit language confirming that the Convention applies to all removals of Pacific halibut in the Convention waters by directed and non-directed fisheries, commercial, recreational, and other.

6) Specify the current species is Pacific halibut (*Hippoglossus stenolepis*)', though other species of Hippoglossus would also be covered under the convention should they be identified.

General principles

The IPHC Convention does not contain general or management principles per se. There are a couple of principles included, e.g., the reference in Article 1, paragraph 2 to "develop the stocks of halibut in the Convention waters to those levels which will permit the optimum yield from the fishery and to maintain the stocks at those levels" and in Article III, paragraph 2 stating that the Commission "shall make such investigations as are necessary into the life history of the halibut."

The Code of Conduct contains provisions on fisheries management, which include data gathering and management advice, application of the precautionary approach, the establishment of management measures as well as their implementation (see in particular Article 6[13]). The international plans of actions established by the FAO also contain elements regarded to be common general principles for fisheries management.[14] In addition, FAO guidelines established in recent years contain general principles relevant to regional efforts in conservation and management of fisheries.[15]

[12] If this latter option is chosen, provisions concerning "Cooperation with non-parties" should be included in the Convention.
[13] The most relevant paragraphs in this context are paragraphs 6.3-6.6, and 6.11.
[14] IPOA-Capacity, IPOA-Seabirds, IPOA-Sharks, and IOPA-IUU.
[15] Examples are the Bycatch Guidelines and the Flag State Guidelines.

Article 5 of UNFSA sets out the general principles to be applied by RFMOs and coastal states in order to conserve and manage straddling fish stocks and highly migratory fish stocks. These principles are now associated with common standards for the conservation of living marine resources, and consequently relevant to conservation and management of all fish stocks, including those occurring only in national waters. Article 5 provides, among other things, that in order to conserve the stocks concerned, states are required to adopt measures to ensure their "long term sustainability" and promote the objective of their optimum utilization, to ensure that such measures are based on the best scientific evidence available and to apply the precautionary approach in accordance with article 6 of UNFSA. The aim of the application of the precautionary approach to fisheries management is to reduce the risk of overexploitation and depletion of fish stocks. The use of precaution is required at all levels of the fishery system, including management decisions, research, technology development as well as institutional frameworks. Article 5 also promotes the protection of marine ecosystems and the protection of biodiversity in the marine environment. States are further called upon to minimize pollution, waste, discards, catch by lost or abandoned gear, catch of non-target species, both fish and non-fish species, and impacts on associated or dependent species. States are also required to collect, share and complete accurate data concerning fishing activities on, among other things, vessel position, catch, and fishing effort, as set out in Annex I of UNFSA, as well as information from national and international research programmes.

In giving effect to its objective, the NPFC Convention in Article 3 contains a rather long list of general principles, in essence mirroring Article 5 of UNFSA, stating that measures shall be based on the best scientific information available, and in accordance with the precautionary approach and ecosystem approach, that the impacts of fishing activities on species belonging to the same ecosystem shall be assessed, that biodiversity in the marine environment shall be protected, that overfishing and excess capacity shall be prevented or eliminated, that collection and sharing of complete and accurate data, that pollution and waste, and discards shall be minimized, and that compliance with conservation and management measures shall be ensured.

The Antigua Convention does not contain a specific provision on general principles. Article IV specifies, however, the application of the precautionary approach, making cross-references to the relevant parts of the Code of Conduct and UNFSA. In this regard, it is stated that IATTC shall be more cautious when information is uncertain, unreliable, or inadequate. In addition, some principles are indirectly included in the functions of its commission by stating that "measures shall be based on the best scientific evidence available…" and "to maintain or restore the populations of harvested species at levels of abundance which can produce the maximum sustainable yield."

Article III of the PSC Convention contains principles concerning each party's fisheries and enhancement programs, which shall prevent overfishing and provide for optimum production and provide for each party to receive benefits equivalent to the production of salmon originating in its waters.[16]

General principles relevant to fishing contained in the BCC Convention include the protection of biodiversity in the marine environment and conservation of the marine ecosystem, taking necessary measures to protect the marine ecosystem against any adverse impacts, undertaking environmental assessments for proposed activities that are likely to cause adverse impacts on the marine and coastal environment, applying management measures based on best scientific evidence available, and protecting vulnerable species and biological diversity.

Recommendation:

7) Incorporate an article for "General principles" to include references to long-term sustainability, science-based decisions, application of the precautionary approach, minimisation of harmful impact on the marine ecosystem, collection and sharing of data, and ensuring effective compliance, etc.

The Commission

Pursuant to Article III, paragraph 1 of the IPHC Convention, the Commission referred to in previous instruments continues. The Commission comprises six members, three appointed by each party. Details concerning location, representation, sessions, and selection and functions of Chairperson and Vice-Chairperson are described in the Rules of Procedure (2017).

The IATTC was maintained in a similar manner when the 1949 Convention was replaced by the Antigua Convention- (see Article VI), which also includes provisions on the Commission's legal status and its location.

Article 5 of the NPFC Convention establishes the Commission, and includes provisions on meeting frequency and request for additional meetings, election of chairperson and vice-chairperson, and on the legal status of the Commission.

The PSC is established by Article II of its Convention, which also includes the composition of the Commission, election of Chairman and Vice-Chairman, the frequency of meetings and the location of the seat of the Commission (see paragraphs 1, 3-5, and 9-10).

Article II of GLFC Convention establishes the Commission and its composition, while election of Chairman and Vice-Chairman, and conduct of meetings are addressed in Article III (see paragraphs 1, 3 and 5).

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[16] "Overfishing" means fishing patterns which results in escapements significantly less than those required to produce maximum sustainable yields, see Article 1, paragraph 5 of the PSC Convention.

Recommendations:

8) Maintain, but in a stand-alone article, the current provisions for continuation of the Commission, with all its assets and liabilities established by the 1923 Convention and subsequent revisions.

9) Consider whether elements of the current Rules of Procedure are better placed in the Convention or a Headquarters Agreement.

Functions of the Commission

Most of the functions of the Commission are set out in Article III, paragraph 3 of the IPHC Convention. The functions are to: (a) divide the Convention waters into areas; (b) establish one or more open or closed seasons as to each area;(c) limit the size of the fish and the quantity of the catch to be taken from each area within any season during which fishing is allowed;(d) during both open and closed seasons, permit, limit, regulate or prohibit the incidental catch of halibut that may be taken, retained, possessed, or landed from each area or portion of an area, by vessels fishing for other species of fish;(e) fix the size and character of halibut fishing appliances to be used in any area; (f) make such regulations for the licensing of vessels and for the collection of statistics on the catch of halibut as it shall find necessary to determine the condition and trend of the halibut fishery and to carry out the other provisions of this Convention; (g) close to all taking of halibut any area or portion of an area that the Commission finds to be populated by small, immature halibut and designates as nursery grounds.

Additional functions are set out in Article III, paragraph 2; “the Commission shall make such investigations as are necessary into the life history of the halibut and may conduct or authorize fishing operations to carry out such investigations”.

Functions of the NPFC as set out in Article 7 relevant in the context of the IPHC Convention are: (i) adopt conservation and management measures to ensure the long-term sustainability of the fisheries resources within the Convention Area, including the total allowable catch or total allowable level of fishing effort for those fisheries resources as the Commission may decide; (ii) adopt, where necessary, conservation and management measures for species belonging to the same ecosystem or dependent upon or associated with the target stocks; (iii) adopt, where necessary, management strategies for any fisheries resources and for species belonging to the same ecosystem or dependent upon or associated with the target stocks, as may be necessary to achieve the objective of this Convention; and (iv) adopt conservation and management measures to prevent significant adverse impacts on vulnerable marine ecosystems in the Convention Area.

The Antigua Convention in Article VII provides a long and detailed list of Commission functions, requiring it to perform the following relevant in this context: (i) promote, carry out and coordinate scientific research concerning the abundance, biology and biometry in the Convention Area of fish stocks covered by the Convention and, as necessary, of associated or dependent species, and the effects of natural factors and human activities on the populations of these stocks and species; (ii) adopt standards for collection, verification, and timely exchange and reporting of data concerning the fisheries for fish stocks covered by the Convention; (iii) adopt measures that are based on the best scientific evidence available to ensure the long-term conservation and sustainable use of the fish stocks covered by the Convention and to maintain or restore the populations of harvested species at levels of abundance which can produce the maximum sustainable yield, inter alia, through the setting of the total allowable catch of such fish stocks as the Commission may decide and/or the total allowable level of fishing capacity and/or level of fishing effort for the Convention Area as a whole; (iv) determine whether, according to the best scientific information available, a specific fish stock covered by the Convention is fully fished or overfished and, on this basis, whether an increase in fishing capacity and/or the level of fishing effort would threaten the conservation of that stock; (v) adopt, as necessary, conservation and management measures and recommendations for species belonging to the same ecosystem and that are affected by fishing for, or dependent on or associated with, the fish stocks covered by the Convention, with a view to maintaining or restoring populations of such species above levels at which their reproduction may become seriously threatened; (vi) adopt appropriate measures to avoid, reduce and minimize waste, discards, catch by lost or discarded gear, catch of non-target species (both fish and non-fish species) and impacts on associated or dependent species, in particular endangered species; (vii) adopt appropriate measures to prevent or eliminate over-fishing and excess fishing capacity and to ensure that levels of fishing effort do not exceed those commensurate with the sustainable use of the fish stocks covered by the Convention; (viii) establish a comprehensive program for data collection and monitoring which shall include such elements as the Commission determines necessary. Each member of the Commission may also maintain its own program consistent with guidelines adopted by the Commission; (ix) promote, to the extent practicable, the development and use of selective, environmentally safe and cost-effective fishing gear and techniques and such other related activities, including activities connected with, inter alia, transfer of technology and training; and (x) promote the application of any relevant provision of the Code of Conduct and of other relevant international instruments including, inter alia, the International Plans of Action adopted by FAO in the framework of the Code of Conduct.

The PSC Convention includes a general provision related to management, stating that the Commission may make recommendations to or advise the Parties on any matter relating to the Treaty, see Article II, paragraph 8. But the bulk of conservation and management options and guidance is contained in articles related a system of panels/specific areas, see Articles IV, paragraphs 4-6, Articles VI and VIII.[17]

Article IV of the GLFC Convention contains the following duties; (a) formulate a research program or programs designed to determine the need for measures to make the maximum sustained productivity of any stock of fish in the Convention Area; (b) coordinate research and, if necessary, to undertake research itself; (c) recommend appropriate measure to the Contracting Parties on the basis of the findings of such research programs, and (d) formulate and implement

[17] See also Annex II and Annex IV, noting that all references to the Convention shall be understood to include the Annexes.

a comprehensive program for the purpose of eradicating or minimizing the sea lamprey populations.

Recommendations:

10) The functions concerning fishing set out in the Convention to be streamlined in a specific article, and to include the following additional functions: (i) adopt standards for collection and sharing of data, (ii) adopt measures for species belonging to the same ecosystem or dependent upon or associated with halibut, (iii) adopt measures to avoid, reduce and minimize waste, discards, catch by lost or discarded gear, (iv) adopt measures to prevent significant adverse impacts on VMEs, and (v) adopt measures to ensure effective monitoring, control and surveillance, as well as compliance.

Subsidiary bodies

There are no references to subsidiary bodies of the Commission in the IPHC Convention, but the Commission has by the Rules of Procedure established seven such bodies in two committees and five boards: the Finance and Administration Committee, the Scholarship Committee, the Conference Board, the Processor Advisory Board, the Research Advisory Board, the Management Strategy Advisory Board and the Scientific Review Board (Rule 14 of the Rules of Procedure 2017). The terms of reference for each of them are set out in appendices to the Rules of Procedure.

The NPFC Convention established a Scientific Committee and a Technical Committee, and their respective duties and functions are described in the convention itself in articles 6, 10 and 11. In addition, the Commission may establish any other subsidiary bodies from time to time to assist in meeting the objective of the NPFC Convention, see Article 6, paragraph 1.

The same approach was taken by IATTC. The Antigua Convention established the Committee for the Review of Implementation of Measures Adopted by the Commission and a Scientific Advisory Committee (Articles X and XI). Their general functions are described in its Convention, while the details are set out in two annexes, Annex 3 and Annex 4. The Commission may also establish such other subsidiary bodies as it considers necessary, see Article VII, paragraph 1(u).

Pursuant to Article II, paragraph of the PSC Convention, the Commission shall establish a Committee on Research and Statistics and a Committee on Finance and Administration. In addition, the PSC shall establish four panels as described in Annex I of the Convention.

The BCC Convention also established subsidiary bodies to its Commission in the statutory document. These are an Ecosystem Advisory Committee, a Finance and Administration Committee, and a Compliance Committee (Article 9 of the BCC Convention). The functions of those committees are set out in Articles 10, 11 and 12, respectively.

Recommendation:

11) Consider whether the establishment some of the Commission's subsidiary bodies to be moved from the Rules of Procedure to the Convention.

Administration

There are no specific references to administrative issues in the IPHC Convention. But pursuant to Rule 13 of the Rules of Procedure, the Commission shall appoint an Executive Director, whose duties are described therein.

Many other RFMO treaties contain guidance concerning administrative issues. In accordance with Article 5, paragraph 9 the NPFC Convention, the Commission may establish a permanent Secretariat consisting of an Executive Secretary and other such staff as the Commission may require and/or enter into contractual arrangements with the Secretariat of an existing organization for the provision of services. NPFC has chosen to establish a permanent secretariat.

The Antigua Convention includes a specific provision on the appointment of a Director and his or her functions, and it contains rather detailed descriptions of the required competence of the director as well as the responsibilities (see Article XII). In addition, the Commission shall maintain a qualified staff under the supervision of a Director according to Article VII, paragraph 2. Pursuant to Article 13 of the BCC Convention, a secretariat to be headed by an Executive Secretary was established, and some of the key duties of the Executive Secretary are described.

The availability of adequate financial resources is critical to the effective functioning of an RFMO. Concerning financial issues, the IPHC Convention states that each party shall pay the salaries and expenses of its own members, and that joint expenses incurred by the Commission shall be paid by the two parties in equal shares. But it should be noted that the parties may agree to vary the proportion of such joint expenses (see Article III, paragraph 1). IPHC and other RFMOs have established permanent subsidiary bodies to deal with financial issues, which are responsible for reviewing the operation of the budget for the current year and examining the draft budget for the coming year. But to underscore the importance of this issue, most RFMO treaties also contain specific provisions on budgets and contributions.

The Antigua Convention deals with the budget and the contributions by parties in separate provisions, Article XIV and Article XV, respectively. They address issues like financial audit, determination of member contributions, additional funding mechanisms and arrears in payment. Article 12 of the NPFC Convention deals with the organisation's budget, and includes provisions on adoption, member contributions, deadline for payment, arrears and auditing. Article 15 of the BCC Convention sets out the basic principles concerning finance and budget, which includes equal contributions and consequences of failing to pay contributions.

In accordance with Article II of the PSC Convention, the Commission shall; (i) prepare an annual budget, and bear the costs of the budget in equal shares unless otherwise agreed; (ii) authorize the disbursement of funds, and may enter into contracts and acquire property necessary for the performance of its functions; (iii) submit an annual report on its activities an annual financial statement, and (iv) shall appoint an Executive Secretary, who, subject to the supervision of the Commission, shall be responsible for the general administration of the Commission.

Pursuant to Article III of the GLFC Convention, the Commission shall appoint an Executive Secretary, who shall have the full power and authority of the staff and shall perform such functions as the Commission may describe, see paragraphs 6-8. Some general guidance concerning financial arrangements are included in Articles VIII and IX.

Recommendation:

12) Incorporate in the Convention a specific article dealing with administrative issues, such as to appoint of a Director,[18] to approve program of work, to approve budget, to adopt or amend rules of procedures, financial regulations and other internal administrative regulations.

Decision-making

Among other things, Article III, paragraph 1 of the IPHC Convention also includes a decision-making clause. All decisions of the Commission shall be made by concurring vote of at least two of the Commissioners of each Party. However, this is modified by Rule 11, paragraph 1 of the Rules of Procedure 2017, which states that as a general rule, decision-making in the Commission should be by consensus, defined to mean the absence of any formal objection made at the time the decision was taken. A voting procedure will be invoked if it appears that all efforts to reach consensus have been exhausted, and the decision will be made by voting as referred to in Article III, paragraph 1 of the Convention.

Many other agreements contain stand-alone provisions for decision-making, underpinning their importance.

Decision-making based on voting has been the traditional process agreed to in RFMOs. Notwithstanding the formal procedures established by them, the practice is to rely on decision-making based on consensus. The notion of "consensus" is typically, as defined in the Rules of Procedure of IPHC, the adoption of a decision without any vote or formal opposition at the time of adoption.

The NPFC operates under a consensus rule (see Article 8). However, if all efforts to reach consensus have been exhausted, voting is an option. The IATTC also make decisions by consensus (see Article IX). The decision-making provision of the Antigua Convention also sets out clearly how to decide if any party is absent from the meeting. The BCC takes decisions and makes recommendations by consensus only (see Article 16).[19]

[18] The appointment and duties of the Director then to be moved from the Rules of Procedure to the Convention.
[19] Concerning decisions and recommendations on transboundary issues affecting only two of the three parties of the BCC, consensus means that those decisions and recommendations are supported by the affected parties.

Recommendation:

13) Harmonize the decision-making provisions of the Convention and the Rules of Procedure, and incorporate those in a specific article of the Convention.

Implementation

Although it is obvious that members of regional bodies shall, taking into account the decision-making process,[20] implement decisions to which they are bound, some RFMO agreements make this clear in the statutory document. This is also the case of the IPHC Convention. Pursuant to Article IV, parties shall take any action, including enactment of legislation and enforcement, as may be necessary to make effective the provisions of the Convention and any regulations adopted thereunder. Other RFMO treaties contain similar provisions, but recent instruments are more explicit when referring to member duties.

Global organisations and regional bodies have taken initiatives to combat IUU fishing. The IPOA-IUU calls on States, through RFMOs, to take various actions, such as developing boarding and inspection schemes, implementing vessel monitoring systems (VMS) and observer programmes, identifying vessels that are engaged in IUU fishing, regulating transhipment operations as well as adopting port inspection schemes, certification, and/or trade documentations schemes and other marked-related measures.

Each Party of the Antigua Convention shall provide to the Commission statistical and biological information and information concerning its fishing activities, and shall provide information regarding actions taken to implement measures adopted in accordance with the Convention. To this end, the Antigua Convention requires that parties promptly provide their national legal and administrative provisions related to conservation and management measures adopted by the Commission (see Article XVIII, paragraphs 2 and 3). In addition, parties shall provide to the Commission every six months a report on the activities of their vessels and any other relevant information (see Article XVII, paragraph 4(c)).

The NPFC Convention includes specific and very detailed provisions on flag-state duties, port-state duties and on data collection, compilation, and exchange in Articles 13, 14 and 16, respectively. On flag-state duties, it includes required authorizations, monitoring and real-time reporting obligations, observer coverage, and record of fishing vessels. Furthermore, the Commission shall adopt measures for the effective monitoring, control, and surveillance that shall include an observer program, procedures for boarding and inspection,[21] and mechanisms to combat IUU fishing (see Article 7, paragraph 2).

Article IV of the PSC Convention contains provisions to facilitate the implementation of Articles III, VI and VII of the Convention, which includes an obligation to submit annual reports on fishing activities, and to establish and enforce regulations to implement fishery

[20] Many RFMO treaties include provisions on how and when binding decisions shall take effect, which also include the right to object under certain conditions, as well as internal procedures if an objection is launched.
[21] If, within three years of entry into force of the Convention , the Commission is not able to agree on procedures for boarding and inspection, Articles 21 and 22 of UNFSA shall be applied as if they were part of the Convention.

regimes adopted by the Parties. Each Party shall notify the Commission and the other Party of these regulations and shall promptly communicate to the Commission and the other Party any in-season modification. Furthermore, each Party shall require reports from its nationals and vessels of catch, effort and related data for all stocks subject to the Convention and make such data available to the Commission, see Article XIV of the Convention.

In accordance with Article XI of the GLFC Convention the Parties have agreed to enact such legislation as may be necessary to give effect to the provisions of the Convention.

The BCC Convention states that each party shall take measures to ensure implementation, including adoption of the necessary legislation, and shall report to the Commission on an annual basis indicating how it has implemented decisions of and acted on recommendations by the Commission.

Recommendation:

14) Expand the current text to also include obligations to provide national legal provisions related to measures adopted by the Commission, and submit reports on vessel activities at appropriate intervals.

Compliance and enforcement

Closely linked to implementation is compliance and enforcement. Pursuant to Article II of the IPHC Convention, each Party shall have the right to enforce the Convention and any regulation adopted pursuant thereto in all Convention waters against its own nationals and fishing vessels, and in the portion of the waters in which it exercises exclusive fisheries jurisdiction against nationals or fishing vessels of either Party or third parties. This approach reflects the sovereign rights of the coastal state within its exclusive economic zone as set out in Part V of UNCLOS, in particular Article 73. Parties shall also ensure that their nationals and fishing vessels allow and assist boarding and inspections by duly authorized officials of the other Party (see Article II, paragraph 3).[22] In paragraph 2 it is stated that each Party may conduct prosecutions or take other action under domestic law for violation of the Convention or of any regulations adopted pursuant thereto. This means that a Party may take actions against vessels entitled to fly its flag for violations anywhere in the Convention Area, and against vessels entitled to fly the flag of the other Party within its national waters.

The approach taken in the IPHC Convention reflects relevant provisions of UNCLOS, in particular Article 73. It should also be noted that there is a section in the Flag State Guidelines dealing with cooperation between flag states and coastal states, which addresses issues like their respective roles and responsibilities, including the flag state's duty to impose sanctions notwithstanding those that may be applied by a coastal state under coastal state's own laws and jurisdiction, on vessels flying its flag that have violated the flag state's legislation related to

[22] Basic procedures for boarding and inspection are set out in UNFSA Article 22. Although they apply to the high seas, some elements could be relevant also for boarding and inspection procedures in national waters.

fishing and fishing related activities in maritime areas under coastal state jurisdiction (see paragraphs 39-43 of the guidelines).

UNFSA places a series of obligations on flag states concerning compliance and enforcement, including immediate and full investigation of alleged violations, prompt reporting on the progress and outcome of the investigation to the relevant RFMO, and if a serious violation has been proven, the requirement not to allow the vessel to fish until such time as imposed sanctions have been complied with. Furthermore, the flag state must ensure that applicable sanctions are adequate in severity to secure compliance and to discourage violations and deprive offenders of the benefits accruing from non-compliance.

The Antigua Convention contains quite detailed descriptions in relation to compliance and follow-up actions in Article XVIII, paragraphs 5-10. One party has the duty to act when a vessel flying the flag of another party is suspected of being engaged in activities that undermine the effectiveness of applicable measures. Each Party is obliged to thoroughly investigate if one of its vessels has carried out activities which contravene adopted measures, and shall apply sanctions of sufficient gravity as to be effective in securing compliance and to deprive offenders of the benefits accruing from such activities,[23] including refusal, suspension, or withdrawal of the authorization to fish. The Antigua Convention also established a Committee for the Review of Implementation of Measures Adopted by the Commission (see Article X). The functions of the Committee are set out in Annex 3 to the Convention, which include to review and monitor compliance with adopted conservation and management measures, analyse information provided by flag states and provide the Commission with information, technical advice, and recommendations relating to the implementation, and compliance with, conservation and management measures.

The NPFC Convention contains a specific article on compliance and enforcement, Article 17. Each Party shall investigate any allegation that vessels entitled to fly its flag have violated any provision of the Convention or any measures adopted by the Commission, and take appropriate actions if the allegation is proven to be correct. The flag state shall order its vessel to leave the Convention Area if involved in the commission of a serious violation.[24] The NPFC Convention goes further than other treaties concerning beneficial owners, as it specifies that the flag state shall ensure, to the greatest extent possible, compliance by its nationals, and fishing vessels owned, operated, or controlled by its nationals. Like other instruments, it requires that sanctions shall be adequate in severity to be effective in securing compliance, and shall deprive offenders of the benefits accruing from their illegal activities.

Recommendations:

15) Noting the adequate provisions in the Convention, the text should also contain follow-up actions by the flag state that include application of sanctions of sufficient

[23] Similar language is included in the IPOA-IUU, see paragraph 21 and in UNFSA Article 19, paragraph 2.
[24] A serious violation includes any of the violations specified in Article 21, subparagraphs 11(a) to (h) of UNFSA.

gravity as to be effective in securing compliance, such as depriving offenders of benefits, and refusal, suspension, or withdrawal of authorizations.

16) Consider establishment of a Compliance Committee for reviewing implementation of measures adopted by the Commission.

Transparency

The IPHC Convention does not make reference to observer participation, but according to Rule 6.2 of the Rules of Procedure 2017 meetings of the Commission may be open to observers and the general public. Rule 12 specifies IPHC's relationship to observers and the general public, and states that all sessions of the Commission and its subsidiary bodies may be open to observers and the general public, unless the Commission decides otherwise. It may invite States, RFMOs and other relevant governmental and intergovernmental organisations and non-governmental organisations.

As a general principle set out in the Code of Conduct, states should at national levels ensure that decision-making processes are transparent, and should facilitate consultation and effective participation of industry, fishery workers, environmental and other interested organizations in decision-making with respect to the development of laws and policies related to fisheries management and development.

Although Article 12 of UNFSA relates to straddling and highly migratory fish stocks, standards set out therein are regarded as best practice concerning transparency in fisheries organizations. It requires transparency in decision-making processes and other activities. Most RFMOs have publicly accessible websites, which include meeting minutes, reports, and scientific information. Many RFMOs have amended their rules of procedures for commission meetings or agreed on specific guidelines and criteria for observer status in order to meet the obligations under article 12(2) of UNFSA. The NPFC Convention and the Antigua incorporate provisions mirroring those in article 12 of UNFSA, see Article 18 of the NPFC Convention and Article XVI of the Antigua Convention.[25]

In order to carry out its duties, the GLFC may hold public hearings in Canada and United States, see Article V (c).

Recommendation:

17) Incorporate in a specific article of the Convention general language concerning transparency.

[25] Details for IATTC are set out in Annex 2 of the Antigua Convention.

Dispute settlement

IPHC Convention does not address potential disputes.

International standards for dispute settlement in RFMOs are established by part VIII of UNFSA. Article 27 of UNFSA provides that all disputes shall be settled by negotiation, inquiry, mediation, conciliation, arbitration, judicial settlement, resort to regional agencies or arrangements, or other peaceful means chosen by the parties to the dispute. The UNFSA emphasizes that in order to prevent disputes, states shall cooperate with a view to agreeing on efficient and expeditious decision-making procedures within RFMOs and to strengthen existing ones as necessary.

Article 30 of UNFSA provides the application of arrangements in part XV of UNCLOS also to disputes about UNFSA itself, about RFMO instruments, or about conservation and management measures taken by an RFMO, whether or not they are also parties to the UNCLOS. Part XV of the UNCLOS provides for mandatory procedures leading to a binding decision by the International Court of Justice or the International Tribunal on the Law of the Sea. It should be noted that, concerning RFMO measures, these mechanisms only apply to parties to UNFSA, and for this reason many recent RFMO agreements consequently have adopted their own specific arrangements.

Articles 28 and 29 of the UNFSA provide for the prevention of disputes by efficient and expeditious decision-making procedures and for the prompt resolution of technical disputes by *ad hoc* expert panels.

The Antigua Convention contains requirement to address disputes, and members of the Commission are required to consult in order to find a quick solution. If this fails, parties to a dispute shall settle the dispute through peaceful means they may agree upon, in accordance with international law. A dispute on technical nature may be referred to a non-binding *ad hoc* expert panel constituted within the framework of the Commission.

NPFC simply applies Part VIII of UNFSA to any dispute between NPFC parties, whether or not they are also parties to UNFSA (see Article 19 of the NPFC Convention).

The BCC Convention also contains a clause on settlement of disputes, stating that if a dispute arises between Parties concerning the interpretation or implementation of the Convention, those concerned shall consult among themselves as soon as possible in order to settle the dispute by negotiation or any other means they agree upon.

Article XII of the PSC Convention deals with technical disputes, which are described as disputes concerning estimates of the extent of salmon interceptions and data related to questions of overfishing. Such disputes shall be referred to a Technical Dispute Settlement Board, established in accordance with Annex III of the Convention.

Recommendation:

18) Incorporate in the Convention a specific article, which in general terms states that in order to settle a possible dispute between Contracting Parties, concerning interpretation or implementation of the Convention, the parties shall consult by means they agree upon.

Final clauses

Most RFMO treaties contain so-called “final provisions,” such as rules on signature and ratification, entry into force, reservations, declarations and statements, relationship with other instruments, amendments, withdrawal, and depository.[26]

Recommendations:

19) Incorporate an article on signature, ratification, acceptance and approval, stating who are entitled to become parties, as well as the timeframe for signature.

20) Incorporate an article stating when it enters into force, and conditions thereto.[27]

21) Incorporate an article stating whether or not reservations or exceptions may be made.

22) Incorporate an article allowing parties to make statements or declarations that do not exclude or modify the legal effect of the provisions.

23) Incorporate an article making references to for example the UNCLOS concerning sovereign rights of coastal States as well as other possible relevant instruments.

24) Incorporate an article describing the amendment mechanisms such as time frames, communication, adoption and entering into force. If annexes or appendices are regarded as an integral part of the treaty, more flexible mechanism for those.

25) Incorporate an article describing possible withdrawal procedures.[28]

26) Incorporate an article stating who will be the depository government as well as its obligations and functions.

[26] Examples are Part IX of the Antigua Convention, Articles 23-31 of the NPFC Convention, and Articles 22-31 of the BCC Convention.
[27] This is present in Article VII, which became effective 29 March 1979 and continues until 1981, and thereafter until either party gives notice to terminate.
[28] This is present in Article VII. Like most other RFMO treaties, one year notice is required.

ANNEX I

Summaries of various relevant international instruments

UN Convention on the Law of the Sea (UNCLOS)

UNCLOS provides the legal framework for all uses of the oceans as well as their superjacent air space and subjacent seabed and subsoil. UNCLOS includes provisions on limits of various maritime zones, such as the territorial sea, the exclusive economic zone (EEZ) and the continental shelf, rules on navigation, a framework for conservation and utilization of living marine resources, a regime for the deep seabed beyond national jurisdiction, rules for protection and preservation of the marine environment from pollution, rules on scientific research and provisions on dispute settlement. Article 56 gives the coastal state sovereign rights to explore and exploit, conserve and manage natural resources, whether living or non-living, within its EEZ. The core provisions on fisheries are Articles 61 and 62 which deal with the conservation, management and utilization of the living resources of the EEZ , while in this context in particular Article 63, paragraph 1 is essential as states shall, where the same stock or stocks of associated species occur within the EEZs of two or more coastal states, these states shall seek, either directly or through appropriate sub-regional or regional organizations, to agree upon measures necessary to coordinate and ensure the conservation and development of such stocks. Article 73 allows the coastal state in the exercise of its sovereign concerning the living marine resources of the EEZ to take measures, including boarding and inspection, arrest and judicial proceedings as mat be necessary to ensure compliance with its laws and regulations.

Furthermore UNCLOS Article 192 imposes a broad obligation on states to "protect and preserve the marine environment" and pursuant to Article 194(5) this includes taking measures to "protect and preserve rare or fragile ecosystems as well as the habitat of depleted, threatened or endangered species or other forms of marine life".

UN Fish Stocks Agreement (UNFSA)

The objective of UNFSA is to ensure the long-term conservation and sustainable use of straddling fish stocks and highly migratory fish stocks through effective implementation of the relevant provisions of UNCLOS. Straddling stocks is also generally understood to refer to stocks which occur both within the EEZ and in an area beyond or adjacent to the zone, in accordance with Article 63(2) of UNCLOS The focus of the agreement is on cooperation within regional fisheries management organizations (RFMOs).

Although the main objective of UNFSA is related to the conservation and management of straddling fish stocks and highly migratory fish stocks on the high seas, Articles 5 (general principles) and 6 (application of the precautionary approach) also apply to the conservation and management of those stocks in areas under national jurisdiction.

Article 5 sets out the general principles, which includes, among other things, that states are required to adopt measures to ensure the ‘long term sustainability’ of fish stocks and to promote the objective of their optimum utilization; to ensure that such measures are based on the best scientific evidence available; and to apply the precautionary approach in accordance with Article 6 of the agreement. Article 5 calls for the conservation and management of marine ecosystems and the protection of biological diversity in the marine environment, and states are also required to minimize pollution, waste, discards, catch by lost or abandoned gear; catch of non-target species, both fish and non-fish species, and impacts on associated or dependent species. Under Article 5(d), states are required to assess the impact of fishing on target stocks and species belonging to the same ecosystem or associated with or dependent upon target stocks. States are further required to collect, share and complete accurate data concerning fishing activities on, among other things, vessel position, catch and fishing effort, as set out in Annex I to the agreement, as well as information from national and international research programs.

Article 6 requires states to apply the precautionary approach to conservation and management in order to protect the living marine resources and preserve the marine environment. Annex II of the agreement provides guidance for the application of precautionary reference points in conservation and management of the stocks concerned. The aim of the application of the precautionary approach to fisheries management is to reduce the risk of overexploitation and depletion of fish stocks. The application of the precautionary approach entails that the lack of full scientific information should not be used as a reason to postpone taking action by the establishment of conservation and management measures. The approach involves the setting of reference points for management and threshold levels for spawning stock size and fish mortality. The management objectives are to ensure that the fish mortality rates and the size of the spawning stock biomass are maintained at or above desired levels.

Although the flag state duties set out in UNFSA Article18 apply to high seas fishing, they are regarded as common international standards. It imposes the basic obligation for a flag state to ensure that vessels flying its flag comply with RFMO measures and do not undermine the effectiveness of such measures, and contains rather detailed specifications of the required suite of necessary measures.

FAO Agreement on Port State Measures to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing (PSMA)

The objective of the PSMA is to combat IUU fishing through the implementation of effective port state measures as a means of ensuring the long-term conservation and sustainable use of living marine resources and marine ecosystems. The PSMA sets out minimum standards for port control of foreign fishing vessels, i.e. such vessels that have been fishing in areas beyond the jurisdiction of the port state. For those fishing within the jurisdiction of the port state, UNCLOS Article 73 would apply.

The PSMA establishes a step-by-step process for the port state to allow or deny the entry to and the use of its ports. Article 7 requires each party to designate and publicize ports to which entry may be requested, and to ensure sufficient capacity to conduct inspections.

A party shall pursuant to Article 8, prior to allowing a foreign vessel access to its port, require the provision of information on place, time and purposes of the port call, vessel information, authorizations, transshipment information and catch details.

Article 9 requires prior authorization of entry into port and presentation of authorization upon entry into port. It also requires the denial of entry or other actions that are as effective as denial, where there is sufficient proof of IUU fishing. Entry must be denied where the port state has sufficient proof that a vessel has engaged in IUU fishing, in particular where it is on an IUU vessel list established by an RFMO.

Pursuant to Article 11, a vessel that has entered a port shall not be permitted to use that port if the vessel does not have a fishing authorization required by the relevant flag state or coastal state, or if there is clear evidence that the fish on board was taken in contravention of applicable measures. To this end, use of port shall also be denied if the flag state, on request, fails to confirm within reasonable time that the fish on board was taken in accordance with requirements of an RFMO or the port state has reasonable grounds to believe that IUU fishing had taken place, unless the vessel can establish otherwise. For this purpose, use includes landing, transshipping, packaging, processing, refueling and resupplying, maintenance and dry-docking.

Article 13 of the PSMA lists a series of duties on port states in carrying out inspections, including qualification of inspectors, identity cards, examination, cooperation and communication and an obligation to minimize interference and inconvenience. The port state must thus ensure that inspectors perform functions of verification, review, examination, determination and evaluation. Inspections must be carried out in a fair, transparent and non-discriminatory manner (Article 13(2)(h)).

The port state is, pursuant to Article 14, required to include into a report of the inspection the result indicators such as information on the vessel itself, authorizations, catch, gear and records as well as findings by the inspector and apparent infringements, if any. If, following an inspection, there are clear grounds for believing that the vessel has engaged in IUU fishing, the port state must, pursuant to Article 18, deny the vessel use of the port except for services essential for the safety or health of the crew or the safety of the vessel.

Code of Conduct for Responsible Fisheries (the Code of Conduct)

The Code of Conduct provides a framework for national and international efforts to ensure sustainable exploration of aquatic living resources with an overall objective to promote a framework for sustainable use of fisheries resources. Some of the measures suggested overlap with obligations contained in UNFSA, but the Code of Conduct contains principles and standards applicable to the conservation, management and development of all fisheries.

Article 6 underscores that the right to fish carries with it the obligation to do so in a responsible manner so as to ensure effective conservation and management of the living aquatic resources. It refers to the maintenance of the quality, diversity and availability of fishery resources, including species belonging to the same ecosystem or associated with or dependent upon the target species. It request that conservation and management decisions should be based on the best scientific evidence available, and refers to the application of the precautionary approach to conservation and management and to preserve the aquatic environment. In addition, selective and environmentally safe fishing gear and practices should be used in order to maintain biodiversity and to conserve the population structure and aquatic ecosystems. This is further elaborated in Article 8, under which states should require that fishing gear, methods and practices are sufficiently selective so as to minimize waste, discards, catch of non-target species, both fish and non-fish species, and impacts on associated or dependent species.

Article 7 includes provisions on management objectives, management framework and procedures, data gathering and management advice, application of the precautionary approach, and the establishment of management measures as well as their implementation. It also addresses management objectives of fisheries, which should include the avoidance of excess capacity, the conservation of biodiversity of aquatic habitats and ecosystems, the protection of endangered species, and the minimization of pollution, waste, discards, catch by lost or abandoned gear, catch of non-target species and impacts on associated or dependent species. In addition states should assess impacts of environmental factors on target stocks and species belonging to the same ecosystem.

The implementation of the precautionary approach is described as taking into account, inter alia, uncertainties relating to the size and productivity of the stocks, reference points, stock condition in relation to such reference points, levels and distribution of fishing mortality and the impact of fishing activities, including discards, on non-target and associated or dependent species, as well as environmental and socio-economic conditions.'

Article 8 also sets out responsibilities of flag states, including to ensure that its vessels are properly marked, and the FAO Standard Specifications for Marking and Identification of Fishing Vessels is given as an example. Gear should also be marked.

Article 6.11 calls on flag states to exercise control over their vessels and to ensure that they do not undermine the effectiveness of international or national conservation and management measures. Pursuant to Article 7.1.7 states should also establish effective mechanisms for monitoring, surveillance, control and enforcement of fishing vessels. States should ensure that documentation with regard to fishing operations, retained catch of fish and non-fish species is collected, and states should establish programs, such as observer and inspection schemes, in order to promote compliance with applicable measures. A flag state is required to take enforcement measures against any of its vessels that have contravened applicable conservation and management measures, including, where appropriate, making such contravention an offence under national legislation. Sanctions must be of adequate severity to be effective in securing compliance and discourage violations and should deprive offenders of the benefits accruing from their illegal activities and are to include, for serious offences, refusal, suspension, or withdrawal of the authorization to fish.

International Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing (IPOA-IUU)

Combating IUU fishing has been one of the main priorities on the international fisheries agenda for many years. A number of initiatives have been taken by global organizations, regional bodies and states to counteract such activities. In this context, in particular, the IPOA-IUU is important.

FAO adopted the IPOA-IUU in 2001. The objective of the IPOA-IUU is to prevent, deter and eliminate IUU fishing through comprehensive, effective and transparent measures. Measures should be consistent with the conservation and long-term sustainable use of fish stocks and the protection of the environment Although it is not binding, the action plan contains several suggested measures for combating IUU fishing, including those to be used by flag states, coastal states, port states and RFMOs. The IPOA-IUU calls on states, through RFMO/As, to take various actions, such as developing boarding and inspection schemes, implementing VMS and observer programs, identifying vessels that are engaged in IUU fishing, regulating transshipment operations, as well as adopting port inspection schemes, certification and/or trade documentation schemes and other marked-related measures.

The IPOA-IUU contains a specific section on national legislation, which addresses some particular issues, including state control over nationals, sanctions and monitoring, control and surveillance.

Paragraphs 18 and 19 call on states to take measures to ensure that their nationals do not support or engage in IUU fishing, which would require the scope of any IUU fishing legislation to be applicable to nationals wherever they are involved in fishing and fishing related activities. In particular, the action plan highlights the possibility of targeting measures at the operators or beneficial owners of fishing vessels.

In accordance with paragraph 21, states should ensure that sanctions for IUU fishing and their nationals are of sufficient severity to effectively prevent, deter and eliminate IUU fishing and deprive offenders of the benefits accruing from such activities. An example of a sanction regime is the administrative penalty scheme.

Pursuant to paragraph 24, states should undertake comprehensive and effective MCS of fishing from its commencement, through the point of landing and to final destination. A set of actions is listed in the said paragraph, including establishing access schemes, maintaining records of all vessels and their current owners and operators authorized to undertake fishing subject to their jurisdiction, and the use of VMS and observer programs.

Flag state responsibilities are addressed in a specific section of the IPOA-IUU, which deals with issues related to fishing vessel registration, record of fishing vessels and authorizations to fish.

According to paragraphs 42 and 43, a flag state should maintain a record of fishing vessels entitled to fly its flag. Concerning the content of such record, and provides identification details to be included.

Paragraphs 44-47 deal with fishing authorizations and their conditions. A flag state should not allow its vessels to fish unless so authorized and should ensure that each vessel fishing beyond national waters holds a valid authorization. Minimum content of such an authorization is listed in paragraph 46, while authorization conditions are outlined in paragraph 47.

According to paragraph 48, flag states should ensure that their fishing, transport and support vessels do not support or engage in IUU fishing. It is the responsibility of the flag State to ensure that none of its vessels resupply fishing vessels engaged in IUU fishing or transship fish to or from such vessels.

Paragraph 49 calls on flag states to ensure that their vessels involved in transshipment operations have a prior authorization and apply reporting requirements concerning the operation.

International Plan of Action for Reducing Incidental Catch of Seabirds in Longline Fisheries (IPOA-Seabirds)

There are concerns about incidental catch of seabirds in longline fisheries. According to the action plan, states should, either individually or through appropriate RFMOs, conduct assessments of these fisheries to determine if a problem exists with respect to incidental catch of seabirds. If a problem is identified, initiatives should include the adoption of mitigation measures, plans for research and development, awareness campaigns and data collection programmes. The IPOA-Seabirds also contains an annex describing some optional technical and operational measures for reducing the incidental catch of seabirds in longline fisheries.

Regulations might include a duty to reduce visibility of bait by setting during hours of darkness. In order to reduce the attractiveness of the vessel to seabirds a regulation should require dumping of garbage or offal, either by banning the practice, or if unavoidable requiring duping to be done on the opposite side of the vessel where lines are being set. Furthermore area and seasonal closures should be established when concentrations of breeding or foraging take place, preferential licencing should be given to vessels that use mitigation measures that do not require compliance monitoring, and there should be a duty to release possible alive birds,

There are available some technical installations and devices that reduces the incidental mortality of seabirds. Regulations may require such devises to be used in order for the sink rate of baits to be increased, the line to be set below the water, birds to be scared, and bait to be casted.

International Plan of Action for the Management of Fishing Capacity (IPOA-Capacity)

In 1999 FAO adopted the IPOA-Capacity with the objective for states and RFMOs to achieve an efficient, equitable and transparent management of fishery capacity. The IPOA-Capacity is not binding, but it may be used as guidance by states as to how to comply with their obligations under other international instruments.

IPOA-Capacity specifies actions to be taken for assessing and monitoring capacity, preparing and implementing national plans, international considerations and immediate actions for major international fisheries requiring urgent measures. Overcapacity may be addressed in many ways, for example by input regulations (fishing seasons/days, area closures, gears and vessel-related restrictions), as well as by output regulations, such as right-based measures. Coordinated efforts are, however, essential.

From a conservation perspective, the management of capacity should, pursuant to paragraph 9(iv) of the IPOA-Capacity, be designed to achieve the conservation and sustainable use of fish stocks and the protection of the marine environment consistent with the precautionary approach. The IPOA-Capacity is developed in the context of the Code of Conduct, which provides that states should take measures to prevent and eliminate excess fishing capacity and should ensure that levels of fishing effort are commensurate with sustainable use of fishery resources. In the context of deep-sea fishing, states should limit participation by its vessels to the effort regarded to be commensurate with sustainable use of the deep-sea fisheries in question. This may be achieved through a form of licensing.

FAO Guidelines for Flag State Performance (Flag State Guidelines)

Improvement of flag state performance has been a topic on the international agenda for several years. The Flag State Guidelines were endorsed by the FAO Committee on Fisheries (COFI) in June 2014. The Flag State Guidelines are not legally binding, but they are an important indication of what flag states may need to do in order to comply with their obligations under the UNCLOS and other relevant treaties.

The Flag State Guidelines contain an extensive set of assessment criteria, which include detailed criteria about how a flag state handles fisheries management, authorizations, information, registration and records as well as monitoring, control, surveillance and enforcement. The guidelines also contain procedures for carrying out assessments, encouraging compliance and deterring non-compliance.

States are required to establish grounds for refusal of registration of a vessel, which would include vessels on an IUU vessel list adopted by an RFMO, vessels holding registration from another state and vessels with a history of non-compliance.

States should maintain up-to-date records of vessels authorized to engage in fishing and fishing related activities on the high seas. The Flag State Guidelines list a number of items to be contained in such a record in order to properly identify vessels, and include vessel name, names of owner, operator and beneficial owner and their respective addresses, history and characteristics of the vessel.

Pursuant to the Flag State Guidelines, states should ensure that no vessel is allowed to operate unless authorized by it. States are to advised to establish appropriate scope for such authorization, including conditions for the protection of marine ecosystems. Authorizations should also include minimum information requirements that include the name of the vessel and the owner of the vessel, the areas and duration of the authorization, as well as species targeted and the fishing gear used.

The Flag State Guidelines require states to implement a control regime. Such a regime should include the legal authority to take control of the vessels (e.g. denial of sailing, recall to port) as well as monitoring tools, such as VMS, logbooks/documentation, and observers. In addition, a regime should include mandatory requirements regarding fisheries-related data that must be recorded and reported in a timely manner (e.g. catches, effort, bycatches and discards, landings and transshipments) and an inspection regime.

States should have in place an enforcement regime authority to conduct investigations of violations, and should implement sanctions that are proportionate to the seriousness of the violation and are adequate in severity to be effective in securing compliance and to discourage violations wherever they occur and deprive offenders of benefits accruing from their illegal activities.

States should require its vessels to be marked in accordance with the FAO Standard Specifications and Guidelines for Marking and Identification of Fishing Vessels and relevant requirements of the International Maritime Organization. The guidelines also require states to have in place the legal means to manage capacity, fishing effort, catch limits and transshipment.

International Guidelines on Bycatch Management and Reduction of Discards (Bycatch Guidelines*)*

Concerns about bycatch and the practice of discarding have been expressed in many fora, including on repeated occasions at the UN General Assembly, urging states and others to reduce or eliminate bycatch, catch by lost and abandoned gear, fish discards and post-harvest losses, including juvenile fish. The Bycatch Guidelines were adopted by FAO in 2010 to assist states and RFMOs in implementing the Code and pursuing an ecosystem approach to fisheries through effective management of bycatch and reduction of discards. The main objective of the Bycatch Guidelines is to promote responsible fisheries by minimizing the capture and mortality of species and sizes. They contain a series of suggested measures that contribute towards more effective management of bycatch and reduction of discards, as well as how to improve reporting and the accounting of all components of the catch of which bycatch and discards are subsets. The Bycatch Guidelines are not legally binding, but they may be relevant for states in implementing their other international obligations.

Suggested measures to manage bycatch and reduce discards are contained in section 7 of the Bycatch Guidelines, while pre-catch losses and ghost fishing are dealt with in section 8. States are expected to ensure that bycatch management and discards reduction measures are, among other things, binding, clear and direct, ecosystem-based, ecologically efficient and enforceable. The Bycatch Guidelines suggest that a range of tools are available to manage bycatch and reduce discards, including input and/or output controls, the improvement of the design and use of fishing gear and bycatch mitigation devices, spatial and temporal measures, limits and/or quotas on bycatches and bans on discards.

UN General Assembly Resolutions

Since 2003 the UN General Assembly has adopted annually a resolution dedicated to fisheries and fisheries related issues, the so-called Sustainable Fisheries Resolution. The UN General Assembly resolutions are not legally binding, but they call on states and RFMOs to implement them.

The Sustainable Fisheries Resolution addresses numerous issues, including the implementation of UNFSA, combating IUU fishing, monitoring, control, and surveillance and enforcement, fishing overcapacity, fisheries bycatch and discards, sub-regional and regional cooperation, responsible fisheries in the marine ecosystem, and protection of vulnerable marine ecosystems (VMEs) from bottom fisheries. Many of the paragraphs are general in nature and directed at policy considerations rather than legal implementation. However, there are also paragraphs that call for states to take legal actions at the national level.

The UN General Assembly emphasizes that IUU fishing remains one of the greatest threats to fish stocks and the marine environment, and lists a series of actions that should be taken to counteract this activity, in particular through RFMOs. States are also addressed in various ways, both on policy and suggested measures that require legal implementation at national level.

The UN General Assembly urges states to exercise effective control over their nationals, including beneficial owners, and vessels flying their flag in order to deter them from engaging in IUU fishing or supporting vessels engaged in IUU fishing.

Recent UN General Assembly Resolutions have paid particular attention to the protection of VMEs from fishing activities, particularly bottom fishing and similar destructive fishing practices. The UN General Assembly calls upon states to sustainably manage deep-sea fish stocks and protect VMEs, including seamounts, hydrothermal vents and cold water corals, from destructive fishing practices, recognizing the immense importance and value of deep-sea ecosystems and the biodiversity they contain. In this regard, states are explicitly called upon to ensure that their vessels do not engage in deep-sea fishing until impact assessments have been carried out. States are requested to make publicly available, assessments of whether individual deep-sea fishing activities would have significant adverse impacts on VMEs and the measures adopted, which should be consistent with domestic law.

Furthermore states should identify where VMEs are known to occur or are likely to occur and adopt conservation and management measures to prevent significant adverse impacts on such ecosystems, or close such areas to bottom fishing until conservation and management measures (which can include fisheries closures, gear modification, etc) have been established.

States are requested to establish and implement appropriate protocols, including definitions of what constitutes evidence of an encounter with a VME, in particular threshold levels and indicator species.

The UN General Assembly calls on states to establish mechanisms to promote and enhance compliance with applicable measures related to the protection of VMEs, which would in most cases require implementation in national law.

ANNEX II

Outline example of regional fisheries treaty

Preamble

Note: Introductory statement setting forth the purpose of the treaty in general terms, including references to relevant instruments, documents etc.

Article 1
Use of terms

Note: Description of specific terms used in the treaty, in order to facilitate the understanding and interpretation of the instrument.

Article 2
Objective

Note: Setting forth the purpose and standards that can be achieved, containing the main goals of parties to the treaty.

Article 3
Application

Note: Description of the geographical area, to which the treaty applies as well as targets and activities covered by it.

Article 4
General principles

Note: General principles concerning harvesting of marine living resources may include references to long-term sustainability, science based decisions, maintenance and restoration of the resources, application of the precautionary approach, minimisation of harmful impact on the marine ecosystem, collection and sharing of data, and ensuring effective compliance etc.

Article 5
The Commission

Note: Establishment of the Commission and details concerning participation, chair, meetings etc.

Article 6
Functions of the Commission

Note: Listing the functions and responsibilities of the Commission, related to, inter alia, conservation and management measures, research activities, data and information, and control.

Article 7
Subsidiary bodies of the Commission

Note: If it is decided to establish any subsidiary body of the Commission, its composition, role and functions could be described. Alternatively, it could be a function of the Commission pursuant to the previous article to establish subsidiary bodies as it considers desirable for its functions and direct activities.

Article 8
Administration

Note: Setting forth the functions and responsibilities of the secretariat. Could also include financial arrangements.

Article 9
Financial arrangements

Note: Budget, parties contributions, funds from other sources, consequences of being in arrears of payment etc.

Article 10
Decision-making

Note: General rule for decisions; consensus and/or potential voting.

Article 11
Implementation

Note: Specifying obligations concerning steps to be taken to implement the treaty and relevant decisions by the Commission. These may also include cooperation in furthering the objective of the treaty, enforcement of agreed measures, collection and exchange of scientific, technical, and statistical data and knowledge.

Article 12
Compliance and enforcement

Note: Obligations concerning enforcement. Requiring parties to report periodically on implementation of the treaty and Commission's decisions, Based on these reports the Commission assesses compliance.

Article 13
Transparency

Note: Describing various categories of observers that may attend meetings of the Commission, and potential it's subsidiary bodies, including their rights and obligations. Also to include provisions on access to information by the civil society

Article 14
Settlement of disputes

Note: Describe how to handle disputes relating to the interpretation or application of the treaty and decisions taken by the Commission.

Article 15
Signature, ratification, acceptance and approval

Note: Stating who are entitled to become parties to the treaty, as well as the timeframe for signature.

Article 16
Entry into force

Note: Stating when the treaty enters into force, and conditions thereto.

Article 17
Reservations and exceptions

Note: Stating whether or not reservations or exceptions may be made.

Article 18
Declarations and statements

Note: Allowing parties to make statements or declarations that do not exclude or modify the legal effect of the provisions of the treaty.

Article 19
Relationship with other international instruments

Note: Considering references to for example the UNCLOS concerning sovereign rights of coastal States as well as other possible relevant instruments.

Article 20
Amendments to the treaty

Note: Describing the amendment mechanisms such as time frames, communication, adoption and entering into force. If annexes or appendices are regarded as an integral part of the treaty, more flexible mechanism for those.

Article 21
Withdrawal

Note: Describing possible withdrawal procedures.

Article 22
Depositary

Note: Stating who will be the depositary government as well as its obligations and functions.

Article 23
Authentic texts

Note: Stating that, if relevant, texts in different languages of the treaty are equally authentic.

Financial Statement for FY2017

PREPARED BY: IPHC SECRETARIAT (M. LARSEN; 4 JANUARY 2018)

PURPOSE

1. To provide the Commission with an end of year financial statement(financial period: 1 October 2016 to 30 September 2017).

STATUS OF CONTRIBUTIONS TO THE AUTONOMOUS BUDGET IN FY2017: INCOME

2. For FY2017, the IPHC saw a decrease in the General/Supplemental carryover to $3,922K (**Table 1**). This carryover is higher than the anticipated carryover of $3,137K. The variation to the expected carryover is primarily due to lower administrative and fishery-independent setline survey costs. The average coast-wide price of $6.47/lb was slightly higher than projections ($6.38/lb) and lower than the average 2016 price ($6.81/lb). With certificate of deposit rates remaining under 2%, the IPHC was unable to maintain the investment income near expected levels. This is likely to remain an issue until there is a change in monetary policy by the US Federal Reserve.
3. Items of interest regarding income are:
   a) **Pacific halibut Prices** – In FY2017 the IPHC saw Pacific halibut prices weaken throughout the summer. The prices in fresh-market ports (Prince Rupert, Homer, Seward, SE Alaska) were substantially higher than the frozen-market ports. Prince Rupert landings averaged $8.47/lb. with Canadian prices topping $10 CAD per pound nearly all summer. South-East Alaska ports averaged $6.79/lb. Lower prices persisted in western Gulf of Alaska and Bering Sea ports with the fish primarily going to the frozen market. The lowest prices were received in Adak ($4.92/lb) and St. Paul ($5.22). Dutch Harbor prices were slightly worse than 2016 at $5.57/lb (-5%).
   b) **U.S.A. Contribution** – In FY2017, the U.S. Government appropriated **$4.16M** to the IPHC (**Table 1**). The US contributions included funding for pension deficits and headquarters lease costs.
   c) **Canadian Contribution** – In FY2017, the Canadian government contributed **$1.507M** to the IPHC (**Table 1**). The Canadian contributions included **$848,720** for general contributions (which has been unchanged since 2003), as well as a separate amount of **$95,508** to cover pension deficit payments as well as a one-time payment of the Canadian share of pension deficits of **$563,476 which is shown as an extraordinary income and expense outside the budget.**

EXPENDITURES FOR FY2017

4. For FY2017 expenses were 96% of the projected budget (**Table 7**). Staff salaries and benefits were near expectations along with the related office expenses. Items of interest include:

a) The additional Canadian pension contribution was an additional expense and can be found on **Table 4** as Canadian Pension Liability. The amount shown is $563,476.
b) Office staff payroll was slightly higher (2%) than budget projections (**Table 7-1**) due to job re-descriptions. IPHC Secretariat staff received a 2.64% COLA increase, in line with the U.S. civil service guidelines, and step raises occurred where appropriate. The IPHC fishery-independent setline survey payroll was slightly lower than projected due to fewer weather/non-fishing days than expected.
c) Higher totals for B.C. Worker's Compensation program (BC WorkSafe) are a result of hiring more Canadian employees (port and survey) than anticipated (**Table 7-1 row 72441**). These mandatory costs (1.4% of salary) are much less than US salaried employees (7.65% of salary for FICA) and represent program savings.
d) Overall meeting and travel costs were less than budgeted (**Table 7-2 Travel**). Management Strategy Advisory Board and Science Review Board costs were higher due to more meetings and longer meetings than initially projected (**Table 7-2 rows 8322x**). Interim meeting costs have increased due to the Seattle meeting market (high demand) and the larger meeting spaces needed for public sessions (**Table 7-2 row 83211**).
e) Office and storage lease costs were as projected. U.S. appropriations language for FY2016 limited the contribution to $250,000 (**Table 7-3 rows 82111, 82123**). The issue of payment from the University of Washington for lease costs ($76,382) remains unresolved at this time.
f) Building Maintenance costs (**Table 7-3 row 82212**) include unanticipated building maintenance items (new hot water heater, backflow valve replacement).
g) Legal fees decreased with no major activity. Legal fees are split into general legal fees (**Table 7-3 row 85941**) and personnel legal fees (**Table 7-1 row 75311**).
h) General Liability expenses increased in 2017 and reflect IPHC maintaining adequate coverage (**Table 7-3 row 885212**).

EXTRA-BUDGETARY FUNDS

5. The IPHC continued to receive a grant for costs associated to the implementation of the extended sampling in Alaska. For FY2017 and beyond, the contract for the collection of Sablefish logbooks from NOAA-Fisheries (National Marine Fisheries Service) was terminated and funds for the logbook collection are now part of the above grant. Due to U.S. Federal funding mechanisms the reimbursement will commence in FY2019 (based on FY2017 expenses). The Commission also received funds from the Department of Fisheries and Oceans, Canada and Washington Department of Fish and Wildlife for additional work completed on the fisheries independent surveys in 2017 (**Table 6**).

PERSONNEL SUMMARIES

6. The IPHC maintained personnel full-time equivalent (FTE) similar to FY2016 with 73 employees and 41.58 FTE (FY2016 - 74 people and 40.50). Full-time Seattle staff (year-around) remains under 30 FTE and 30 people. Appendix II provides detail by program for both FTE and employees.

RECOMMENDATION/S

7. That the Commission **NOTE** paper IPHC–2018–AM094–17 which includes the Financial Statement and supporting documentation for the financial period 01 October 2016 to 30 September 2017.

APPENDICES

Appendix I: Financial Statements – Annual Meeting (ver. 1.0)

Appendix II: IPHC Employees by Program

Appendix I - Financial Statements

International Pacific Halibut Commission

Annual Meeting

FY2017 - 1 Oct. 2016 to 30 Sept. 2017

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TABLE 1. Consolidated Statement

IPHC Income and Expenses

FY2017 Actuals
1 Oct. 2016 to 30 Sept. 2017

General & Supplemental Accounts

Income	Actual	Budget	% Budget	***Expenses***	Actual	Budget	% Budget
Contributions				**Core IPHC Activities**			
United States	$ 4,160,000	$ 4,150,000	100%	Administration	$ 1,780,653	$ 1,911,806	93%
Canada	$ 944,228	$ 944,228	100%	Scientific	$ 2,841,974	$ 3,050,610	93%
				Catch Sampling	$ 547,010	$ 663,064	82%
Fish Sales				**Vessel Activity**			
F.I.S.S. Program	$ 3,845,400	$ 3,853,654	100%	F.I.S.S. Program	$ 5,106,587	$ 5,488,335	93%
Other Research	$ -	$ 125,000	0%				
Other Income							
Grants & Contracts	$ 589,631	$ 672,984	88%	**Research Activities**			
Interest Income	$ 14,884	$ 16,125	92%	Other Research	$ 480,397	$ 625,000	77%
Misc. Income	$ -	$ -	n/a	Field Experiments	$ -	$ -	0%
Normal FY2017 Income	**$ 9,554,143**	**$ 9,761,992**	**98%**	**Normal FY2017 Expenses**	**$ 10,756,620**	**$ 11,738,816**	**92%**
Extraordinary Income				**Associated Expenses**			
Canada - Pension Liability	$ 563,476	$ -	n/a	Canada - Pension Liability	$ 563,476	$ -	n/a
Total FY2017 Income	**$ 10,117,619**	**$ 9,761,992**	**104%**	**Total FY2012 Expenses**	**$ 11,320,096**	**$ 11,738,816**	**96%**

Net Normal FY2017	$ (1,202,477)
Net Normal as % of Income	-12.6%
Unrestricted Funds Balance	$ 3,922,332

Notes: Bycatch sales shared between vessel and state/Federal agencies (no funds to IPHC)
Program Expenses include Prior Year expenses

TABLE 2. General & Supplemental

General Fund Balances

General (10)		
Checking Account	$	(262,157)
Savings Account (HRA)	$	27,795
Total Cash	**$**	**(234,362)**
Treasury Bills	$	-
T-bill Money Market	$	-
Certificate of Deposit	$	500,000
Total Investments	$	500,000
General Fund Balance	**$**	**265,638**

Supplemental (20)		
Checking Account	$	2,546,488
Total Cash	$	2,546,488
Treasury Bills	$	-
T-bill Money Market	$	-
Certificate of Deposit	$	1,250,000
Total Investments	$	1,250,000
Supplemental Fund Balance	**$**	**3,796,488**
Grand Total Cash & Investments	**$**	**4,062,126**

TABLE 3. Restricted Accounts

Fund Balances

Leave Liability (30)

Fund Balances			Cash Balances		
Beginning Balance	$	117,913	Bank - Cash	$	117,972
Interest Earned	$	59	Treasury Bills	$	-
Leave Expenses	$	(56,793)	T-bill Money Market	$	-
Funds Transferred	$	-	Certificate of Deposit	$	-
Fund Balance	**$**	**61,179**	Cash Balance	**$**	**117,972**

Medical Annuitants (40)

Fund Balances			Cash Balances		
Beginning Balance	$	630,820	Bank - Cash	$	11,023
Interest Earned	$	6,269	Treasury Bills	$	-
Medical Expenses	$	(123,188)	T-bill Money Market	$	-
Bank Fees	$	-	Certificate of Deposit	$	750,000
Funds Transferred	$	-			
Fund Balance	**$**	**513,901**	Cash Balance	**$**	**761,023**

Reserve Account (50)

Fund Balances			Cash Balances		
Beginning Balance	$	1,000,000	Bank - Cash	$	8,084
Interest Earned	$	8,084	Treasury Bills	$	-
Expenses	$	-	T-bill Money Market	$	-
Reserve Transfer	$	(8,084)	Certificate of Deposit	$	1,000,000
Fund Balance	**$**	**1,000,000**	Cash Balance	**$**	**1,008,084**

Scholarship Account (60)

Fund Balances			Cash Balances		
Beginning Balance	$	249,489	Bank - Cash	$	58,224
Interest Earned	$	13,885	Bank - Money Market	$	-
Scholarship Expenses	$	(10,000)	Treasury Bills	$	-
Bank Fees	$	(150)	T-bill Money Market	$	-
			Certificate of Deposit	$	205,000
Fund Balance	**$**	**253,224**	Cash Balance	**$**	**263,224**
Total Fund Balance	$	1,828,303	Total Cash Balance	$	2,150,303

Restricted Funds		
Interest Earned	$	28,296
Expenses	$	190,131
Net Income	$	(161,835)
Funds Transferred	$	(8,084)

TABLE 4. General I & E

International Pacific Halibut Commission

Income and Expenses

% of Year	100%

INCOME		Actual		Budget	% of Budget
General					
Carry over from Prior FY	$	249,936	$	249,936	100%
US Contribution - General	$	4,160,000	$	4,150,000	100%
CDN Contribution - General	$	848,720	$	848,720	100%
CDN Contribution - Pension	$	95,508	$	95,508	100%
CDN Contribution - Pension Suppl.	$	563,476	$	-	0%
Interest	$	-	$	5,000	0%
Other income	$	-	$	-	0%
FY Income Sub-total	$	5,667,704	$	5,099,228	111%
TOTAL GENERAL FUND INCOME	**$**	**5,917,640**	**$**	**5,349,164**	111%
EXPENSES					
Personnel	$	4,172,392	$	4,297,936	97%
Programs	$	338,561	$	429,558	79%
Administration	$	748,826	$	1,142,874	66%
Supplies	$	390,254	$	379,863	103%
Prior Fiscal Year	$	-	$	-	0%
Sub-total	$	5,650,033	$	6,250,231	90%
Survey Personnel	$	601,804	$	628,323	96%
Survey Programs	$	151,135	$	205,543	74%
Survey Vessels and Contracts	$	3,639,842	$	3,921,817	93%
Survey Supplies	$	713,805	$	732,652	97%
Prior Fiscal Year	$	-	$	-	0%
Sub-total SSA Surveys	$	5,106,587	$	5,488,335	93%
NORMAL EXPENSES	**$**	**10,756,620**	**$**	**11,738,566**	92%
CANADIAN PENSION LIABILITY	**$**	**563,476**	**$**	**-**	n/a
OPERATIONS NET BALANCE	**$**	**(5,402,456)**	**$**	**(5,939,069)**	91%
TRANSFERED FROM SUPPLEMENTAL	**$**	**5,652,892**	**$**	**5,799,497**	**97%**
GENERAL FUND CARRYOVER	**$**	**250,436**	**$**	**249,936**	**100%**

Note: By financial rule General Fund Carryover limited to 5% of combined Appropriations

TABLE 5. Supplemental I & E

International Pacific Halibut Commission
Income and Expenses - Supplemental

Income		Actual		Budget	%	Notes
Supplemental						
Carryover from prior FY	$	4,864,061	$	4,864,061	100%	
Current Year Income						
Fish Sales						
Sale of Halibut - FIS survey	$	3,791,447	$	3,795,257	100%	
Sale of Bycatch - FIS survey	$	53,953	$	58,397	92%	
Sale of Halibut - DMR Project	$	-	$	125,000	0%	Field research deferred to FY2018
Grants and Contracts						
NMFS - Sampling Grant	$	541,966	$	541,966	100%	Annual port sampling grant
NMFS - Sablefish Logbooks	$	-	$	81,761	0%	Deferred and integrated into Sampling Grant
DFO - Rockfish Contract	$	35,735	$	37,079	96%	Area 2B rockfish sampling
WDFW - Rockfish Contract	$	11,930	$	12,178	98%	Area 2A rockfish sampling
Other Income						
Misc. Income	$	-	$	-	n/a	
Interest	$	3,855	$	1,125	343%	
Internal Transfers						
Rollover from Reserve	$	11,029	$	10,000	110%	Transfer of funds in excess of reserve limit
Current Year Income	**$**	**4,449,915**	**$**	**4,662,764**	**95%**	
Supplemental Total	**$**	**9,325,006**	**$**	**9,536,825**	98%	

Expenses		Actual		Budget	%
Supplemental					
Personnel	$	-	$	-	n/a
Programs	$	-	$	-	n/a
Administration	$	218	$	250	87%
Equipment & Supplies	$	-	$	-	n/a
Transfer to Restricted Accounts	$	-	$	-	n/a
Sub-Total	**$**	**218**	**$**	**250**	**87%**
Transfered to Appropriations	**$**	**5,652,892**	**$**	**5,799,497**	**97%**
Total Expenses	**$**	**5,653,110**	**$**	**5,799,747**	**97%**
Balance	**$**	**3,671,896**	**$**	**3,737,078**	**98%**

TABLE6. Operations

International Pacific Halibut Commission

Fiscal Year Actuals and Budgets

Period	**[12-2017]**
% of Year	**100%**

Personnel	10 Administration	20 Scientific	30 Statistics	40 Field Experiments	60 Other Research	***Sub-Total***	50 SSA Surveys	***Actuals***	***Budget***	***% of Budget***
Salaries	$ 607,724	$ 2,018,801	$ 356,023	$ -	$ 4,076	$ 2,986,624	$ 530,082	$ 3,516,706	$ 3,526,190	100%
Benefits	$ 343,732	$ 566,661	$ 52,044	$ -	$ -	$ 962,437	$ 41,406	$ 1,003,844	$ 1,077,146	93%
Taxes	$ 40,927	$ 151,539	$ 20,805	$ -	$ -	$ 213,272	$ 28,879	$ 242,151	$ 256,723	94%
Other	$ 7,182	$ -	$ -	$ -	$ -	$ 7,182	$ -	$ 7,182	$ 15,200	47%
Hiring/Separation	$ 2,830	$ -	$ 47	$ -	$ -	$ 2,877	$ 1,437	$ 4,314	$ 51,000	8%
Subtotal	**$ 1,002,395**	**$ 2,737,001**	**$ 428,919**	**$ -**	**$ 4,076**	**$ 4,172,392**	**$ 601,804**	**$ 4,774,196**	**$ 4,926,259**	**97%**
Programs										
Meetings & Conferences	$ 160,843	$ 17,434	$ -	$ -	$ -	$ 178,277	$ -	$ 178,277	$ 200,250	89%
Travel	$ 23,995	$ 18,402	$ 32,706	$ -	$ 10,800	$ 85,903	$ 67,960	$ 153,863	$ 210,797	73%
Communications	$ 28,146	$ -	$ 4,140	$ -	$ 2,495	$ 34,781	$ 83,176	$ 117,957	$ 163,054	72%
Publications	$ 37,055	$ 2,544	$ -	$ -	$ -	$ 39,600	$ -	$ 39,600	$ 61,000	65%
Subtotal	**$ 250,040**	**$ 38,380**	**$ 36,846**	**$ -**	**$ 13,294**	**$ 338,561**	**$ 151,135**	**$ 489,696**	**$ 635,101**	**77%**
Administration										
Contracts	$ 76,256	$ 12,525	$ 43,399	$ -	$ 138,417	$ 270,598	$ 3,114,861	$ 3,385,459	$ 3,907,292	87%
Maintenance	$ 92,384	$ 3,748	$ -	$ -	$ -	$ 96,132	$ 33,775	$ 129,907	$ 145,316	89%
Facility Rentals	$ 269,807	$ -	$ 3,205	$ -	$ -	$ 273,012	$ 16,361	$ 289,373	$ 298,358	97%
Training & Education	$ 38,500	$ 9,733	$ 24,870	$ -	$ 400	$ 73,504	$ 58,379	$ 131,883	$ 186,400	71%
Fees	$ 29,222	$ -	$ 6,359	$ -	$ -	$ 35,581	$ 416,466	$ 452,047	$ 527,325	86%
Subtotal	**$ 506,169**	**$ 26,007**	**$ 77,833**	**$ -**	**$ 138,817**	**$ 748,826**	**$ 3,639,842**	**$ 4,388,669**	**$ 5,064,690**	**87%**
Supplies & Equipment										
Equipment	$ -	$ 37,359	$ -	$ -	$ 1,407	$ 38,766	$ -	$ 38,766	$ 116,020	33%
Supplies	$ 22,049	$ 3,226	$ 3,411	$ -	$ 322,802	$ 351,488	$ 713,805	$ 1,065,293	$ 996,495	107%
Subtotal	**$ 22,049**	**$ 40,585**	**$ 3,411**	**$ -**	**$ 324,209**	**$ 390,254**	**$ 713,805**	**$ 1,104,059**	**$ 1,112,515**	**99%**
99999 ***Prior FY Expenses***	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**0%**
Grand Total	**$ 1,780,653**	**$ 2,841,974**	**$ 547,010**	**$ -**	**$ 480,397**	**$ 5,650,033**	**$ 5,106,587**	**$ 10,756,620**	**$ 11,738,566**	**92%**
Budget	$ 1,911,556	$ 3,050,610	$ 663,064	$ -	$ 625,000	$ 6,250,231	$ 5,488,335			
% of Budget	93%	93%	82%	n/a	77%	90%	93%			

TABLE 7-1. Personnel Summary

Period	**[12-2017]**
% of Year	**100%**

	Item	10 Administration	20 Scientific	30 Statistics	40 Field Exp.	60 Other Prgms	Subtotal	50 SSA	Operations Actuals	Budget	% of Budget
	Salaries										
7221x	Full-Time Salary	$ 576,163	$ 2,010,071	$ -	$ -	$ -	$ 2,586,234	$ -	$ 2,586,234	$ 2,539,790	102%
72221	Part-Time Salary	$ -	$ -	$ 335,651	$ -	$ -	$ 335,651	$ -	$ 335,651	$ 333,976	101%
72222	AK Cola	$ -	$ -	$ 17,755	$ -	$ -	$ 17,755	$ -	$ 17,755	$ 17,221	103%
72231	Temporary	$ -	$ -	$ -	$ -	$ 4,076	$ 4,076	$ 516,222	$ 520,298	$ 548,150	95%
72241	Hourly	$ 6,294	$ 8,730	$ 1,265	$ -	$ -	$ 16,290	$ 5,435	$ 21,725	$ 58,754	37%
75511	Contract	$ 25,267	$ -	$ -	$ -	$ -	$ 25,267	$ -	$ 25,267	$ 12,500	202%
72251	Sea Duty	$ -	$ -	$ -	$ -	$ -	$ -	$ 8,426	$ 8,426	$ -	n/a
72252	Port Duty	$ -	$ -	$ 1,352	$ -	$ -	$ 1,352	$ -	$ 1,352	$ 13,400	10%
72253	On-Call Duty Pay	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 2,400	0%
	Subtotal	**$ 607,724**	**$ 2,018,801**	**$ 356,023**	**$ -**	**$ 4,076**	**$ 2,986,624**	**$ 530,082**	**$ 3,516,706**	**$ 3,526,190**	**100%**
	Benefits										
7241x	Medical Benefits	$ 89,187	$ 336,327	$ 43,059	$ -	$ -	$ 468,573	$ 11,048	$ 468,573	$ 537,490	87%
72311	Pension	$ 17,843	$ 35,995	$ -	$ -	$ -	$ 53,838	$ -	$ 53,838	$ 53,840	100%
72421	403(b) - ER Base	$ 19,912	$ 111,302	$ -	$ -	$ -	$ 131,214	$ -	$ 131,214	$ 128,107	102%
72422	403(b) - ER Match	$ 11,447	$ 63,576	$ -	$ -	$ -	$ 75,024	$ -	$ 75,024	$ 73,204	102%
72312	Pension Amortization	$ 191,016	$ -	$ -	$ -	$ -	$ 191,016	$ -	$ 191,016	$ 191,016	100%
72431	Life Insurance	$ 2,627	$ 9,963	$ 2,057	$ -	$ -	$ 14,646	$ -	$ 14,646	$ 14,870	98%
72432	AD&D	$ 282	$ 1,069	$ 234	$ -	$ -	$ 1,585	$ -	$ 1,585	$ 1,600	99%
72441	BC Workers Comp.	$ 988	$ -	$ 257	$ -	$ -	$ 1,244	$ -	$ 1,244	$ 179	696%
72433	Industrial Insurance	$ 3,011	$ 8,430	$ 2,438	$ -	$ -	$ 13,879	$ 3,229	$ 17,107	$ 13,137	130%
72261	Performance Bonus	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 5,500	0%
72452	Tuition	$ 1,578	$ -	$ -	$ -	$ -	$ 1,578	$ -	$ 1,578	$ 8,000	20%
72453	Housing Allowance	$ -	$ -	$ 4,000	$ -	$ -	$ 4,000	$ -	$ 4,000	$ 4,500	89%
72461	Travel/Accident Insurance	$ 5,841	$ -	$ -	$ -	$ -	$ 5,841	$ -	$ 5,841	$ 6,000	97%
72462	Vessel P&I	$ -	$ -	$ -	$ -	$ -	$ -	$ 27,130	$ 27,130	$ 39,704	68%
	Subtotal	**$ 343,732**	**$ 566,661**	**$ 52,044**	**$ -**	**$ -**	**$ 962,437**	**$ 41,406**	**$ 992,796**	**$ 1,077,146**	**92%**
	Taxes										
72511	Social Security	$ 40,927	$ 151,539	$ 20,805	$ -	$ -	$ 213,272	$ 28,879	$ 242,151	$ 256,723	94%
	Subtotal	**$ 40,927**	**$ 151,539**	**$ 20,805**	**$ -**	**$ -**	**$ 213,272**	**$ 28,879**	**$ 242,151**	**$ 256,723**	**94%**
	Personnel Related Fees										
75311	Legal	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 5,000	0%
75411	COBRA TPA	$ 1,200	$ -	$ -	$ -	$ -	$ 1,200	$ -	$ 1,200	$ 2,000	60%
75143	Section 125/132 TPA	$ 3,276	$ -	$ -	$ -	$ -	$ 3,276	$ -	$ 3,276	$ 5,000	66%
75412	Defined Benefit Plan TPA	$ 2,706	$ -	$ -	$ -	$ -	$ 2,706	$ -	$ 2,706	$ 3,200	85%
	Subtotal	**$ 7,182**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 7,182**	**$ -**	**$ 7,182**	**$ 15,200**	**47%**
70521	Hiring Expenses	$ 955	$ -	$ 47	$ -	$ -	$ 1,002	$ 1,437	$ 2,439	$ 41,000	6%
70522	Employee Separation Expenses	$ 1,875	$ -	$ -	$ -	$ -	$ 1,875	$ -	$ 1,875	$ 10,000	19%
	Subtotal	**$ 2,830**	**$ -**	**$ 47**	**$ -**	**$ -**	**$ 2,877**	**$ 1,437**	**$ 4,314**	**$ 51,000**	**8%**
	Grand Total	**$ 1,002,395**	**$ 2,737,001**	**$ 428,919**	**$ -**	**$ 4,076**	**$ 4,172,392**	**$ 601,804**	**$ 4,763,148**	**$ 4,926,259**	**97%**
	Budget	$ 1,027,533	$ 2,783,615	$ 461,876	$ -	$ 24,912	$ 4,297,936	$ 628,323			
	% of Budget	98%	98%	93%	n/a	16%	97%	96%			

Table 7-2. Programs

Period	[12-2017]
% of Year	100%

	Item	10 Administration	20 Scientific	30 Statistics	40 Field Exp.	60 Other Research	Sub-Totals	50 SSA Survey	Operations Actuals	Budget	% of Budget
	Meetings & Conferences										
83211	Interim Meeting	$ 11,224	$ -	$ -	$ -	$ -	$ 11,224	$ -	$ 11,224	$ 6,000	187%
83212	Annual Meeting	$ 42,926	$ -	$ -	$ -	$ -	$ 42,926	$ -	$ 42,926	$ 45,000	95%
83221	Research Advisory Board	$ 5,051	$ -	$ -	$ -	$ -	$ 5,051	$ -	$ 5,051	$ 5,500	92%
83271	Scholarship Committee	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 750	0%
83222	MSAB Meetings	$ 29,375	$ -	$ -	$ -	$ -	$ 29,375	$ -	$ 29,375	$ 25,000	118%
83223	SRB Meetings	$ 30,785	$ -	$ -	$ -	$ -	$ 30,785	$ -	$ 30,785	$ 20,000	154%
83231	U.S. Council	$ 19,628	$ -	$ -	$ -	$ -	$ 19,628	$ -	$ 19,628	$ 12,500	157%
83232	HAB - Canada	$ 1,684	$ -	$ -	$ -	$ -	$ 1,684	$ -	$ 1,684	$ 3,000	56%
83241	Workshops/WorkMeeting	$ 5,319	$ -	$ -	$ -	$ -	$ 5,319	$ -	$ 5,319	$ 5,000	106%
83242	Scientific Meeting & Symposia	$ -	$ 17,434	$ -	$ -	$ -	$ 17,434	$ -	$ 17,434	$ 47,500	37%
83251	Scientific Meeting Support	$ 3,058	$ -	$ -	$ -	$ -	$ 3,058	$ -	$ 3,058	$ 10,000	31%
83261	Local & Trade Show	$ 11,794	$ -	$ -	$ -	$ -	$ 11,794	$ -	$ 11,794	$ 20,000	59%
	Subtotal	**$ 160,843**	**$ 17,434**	**$ -**	**$ -**	**$ -**	**$ 178,277**	**$ -**	**$ 178,277**	**$ 200,250**	89%
	Travel										
83111	General Travel - Staff	$ 4,783	$ 18,402	$ 6,131	$ -	$ 10,800	$ 40,115	$ 67,960	$ 108,075	$ 138,297	78%
83112	On Job Training Travel	$ -	$ -	$ 17,765	$ -	$ -	$ 17,765	$ -	$ 17,765	$ 21,500	83%
83113	Follow-up Travel	$ -	$ -	$ 8,811	$ -	$ -	$ 8,811	$ -	$ 8,811	$ 11,000	80%
83121	General Travel - Director	$ 19,212	$ -	$ -	$ -	$ -	$ 19,212	$ -	$ 19,212	$ 40,000	48%
	Subtotal	**$ 23,995**	**$ 18,402**	**$ 32,706**	**$ -**	**$ 10,800**	**$ 85,903**	**$ 67,960**	**$ 153,863**	**$ 210,797**	73%
	Communications										
81311	Phone Tolls	$ 6,282	$ -	$ -	$ -	$ -	$ 6,282	$ -	$ 6,282	$ 7,000	90%
81312	Long Distance	$ 1,207	$ -	$ 363	$ -	$ -	$ 1,571	$ 2,591	$ 4,162	$ 6,245	67%
81313	Reimbursed Communications	$ 3,068	$ -	$ 2,194	$ -	$ -	$ 5,262	$ -	$ 5,262	$ 12,040	44%
82211	Internet Service	$ 2,296	$ -	$ -	$ -	$ -	$ 2,296	$ -	$ 2,296	$ 2,750	83%
81411	Postage	$ 9,967	$ -	$ 609	$ -	$ -	$ 10,576	$ 645	$ 11,221	$ 15,600	72%
81511	Mail Prep Services	$ 4,670	$ -	$ -	$ -	$ -	$ 4,670	$ -	$ 4,670	$ 4,500	104%
81412	Express Mail	$ 656	$ -	$ 973	$ -	$ 1,964	$ 3,594	$ 191	$ 3,785	$ 12,123	31%
81413	Heavy Shipping	$ -	$ -	$ -	$ -	$ 530	$ 530	$ 79,749	$ 80,279	$ 102,796	78%
	Subtotal	**$ 28,146**	**$ -**	**$ 4,140**	**$ -**	**$ 2,495**	**$ 34,781**	**$ 83,176**	**$ 117,957**	**$ 163,054**	72%
	Publications										
81911	Annual Report	$ 28,888	$ -	$ -	$ -	$ -	$ 28,888	$ -	$ 28,888	$ 13,500	214%
81912	Regulations	$ 4,906	$ -	$ -	$ -	$ -	$ 4,906	$ -	$ 4,906	$ 4,000	123%
81921	Blue Book	$ 1,538	$ -	$ -	$ -	$ -	$ 1,538	$ -	$ 1,538	$ 3,750	41%
81922	RARA Report	$ 660	$ -	$ -	$ -	$ -	$ 660	$ -	$ 660	$ 2,000	33%
81931	IPHC Publications	$ -	$ 2,544	$ -	$ -	$ -	$ 2,544	$ -	$ 2,544	$ 30,000	8%
81932	External Journals	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 2,500	0%
81711	Misc. Printing	$ 1,064	$ -	$ -	$ -	$ -	$ 1,064	$ -	$ 1,064	$ 2,000	53%
81712	Logbooks	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 3,250	0%
	Subtotal	**$ 37,055**	**$ 2,544**	**$ -**	**$ -**	**$ -**	**$ 39,600**	**$ -**	**$ 39,600**	**$ 61,000**	65%
	Grand Total	**$ 250,040**	**$ 38,380**	**$ 36,846**	**$ -**	**$ 13,294**	**$ 338,561**	**$ 151,135**	**$ 489,696**	**$ 635,101**	77%
	Budget	$ 262,750	$ 88,550	$ 61,785	$ -	$ 16,473	$ 429,558	$ 205,543			
	% of Budget	95%	43%	60%	n/a	81%	79%	74%			

TABLE 7-3. Administration

Period	**[12-2017]**
% of Year	**100%**

	Item	10 Administration	20 Scientific	30 Statistics	40 Field Exp.	60 Other Research	Sub-Totals	50 SSA Surveys	Operations Actuals	Budget	% of Budget
	Contracts										
82611	Leased Vehicle Fees	$ 3,046	$ -	$ 13,933	$ -	$ -	$ 16,979	$ -	$ 16,979	$ 25,003	68%
70511	Vehicle Mileage Reimbursed	$ -	$ -	$ 8,852	$ -	$ -	$ 8,852	$ -	$ 8,852	$ 11,850	75%
85611	Software Leases	$ 23,793	$ 12,525	$ 2,738	$ -	$ -	$ 39,056	$ -	$ 39,056	$ 34,395	114%
85931	Vendor Contracts	$ 49,417	$ -	$ 17,875	$ -	$ 138,417	$ 205,709	$ 3,114,861	$ 3,320,571	$ 3,836,044	87%
	Subtotal	**$ 76,256**	**$ 12,525**	**$ 43,399**	**$ -**	**$ 138,417**	**$ 270,598**	**$ 3,114,861**	**$ 3,385,459**	**$ 3,907,292**	87%
	Maintenance										
82612	Copier Maintenance	$ 2,054	$ -	$ -	$ -	$ -	$ 2,054	$ -	$ 2,054	$ 1,500	137%
82613	Equipment Maintenance	$ -	$ 3,748	$ -	$ -	$ -	$ 3,748	$ 33,775	$ 37,524	$ 48,000	78%
82614	Vehicle Maintenance	$ 80	$ -	$ -	$ -	$ -	$ 80	$ -	$ 80	$ 250	32%
82615	Building Maintenance	$ 73,558	$ -	$ -	$ -	$ -	$ 73,558	$ -	$ 73,558	$ 77,566	95%
82212	Building Utilities	$ 16,692	$ -	$ -	$ -	$ -	$ 16,692	$ -	$ 16,692	$ 18,000	93%
	Subtotal	**$ 92,384**	**$ 3,748**	**$ -**	**$ -**	**$ -**	**$ 96,132**	**$ 33,775**	**$ 129,907**	**$ 145,316**	89%
	Facility Rentals										
82121	Field Office Rental	$ -	$ -	$ 3,205	$ -	$ -	$ 3,205	$ -	$ 3,205	$ 8,100	40%
82122	Archival Storage Rental	$ 4,923	$ -	$ -	$ -	$ -	$ 4,923	$ -	$ 4,923	$ 5,500	90%
82131	Bait Storage	$ -	$ -	$ -	$ -	$ -	$ -	$ 16,361	$ 16,361	$ 20,000	82%
82111	Office Lease	$ 251,358	$ -	$ -	$ -	$ -	$ 251,358	$ -	$ 251,358	$ 251,358	100%
82123	Storage Lease	$ 13,527	$ -	$ -	$ -	$ -	$ 13,527	$ -	$ 13,527	$ 13,400	101%
	Subtotal	**$ 269,807**	**$ -**	**$ 3,205**	**$ -**	**$ -**	**$ 273,012**	**$ 16,361**	**$ 289,373**	**$ 298,358**	97%
	Training & Education										
85411	Field Staff Orientation	$ -	$ -	$ 22,775	$ -	$ 400	$ 23,175	$ 58,379	$ 81,554	$ 81,300	100%
85421	Management Training	$ 19,422	$ -	$ -	$ -	$ -	$ 19,422	$ -	$ 19,422	$ 20,000	97%
85422	Skill Training	$ -	$ 9,733	$ 2,095	$ -	$ -	$ 11,828	$ -	$ 11,828	$ 63,100	19%
81811	Journals & Memberships	$ 2,544	$ -	$ -	$ -	$ -	$ 2,544	$ -	$ 2,544	$ 3,000	85%
81812	Professional Journals	$ 16,535	$ -	$ -	$ -	$ -	$ 16,535	$ -	$ 16,535	$ 19,000	87%
	Subtotal	**$ 38,500**	**$ 9,733**	**$ 24,870**	**$ -**	**$ 400**	**$ 73,504**	**$ 58,379**	**$ 131,883**	**$ 186,400**	71%
	Fees										
85911	Audit	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 8,000	0%
85921	Bank Charges	$ 6,980	$ -	$ -	$ -	$ -	$ 6,980	$ -	$ 6,980	$ 8,000	87%
85211	Vehicle Insurance	$ 2,806	$ -	$ 6,327	$ -	$ -	$ 9,133	$ -	$ 9,133	$ 4,250	215%
85212	General Liability Insurance	$ 7,283	$ -	$ -	$ -	$ -	$ 7,283	$ -	$ 7,283	$ 5,500	132%
85213	Bonding	$ 494	$ -	$ -	$ -	$ -	$ 494	$ -	$ 494	$ 500	99%
85214	Customs	$ 281	$ -	$ 32	$ -	$ -	$ 313	$ -	$ 313	$ 1,500	21%
75312	Misc. Consultation	$ 4,530	$ -	$ -	$ -	$ -	$ 4,530	$ -	$ 4,530	$ 43,150	10%
85941	Legal Fees	$ 2,338	$ -	$ -	$ -	$ -	$ 2,338	$ -	$ 2,338	$ 10,000	23%
85932	Vessel Revenue Share	$ -	$ -	$ -	$ -	$ -	$ -	$ 411,133	$ 411,133	$ 410,664	100%
81155	Agency Revenue Share	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 28,747	0%
85933	Running Bonus	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	n/a
67111	Realized Gain/Loss	$ 4,510	$ -	$ -	$ -	$ -	$ 4,510	$ -	$ 4,510	$ -	n/a
85951	Dockside Monitoring	$ -	$ -	$ -	$ -	$ -	$ -	$ 5,333	$ 5,333	$ 4,014	133%
	Subtotal	**$ 29,222**	**$ -**	**$ 6,359**	**$ -**	**$ -**	**$ 35,581**	**$ 416,466**	**$ 452,047**	**$ 524,325**	86%
	Grand Total	**$ 506,169**	**$ 26,007**	**$ 77,833**	**$ -**	**$ 138,817**	**$ 748,826**	**$ 3,639,842**	**$ 4,388,669**	**$ 5,064,690**	87%
	Budget	$ 595,974	$ 73,195	$ 127,453	$ -	$ 346,252	$ 1,142,874	$ 3,921,817			
	% of Budget	85%	36%	61%	n/a	40%	66%	93%			

TABLE 7-4. Supplies & Equipment

Period	[12-2017]
% of Year	100%

	Item	10 Administration	20 Scientific	30 Statistics	40 Field Exp.	60 Other Research	Sub-Totals	50 SSA Surveys	Operations Actuals	Budget	% of Budget
	Equipment										
82811	Computer Equipment - Replace	$ -	$ 5,825	$ -	$ -	$ -	$ 5,825	$ -	$ 5,825	$ 5,000	117%
82812	Computer Equipment - Long Term	$ -	$ 7,872	$ -	$ -	$ -	$ 7,872	$ -	$ 7,872	$ 2,900	271%
82831	Field Equipment - Capital	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 14,000	0%
82821	Field Equipment - non-Capital	$ -	$ -	$ -	$ -	$ 1,407	$ 1,407	$ -	$ 1,407	$ 2,270	62%
82832	Scientific Equipment - Capital	$ -	$ 23,353	$ -	$ -	$ -	$ 23,353	$ -	$ 23,353	$ 84,600	28%
82822	Scientific Equipment - non-Capital	$ -	$ 309	$ -	$ -	$ -	$ 309	$ -	$ 309	$ 2,250	14%
82833	Office Equipment - Capital	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	n/a
82823	Office Equipment - non-Capital	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 5,000	0%
	SubTotal	**$ -**	**$ 37,359**	**$ -**	**$ -**	**$ 1,407**	**$ 38,766**	**$ -**	**$ 38,766**	**$ 116,020**	33%
	Supplies										
81121	Supplies	$ 20,765	$ 2,963	$ 1,883	$ -	$ 319,071	$ 344,681	$ 52,763	$ 397,444	$ 280,493	142%
81122	Tag Recoveries	$ -	$ -	$ -	$ -	$ 3,731	$ 3,731	$ -	$ 3,731	$ 8,800	42%
81151	Bait	$ -	$ -	$ -	$ -	$ -	$ -	$ 565,560	$ 565,560	$ 580,630	97%
81152	Ice	$ -	$ -	$ -	$ -	$ -	$ -	$ 11,962	$ 11,962	$ 11,680	102%
81153	Gear Replacement	$ -	$ -	$ -	$ -	$ -	$ -	$ 65,197	$ 65,197	$ 67,275	97%
81154	Misc. Expenses	$ -	$ -	$ -	$ -	$ -	$ -	$ 8,337	$ 8,337	$ 32,842	25%
70531	Gear Allowance	$ 1,284	$ 263	$ 1,529	$ -	$ -	$ 3,076	$ 9,986	$ 13,062	$ 14,775	88%
	SubTotal	**$ 22,049**	**$ 3,226**	**$ 3,411**	**$ -**	**$ 322,802**	**$ 351,488**	**$ 713,805**	**$ 1,065,293**	**$ 996,495**	107%
	Grand Total	**$ 22,049**	**$ 40,585**	**$ 3,411**	**$ -**	**$ 324,209**	**$ 390,254**	**$ 713,805**	**$ 1,104,059**	**$ 1,112,515**	99%
	Budget	$ 25,300	$ 105,250	$ 11,950	$ -	$ 237,363	$ 379,863	$ 732,652			
	% of Budget	87%	39%	29%	n/a	137%	103%	97%			

TABLE 8-1. Catch Effort Program

Catch Effort Program

Dept. 30		51-53	1	64	61-63	2	82	71-92	3	81			
		WA/OR/CA			Canada			Alaska					
		Ports	General	Total	Ports	General	Total	Ports	General	Total	Grand Total	FY2017 Budget	% of Budget
	Salaries and Benefits												
72221	Part-Time Salary	$ -	$ -	$ -	$ 63,329	$ -	$ 63,329	$ 272,321	$ -	$ 272,321	$ 335,651	$ 333,976	101%
72222	AK Cola	$ -	$ -	$ -	$ -	$ -	$ -	$ 17,755	$ -	$ 17,755	$ 17,755	$ 17,221	103%
72241	Hourly	$ 969	$ -	$ 969	$ -	$ -	$ -	$ 296	$ -	$ 296	$ 1,265	$ 500	253%
72252	Port Duty	$ -	$ -	$ -	$ 128	$ -	$ 128	$ 1,224	$ -	$ 1,224	$ 1,352	$ 13,400	10%
7241x	Medical	$ -	$ -	$ -	$ 10,057	$ -	$ 10,057	$ 33,002	$ -	$ 33,002	$ 43,059	$ 55,284	78%
72431	Life Insurance	$ -	$ -	$ -	$ 367	$ -	$ 367	$ 1,690	$ -	$ 1,690	$ 2,057	$ 2,126	97%
72432	AD&D	$ -	$ -	$ -	$ 43	$ -	$ 43	$ 191	$ -	$ 191	$ 234	$ 228	103%
72441	BC Workers Comp.	$ -	$ -	$ -	$ -	$ -	$ -	$ 257	$ -	$ 257	$ 257	$ 179	143%
72433	Industrial Insurance	$ -	$ -	$ -	$ 536	$ -	$ 536	$ 1,902	$ -	$ 1,902	$ 2,438	$ 2,448	100%
72261	Performance Bonus	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,500	0%
72453	Housing Allowance	$ -	$ -	$ -	$ -	$ -	$ -	$ 4,000	$ -	$ 4,000	$ 4,000	$ 4,500	89%
72511	Social Security	$ -	$ -	$ -	$ -	$ -	$ -	$ 20,805	$ -	$ 20,805	$ 20,805	$ 21,515	97%
70521	Hiring Expenses	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 47	$ 47	$ 47	$ 9,000	1%
	Subtotal - Salary and Benefits	$ 969	$ -	$ 969	$ 74,460	$ -	$ 74,460	$ 353,443	$ 47	$ 353,490	$ 428,919	$ 461,876	93%
	Programs												
83111	General Travel - Staff	$ 1,591	$ -	$ 1,591	$ -	$ -	$ -	$ 4,539	$ -	$ 4,539	$ 6,131	$ 13,100	47%
83112	On Job Training Travel	$ 404	$ -	$ 404	$ -	$ 8,364	$ 8,364	$ -	$ 8,998	$ 8,998	$ 17,765	$ 21,500	83%
83113	Follow-up Travel	$ -	$ -	$ -	$ -	$ 1,000	$ 1,000	$ -	$ 7,811	$ 7,811	$ 8,811	$ 11,000	80%
81312	Long Distance	$ -	$ -	$ -	$ -	$ 89	$ 89	$ -	$ 275	$ 275	$ 363	$ 545	67%
81313	Comm Allow - Port	$ -	$ -	$ -	$ 1,609	$ -	$ 1,609	$ 585	$ -	$ 585	$ 2,194	$ 7,040	31%
81411	USPS Postage	$ -	$ 67	$ 67	$ -	$ 369	$ 369	$ -	$ 173	$ 173	$ 609	$ 3,100	20%
81412	Express Mail	$ -	$ -	$ -	$ -	$ 224	$ 224	$ -	$ 749	$ 749	$ 973	$ 2,250	43%
81712	Logbooks	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 3,250	0%
	Subtotal - Programs	$ 1,995	$ 67	$ 2,062	$ 1,609	$ 10,045	$ 11,654	$ 5,124	$ 18,006	$ 23,130	$ 36,846	$ 61,785	60%
	Administration												
82611	Leased Vehicle Fees	$ -	$ -	$ -	$ 714	$ -	$ 714	$ 13,220	$ -	$ 13,220	$ 13,933	$ 21,003	66%
70511	Vehicle Mileage Reimbursed	$ -	$ -	$ -	$ 3,616	$ -	$ 3,616	$ 5,236	$ -	$ 5,236	$ 8,852	$ 11,850	75%
85611	Software Leases	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 2,738	$ 2,738	$ 2,738	$ 2,800	98%
85931	Vendor Contracts	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 17,875	$ 17,875	$ 17,875	$ 47,400	38%
82121	Field Office Rental	$ -	$ -	$ -	$ -	$ -	$ -	$ 3,205	$ -	$ 3,205	$ 3,205	$ 8,100	40%
85411	Field Staff Orientation	$ -	$ -	$ -	$ -	$ 4,594	$ 4,594	$ -	$ 18,181	$ 18,181	$ 22,775	$ 25,300	90%
85422	Skill Training	$ -	$ -	$ -	$ -	$ 2,095	$ 2,095	$ -	$ -	$ -	$ 2,095	$ 11,000	19%
85211	Vehicle Insurance	$ -	$ -	$ -	$ -	$ -	$ -	$ 6,327	$ -	$ 6,327	$ 6,327	$ 85	7444%
85214	Customs	$ -	$ -	$ -	$ -	$ 32	$ 32	$ -	$ -	$ -	$ 32	$ -	n/a
	Subtotal - Administration	$ -	$ -	$ -	$ 4,330	$ 6,721	$ 11,051	$ 27,988	$ 38,794	$ 66,783	$ 77,833	$ 127,538	61%
	Supplies and Equipment												
81121	Supplies	$ -	$ 89	$ 89	$ -	$ 39	$ 39	$ -	$ 1,755	$ 1,755	$ 1,883	$ 9,400	20%
70531	Gear Allowance	$ -	$ -	$ -	$ 231	$ -	$ 231	$ 1,297	$ -	$ 1,297	$ 1,529	$ 2,550	60%
	Subtotal - Supplies and Equipment	$ -	$ 89	$ 89	$ 231	$ 39	$ 271	$ 1,297	$ 1,755	$ 3,052	$ 3,411	$ 11,950	29%
99999	**Prior Fiscal Year Expense**	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	n/a
	Catch Effort Program Totals	$ 2,964	$ 155	$ 3,120	$ 80,630	$ 16,805	$ 97,435	$ 387,853	$ 58,602	$ 446,455	$ 547,010	$ 663,149	82%

TABLE 8-2. Statistics Ports

Catch Effort Program - by ports

	Port ID	61	71	72	73	81	82	83	89	91	92	
	U.S Ports	Bellingham	Petersburg	Sitka	Juneau	Seward	Homer	Kodiak	Sandpoint	Dutch Harbor	St. Paul	AK Total
72221	Part-Time Salary	$ 25,039	$ 36,608	$ 34,473	$ 35,452	$ 36,113	$ 38,670	$ 31,397	$ -	$ 27,300	$ 7,269	$ 272,321
72222	AK Cola	$ -	$ 2,628	$ 2,475	$ 2,545	$ 2,593	$ 2,777	$ 2,254	$ -	$ 1,960	$ 522	$ 17,755
72241	Hourly	$ -	$ -	$ -	$ 296	$ -	$ -	$ -	$ -	$ -	$ -	$ 296
72252	Port Duty	$ -	$ 204	$ 204	$ 204	$ 204	$ 204	$ 204	$ -	$ -	$ -	$ 1,224
	Medical	$ 3,354	$ 4,421	$ 4,038	$ 4,427	$ 3,838	$ 4,201	$ 4,885	$ -	$ 3,838	$ 528	$ 33,002
72431	Life Insurance	$ 90	$ 237	$ 223	$ 223	$ 235	$ 243	$ 217	$ -	$ 201	$ 21	$ 1,690
72432	AD&D	$ 18	$ 25	$ 24	$ 24	$ 25	$ 26	$ 23	$ -	$ 19	$ 7	$ 191
72441	BC Workers Comp.	$ -	$ -	$ -	$ 257	$ -	$ -	$ -	$ -	$ -	$ -	$ 257
72433	Industrial Insurance	$ 179	$ 238	$ 238	$ 238	$ 238	$ 238	$ 238	$ -	$ 238	$ 58	$ 1,902
72453	Housing Allowance	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 4,000	$ -	$ 4,000
72511	Social Security	$ 1,913	$ 2,797	$ 2,634	$ 2,709	$ 2,759	$ 2,954	$ 2,399	$ -	$ 2,086	$ 555	$ 20,805
	Salary and Benefits	**$ 30,593**	**$ 47,158**	**$ 44,309**	**$ 46,375**	**$ 46,005**	**$ 49,313**	**$ 41,617**	**$ -**	**$ 39,641**	**$ 8,432**	$ 353,443
83111	General Travel - Staff	$ 129	$ -	$ -	$ -	$ 1,613	$ -	$ -	$ -	$ -	$ 2,798	$ 4,539
83112	Travel - Training	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
81313	Comm Allow - Port	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 585	$ -	$ 585
82611	Leased Vehicle Fees	$ 802	$ -	$ -	$ 3,648	$ -	$ -	$ 4,465	$ -	$ 4,305	$ -	$ 13,220
70511	Vehicle Mileage Reimbursed	$ 262	$ 489	$ 1,885	$ 31	$ -	$ 2,403	$ -	$ -	$ 167	$ -	$ 5,236
82121	Field Office Rental	$ -	$ -	$ 2,380	$ -	$ -	$ 825	$ -	$ -	$ -	$ -	$ 3,205
85211	Vehicle Insurance	$ 1,545	$ -	$ -	$ 1,480	$ -	$ -	$ 1,651	$ -	$ 1,651	$ -	$ 6,327
70531	Gear Allowance	$ 141	$ 81	$ 166	$ 97	$ 138	$ 187	$ 34	$ -	$ 252	$ 200	$ 1,297
	Total	**$ 33,471**	**$ 47,728**	**$ 48,740**	**$ 51,631**	**$ 47,755**	**$ 52,729**	**$ 47,768**	**$ -**	**$ 46,601**	**$ 11,431**	**$ 387,853**

	Port ID	00	51	52	53		61	62	63					
		Aging	Tribal (2A)	Newport (2A)	Washington (2A)	Area 2A Total	Vancouver	Port Hardy	Prince Rupert	Cdn Total	US Total	Grand Total	Budget	% of Actuals
72221	Part-Time Salary	-	-	-	-	-	$ 8,346	$ 24,781	$ 30,202	$ 63,329	$ 272,321	$ 335,651	$ 333,976	101%
72222	AK Cola	-	-	-	-	-	$ -	$ -	$ -	$ -	$ 17,755	$ 17,755	$ 17,221	103%
72241	Hourly	-	-	969	-	969	$ -	$ -	$ -	$ -	$ 1,265	$ 1,265	$ 500	253%
72252	Port Duty	-	-	-	-	-	$ -	$ 64	$ 64	$ 128	$ 1,224	$ 1,352	$ 13,400	10%
	Medical	-	-	-	-	-	$ 1,113	$ 4,472	$ 4,472	$ 10,057	$ 33,002	$ 43,059	$ 55,284	78%
72431	Life Insurance	-	-	-	-	-	$ 54	$ 150	$ 163	$ 367	$ 1,690	$ 2,057	$ 2,126	97%
72432	AD&D	-	-	-	-	-	$ 7	$ 15	$ 21	$ 43	$ 191	$ 234	$ 228	103%
72441	BC Workers Comp.	-	-	-	-	-	$ -	$ -	$ -	$ -	$ 257	$ 257	$ 179	144%
72433	Industrial Insurance	-	-	-	-	-	$ 60	$ 238	$ 238	$ 536	$ 1,902	$ 2,438	$ 2,448	100%
72453	Housing Allowance	-	-	-	-	-	$ -	$ -	$ -	$ -	$ 4,000	$ 4,000	$ 4,500	89%
72511	Social Security	-	-	-	-	-	$ -	$ -	$ -	$ -	$ 20,805	$ 20,805	$ 21,515	97%
	Salary and Benefits	**-**	**-**	**969**	**-**	**969**	**$ 9,580**	**$ 29,720**	**$ 35,160**	**$ 74,460**	**$ 354,413**	**$ 428,872**	**$ 451,376**	**95%**
83111	General Travel - Staff	-	609	983	-	1,591	$ -	$ -	$ -	$ -	$ 6,131	$ 6,131	$ 10,100	61%
83112	Travel - Training	-	404	-	-	404	$ -	$ -	$ -	$ -	$ 404	$ 404	$ 1,500	27%
81313	Comm Allow - Port	-	-	-	-	-	$ -	$ 949	$ 660	$ 1,609	$ 585	$ 2,194	$ 7,040	31%
82611	Leased Vehicle Fees	-	-	-	-	-	$ 714	$ -	$ -	$ 714	$ 13,220	$ 13,933	$ 21,003	66%
70511	Vehicle Mileage Reimbursed	-	165	435	124	724	$ 102	$ 292	$ 3,222	$ 3,616	$ 5,960	$ 9,576	$ 11,850	81%
82121	Field Office Rental	-	-	-	-	-	$ -	$ -	$ -	$ -	$ 3,205	$ 3,205	$ 8,100	40%
85211	Vehicle Insurance	-	-	-	-	-	$ -	$ -	$ -	$ -	$ 6,327	$ 6,327	$ -	n/a
70531	Gear Allowance	-	-	-	-	-	$ -	$ 194	$ 38	$ 231	$ 1,297	$ 1,529	$ 2,550	60%
	Total	**-**	**1,177**	**2,387**	**124**	**3,688**	**$ 10,395**	**$ 31,155**	**$ 39,080**	**$ 80,630**	**$ 387,853**	**$ 468,483**	$ 513,519	91%

* Note: Aging included in Grand total but not in US or CDN totals

TABLE 9-1. FISS Summary

SSA Program

F.I.S.S. Program Totals

	Actual	Budget	% of Budget
Total Pounds Landed	573,420	594,466	96%
Average Net Price	$6.47	$6.38	101%
Net Halibut Proceeds	$3,707,822	$3,795,257	98%
WPUE (Landed Fish)	73	75	98%
Net Bycatch Proceeds	$53,331	$57,494	93%
Vessel Expenses	($4,763,986)	($5,086,518)	94%
Office Expenses	($283,783)	($345,111)	82%
Trawl Survey	($58,818)	($56,706)	104%
Prior Year	($460)	$0	n/a
Net Proceeds	**($1,345,894)**	**($1,635,583)**	82%

Period	[12-2017]
% of Year	100%

Reg. Area Totals

	2A All Regions	2B All Regions	2C All Regions	3A All Regions	3B All Regions	4A All Regions	4B All Regions	4D 4D Edge	Totals
Net Halibut proceeds	$ 127,758	$ 539,854	$ 839,380	$ 1,257,754	$ 436,737	$ 173,007	$ 231,683	$ 101,649	$ 3,707,822
Bycatch proceeds	$ 1,067	$ 14,358	$ 13,947	$ 11,273	$ 8,621	$ 4,065	$ -	$ -	$ 53,331
Vessel expenses	$ 467,000	$ 422,989	$ 352,160	$ 914,916	$ 634,176	$ 336,504	$ 747,760	$ 207,796	$ 4,083,301
Net Per Reg Area	**($338,175)**	**$131,223**	**$501,167**	**$354,111**	**($188,818)**	**($159,432)**	**($516,077)**	**($106,147)**	**($322,148)**
Pounds Halibut Landed	19,666	64,729	123,707	197,901	71,762	31,470	44,233	19,952	573,420
Average Price	$ 6.50	$ 8.34	$ 6.79	$ 6.36	$ 6.09	$ 5.50	$ 5.24	$ 5.09	$ 6.47

Vessel Expenses

	2A All Regions	2B All Regions	2C All Regions	3A All Regions	3B All Regions	4A All Regions	4B All Regions	4D 4D Edge	Totals
% Completed	100%	100%	100%	100%	100%	100%	100%	100%	100%
Contract	$ 421,600	$ 270,632	$ 209,000	$ 649,553	$ 486,000	$ 264,400	$ 628,777	$ 164,900	$ 3,094,861
Revenue Share	$ 1,086	$ 68,305	$ 102,517	$ 133,294	$ 52,477	$ 21,366	$ 21,922	$ 10,165	$ 411,133
Running bonus	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Dockside Monitoring	$ -	$ 3,530	$ 1,803	$ -	$ -	$ -	$ -	$ -	$ 5,333
Bait	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Ice	$ 959	$ 3,944	$ 1,722	$ 1,967	$ 1,023	$ 800	$ 662	$ 886	$ 11,962
Gear Expenses	$ 10,523	$ 5,656	$ 5,694	$ 14,939	$ 8,163	$ 5,398	$ 11,252	$ 3,572	$ 65,197
Staff Salaries	$ 31,663	$ 71,553	$ 27,772	$ 107,720	$ 79,639	$ 40,778	$ 69,564	$ 23,449	$ 452,137
Sea Duty Pay	$ -	$ -	$ 4,291	$ -	$ -	$ -	$ 4,134	$ -	$ 8,426
Medical	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
BC Worker's Comp	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Payroll Taxes	$ 2,422	$ 821	$ 1,593	$ 7,417	$ 5,483	$ 3,119	$ 5,322	$ 1,794	$ 27,971
Vessel P&I	$ -	$ 555	$ 803	$ 2,487	$ 5,665	$ 2,528	$ 9,380	$ 5,711	$ 27,130
Travel Expenses	$ 1,178	$ 3,234	$ 5,646	$ 14,355	$ 15,428	$ 9,290	$ 9,739	$ 3,868	$ 62,739
Customs	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Misc. Expenses	$ 402	$ 3,343	$ 1,630	$ 796	$ 120	$ 2,046	$ -	$ -	$ 8,337
Gear Allowance	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total Vessel Expenses	$469,833	$431,574	$362,472	$932,527	$653,999	$349,725	$760,752	$214,344	$ 4,175,226

Office Expenses

	Actuals	Budget	Percent
Hiring Expenses	$ 1,437	$ 2,000	72%
Gear Assistant	$ 5,435	$ 5,620	97%
Training - personnel costs	$ 7,500	$ 7,200	104%
Temporary Staff benefits	$ 1,062	$ 1,025	104%
Bonus Program	$ -	$ 1,500	0%
Worker's Comp	$ -	$ -	n/a
Payroll taxes	$ 908	$ 900	101%
Survey Supplies	$ 52,752	$ 49,700	106%
Agency bycatch share	$ -	$ 28,747	0%
Communications	$ 2,591	$ 4,300	60%
Postage	$ 645	$ -	n/a
Express Shipping	$ 191	$ 2,500	8%
Shipping	$ 79,749	$ 97,496	82%
Bait Storage	$ 16,361	$ 20,000	82%
Equipment Maintenance	$ 33,775	$ 42,000	80%
Contract - Profiler Data	$ 20,000	$ 20,800	96%
Survey Equipment	$ -	$ 1,400	0%
Staff Travel	$ 2,999	$ 3,842	78%
Sea Sampler train/debrief	$ 58,379	$ 56,000	104%
Total Office Expenses	$ 283,783	$ 345,030	82%

Unallocated Expenses

85521	Bait	$ 565,560
72433	Accident Indem.	$ 3,229
70531	Gear Allowance	$ 9,986
7241x	Medical	$ 16,359

NMFS Trawl Survey (P604)

	Category	Actuals	Budget	Percent
72231	Temporary Salary	$ 56,585	$ 46,377	122%
72411	Medical Insurance	$ -	$ 750	0%
72433	ndustrial Insurance	$ -	$ 143	0%
72511	Payroll Tax	$ -	$ 3,548	0%
	Personnel Total	**$56,585**	**$ 50,818**	111%
83111	Travel	$ 2,222	$ 3,000	74%
81312	Communications	$ -	$ 400	0%
81412	Express Mail	$ -	$ -	n/a
	Programs Total	**$2,222**	**$ 3,400**	65%
85411	Staff Orientation	$ -	$ -	n/a
	Administration	**$0**	**$ -**	n/a
81121	Field Supplies	$ 11	$ 300	4%
70531	Gear Allowance	$ -	$ 900	0%
	Supplies Total	**$11**	**$ 1,200**	1%
	Trawl Survey Total	**$58,818**	**$ 55,418**	106%

Detailed Expenses

	Actuals	Fiscal Year Budget: Budget	Percent
Personnel			
Salaries			
Sea Samplers	$ 516,222	$523,238	99%
Sea Duty	$ 8,426	$0	n/a
Office Staff	$ 5,435	$ 5,620	97%
On-Call Duty Pay	$ -	$ -	n/a
Benefits			
Performance Bonus	$ -	$ 1,500	0%
Temp. Staff Benefits	$ 1,062	$ 1,025	104%
Field Staff Benefits	$ 9,986	$ 14,635	68%
Industrial Insurance	$ 3,229	$ 143	2258%
BC Workers Comp	$ -	$ -	n/a
Payroll Taxes			
Sea Samplers	$ 27,971	$ 39,477	71%
Office Staff	$ 908	$ 980	93%
Other			
Hiring Expenses	$ 1,437	$ 2,000	72%
Vessel P & I	$ 27,130	$ 39,704	68%
Total	**$ 601,804**	**$ 628,323**	**96%**
Programs			
Travel			
Travel	$ 67,960	$ 100,847	67%
Communications			
Phone Communications	$ 2,591	$ 4,700	55%
Communications Allowance	$ -	$ -	n/a
Postage	$ 645	$ -	n/a
Express Shipping	$ 191	$ 2,500	8%
Shipping	$ 79,749	$ 97,496	82%
Total	**$ 151,135**	**$ 205,543**	**74%**
Administration			
Rentals & Contracts			
Lump Sum (vessels)	$ 3,094,861	$ 3,336,592	93%
Contracts	$ 20,000	$ 20,800	96%
Facility Rentals			
Bait Storage	$ 16,361	$ 20,000	82%
Training			
Staff Orientation	$ 58,379	$ 56,000	104%
Agency Bycatch Share	$ -	$ 28,747	0%
Customs	$ -	$ -	n/a
Equipment Maintenance	$ 33,775	$ 42,000	80%
Dockside Monitoring	$ 5,333	$ 4,014	133%
Total	**$ 3,639,842**	**$ 3,921,817**	**93%**
Survey Bait and Supplies			
Supplies			
Survey Equipment	$ -	$ 1,400	0%
Survey Gear	$ 52,763	$ 50,000	106%
Survey Bait	$ 565,560	$ 559,330	101%
Ice	$ 11,962	$ 11,680	102%
Gear Replacement	$ 65,197	$ 67,275	97%
Gear Allowance	$ 9,986	$ 10,125	99%
Misc. Expenses	$ 8,337	$ 32,842	25%
Total	**$ 713,805**	**$ 732,652**	**97%**
SSA Survey Total	**$ 5,106,587**	**$ 5,488,335**	**93%**

Prior FY	$ 460	$ -	
Survey Total	$ 5,107,047	$ 5,488,335	93%

9999

TABLE 10-1. Other Research (1)

		Department		60			Period [12-2017]		
							% of Year 100%		
		1	6`	1	1	1			
	On-going Projects	621	621	642	650	650	661	670	
Object	Item	621-15-00 Genetic Sex ID - Field	621-16-00 Genetic Sex ID - Genome	642-00-00 ADEC/EPA Contaminants	650-18-00 Archival Tag - Geomag	650-20-00 Archival Tagging - 4D	661-11-00 Ichthyophonus Prevalance	670-11-00 NMFS Trawl Tagging	On-going Projects Sub-Total
	Personnel								
	Personnel Subtotal	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
	Programs								$ -
81412	Express Mail	$ 64	$ 34	$ 33	$ -	$ -	$ 85	$ 33	$ 249
81413	Heavy Shipping	$ 137	$ -	$ -	$ -	$ -	$ -	$ -	$ 137
	Communications	$ 202	$ 34	$ 33	$ -	$ -	$ 85	$ 33	$ 386
	Programs Subtotal	**$ 202**	**$ 34**	**$ 33**	**$ -**	**$ -**	**$ 85**	**$ 33**	**$ 386**
	Administration								$ -
85931	Vendor Contracts	$ -	$ 90,199	$ -	$ -	$ -	$ 1,267	$ -	$ 91,466
	Contracts & Leases	$ -	$ 90,199	$ -	$ -	$ -	$ 1,267	$ -	$ 91,466
	Administration Subtotal	**$ -**	**$ 90,199**	**$ -**	**$ -**	**$ -**	**$ 1,267**	**$ -**	**$ 91,466**
	Supplies & Equipment								$ -
81121	Supplies	$ 18,185	$ -	$ 2,026	$ -	$ 1,680	$ 1,124	$ 5,319	$ 28,333
81122	Tag Recoveries	$ -	$ -	$ -	$ 1,100	$ -	$ -	$ 731	$ 1,831
	Supplies	$ 18,185	$ -	$ 2,026	$ 1,100	$ 1,680	$ 1,124	$ 6,050	**$ 30,164**
	Supplies & Equipment Subtotal	**$ 18,185**	**$ -**	**$ 2,026**	**$ 1,100**	**$ 1,680**	**$ 1,124**	**$ 6,050**	**$ 30,164**
99999	**Prior FY**	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ -**
	Total	**$ 18,386**	**$ 90,233**	**$ 2,059**	**$ 1,100**	**$ 1,680**	**$ 2,476**	**$ 6,083**	**$ 122,017**
	Income								
	Total Income	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
	Budget	$ 18,120	$ 146,107	$ 5,773	$ 2,800	$ 5,500	$ 8,055	$ 12,000	$ 198,355
	Percent	101%	62%	36%	39%	31%	31%	51%	62%

TABLE 10-2. Other Research (2)

Department	60	Period	[12-2017]
		% of Year	**100%**

On-going Projects

Item	**On-going Projects Total**	672 672.12 Condition Factor	672 672.13 DMR Classification	673 673.13 Genome Sequencing	674 674.11 Reproductive Cycle	650 650.21 Area 4B PAT Tags	673 673.14 Growth Markers	675.11 Tail Patterns	**Projects Sub-Total**	**Grand Total**
Personnel										
Temporary	**$ -**	$ -	$ -	$ -	$ 4,076	$ -	$ -	$ -	$ 4,076	**$ 4,076**
Hourly	**$ -**	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ -**
Salary Totals	**$ -**	$ -	$ -	$ -	$ 4,076	$ -	$ -	$ -	$ 4,076	**$ 4,076**
Personnel Subtotal	**$ -**	**$ -**	**$ -**	**$ -**	**$ 4,076**	**$ -**	**$ -**	**$ -**	**$ 4,076**	**$ 4,076**
									$ -	
Programs									$ -	
General Travel - Staff	**$ -**	$ -	$ -	$ -	$ 7,625	$ 3,175	$ -	$ -	$ 10,800	**$ 10,800**
Travel	**$ -**	$ -	$ -	$ -	$ 7,625	$ 3,175	$ -	$ -	$ 10,800	**$ 10,800**
Postage	**$ -**	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ -**
Express Mail	**$ 249**	$ 78	$ -	$ -	$ -	$ 1,638	$ -	$ -	$ 1,716	**$ 1,964**
Heavy Shipping	**$ 137**	$ -	$ -	$ -	$ -	$ 393	$ -	$ -	$ 393	**$ 530**
Communications	**$ 386**	$ 78	$ -	$ -	$ -	$ 2,031	$ -	$ -	**$ 2,109**	**$ 2,495**
External Journals	**$ -**	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ -**
Publications	**$ -**	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ -**
Programs Subtotal	**$ 386**	**$ 78**	**$ -**	**$ -**	**$ 7,625**	**$ 5,206**	**$ -**	**$ -**	**$ 12,908**	**$ 13,294**
Administration										
Vendor Contracts	**$ 91,466**	$ 2,310	$ -	$ 6,558	$ 12,500	$ 1,026	$ 24,558	$ -	$ 46,951	**$ 138,417**
Contracts & Leases	**$ 91,466**	$ 2,310	$ -	$ 6,558	$ 12,500	$ 1,026	$ 24,558	$ -	$ 46,951	**$ 138,417**
Field Staff Orientation	**$ -**	$ -	$ -	$ -	$ 400	$ -	$ -	$ -	$ 400	**$ 400**
Training & Education	**$ -**	$ -	$ -	$ -	$ 400	$ -	$ -	$ -	$ 400	**$ 400**
Administration Subtotal	**$ 91,466**	**$ 2,310**	**$ -**	**$ 6,558**	**$ 12,900**	**$ 1,026**	**$ 24,558**	**$ -**	**$ 47,351**	**$ 138,817**
									$ -	
Supplies & Equipment									$ -	
Field Equipment - non-Capital	**$ -**	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,407	$ 1,407	**$ 1,407**
Scientific Equipment - non-Capital	**$ -**	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ -**
Equipment	**$ -**	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,407	$ 1,407	**$ 1,407**
Supplies	**$ 28,333**	$ 13,195	$ 161,360	$ 1,040	$ 1,830	$ 113,142	$ 102.83	$ 67	$ 290,738	**$ 319,071**
Tag Recoveries	**$ 1,831**	$ -	$ -	$ -	$ -	$ 1,900	$ -	$ -	$ 1,900	**$ 3,731**
Bait	**$ -**	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ -**
Supplies	**$ 30,164**	$ 13,195	$ 161,360	$ 1,040	$ 1,830	$ 115,042	$ 103	$ 67	**$ 292,638**	**$ 322,802**
Supplies & Equipment Subtotal	**$ 30,164**	**$ 13,195**	**$ 161,360**	**$ 1,040**	**$ 1,830**	**$ 115,042**	**$ 103**	**$ 1,474**	**$ 294,045**	**$ 324,209**
Prior FY	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
Total	**$ 122,017**	**$ 15,583**	**$ 161,360**	**$ 7,598**	**$ 26,431**	**$ 121,274**	**$ 24,660**	**$ 1,474**	**$ 358,380**	**$ 480,397**
Income										
Other Federal Grant	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -		**$ -**
Total Income	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	**$ -**	**$ -**
Budget	**$ 198,355**	$ 10,500	$ 152,000	$ 22,500	$ 91,098	$ 123,777	$ 25,900	$ 870	$ 426,645	**$ 625,000**
Percent	**62%**	148%	106%	34%	29%	98%	95%	169%	84%	**77%**

IPHC Employees by Program

Full-time equivalents (FTE's) and Employees

FY 2017

	Administration	Employees	Statistics & Surveys	Employees	Biological Research	Employees	Stock Assessment	Employees	**FTE's**	**Employees**
Full-time										
Office	9.33	*11*	9.01	*10*	8.00	*8*	3.00	*3*	**29.34**	***32***
Part-time										
Field Sampler			6.89	*11*					**6.89**	***11***
Sea Sampler			4.98	*28*					**4.98**	***28***
Interns					0.22	*1*			**0.22**	***1***
Office			0.15	1					**0.15**	***1***
FY2017 Totals	**9.33**	***11***	**21.03**	***50***	**8.22**	***9***	**3.00**	***3***	**41.58**	***73***
FY2016 Totals	10.18	*13*	20.61	*49*	6.97	*8*	2.74	*4*	40.50	*74*

Independent auditor's reports (FY2016 & FY2017)

PREPARED BY: IPHC SECRETARIAT (M. LARSEN; 19 JANUARY 2018)

PURPOSE

To provide the Commission with the Auditors Reports per Regulation 13 of the IPHC Financial Regulations (Sept. 2014). In addition, the report provides information on past audit costs and recommendation for appointment of the auditor for FY2018.

FY2016 AUDIT REPORT

Due to issues related to the updated financial accounting software and the initial implementation, the audit report was delayed while erroneous FY2016 data was updated (Appendix I). These issues have been resolved and the final data has been submitted to the auditor for review.

The report will be available for distribution and approval either in Session at the AM094, or immediately following for an intersessional decision.

The work of the financial software vendor during the upgrade and roll-out has been unacceptable and a new vendor will be selected this year.

FY2017 AUDIT REPORT

The 2017 audit is scheduled for February 2018 and the report will be available for distribution and approval intersessionally.

APPROVAL OF AUDITOR FOR FY2018 AUDIT AND REPORT

The IPHC Financial Regulations (Section 13.1) requires the IPHC Finance and Administration committee to annually approve the auditor for the subsequent audit and the Commission approve the auditor on a three-year term.

In 2015 at the IPHC Annual Meeting the Commission approved MKD CPAs PPLC (Seattle, WA) as the auditor on a three-year basis beginning with the audit of the FY2015 IPHC financial statements. The cost in FY2016 for the audit and submission of 941 was $6,950 USD.

RECOMMENDATIONS

That the Commission:

1) **NOTE** paper IPHC-2018-AM094-18 which provided the Independent Auditors Reports per Regulation 13 of the IPHC Financial Regulations (Sept. 2014). In addition, the report provides information on past audit costs and recommendation for appointment of the auditor for FY2018.
2) **APPROVE** Appendix I, which provides the Commission with the FY2016 audit report.

3) **ENDORSE** the re-appointment of MKD CPAs PPLC (Seattle, WA) as the IPHC auditor for the FY2018 audit of the IPHC financial statements.

Appendices

Appendix I: FY2016 Audit Report (pending)

Handling of the Annual Budget Carryover

PREPARED BY: IPHC SECRETARIAT (M. LARSEN & D. WILSON; 20 DECEMBER 2017)

PURPOSE

To remind the Commission of the endorsed methodology used for parsing the IPHC General and Supplemental Fund carryovers into two distinct accounts. These accounts will be used to independently track annual carryovers related to IPHC Core operations and to the IPHC Fisheries-Independent Setline Survey (FISS).

BACKGROUND

At the 93rd Session of the IPHC Interim Meeting (28-29 November 2017), the Commission reviewed the draft methodology to be used for parsing the IPHC General and Supplemental Fund carryovers into two distinct accounts, and agreed on the following course of action:

12.2 Handling of the annual budget carryover

86. The Commission NOTED paper IPHC-2017-IM093-16 which provided the methodology to be used for parsing the IPHC General and Supplemental Fund carryovers into two distinct accounts. These accounts will be used to independently track annual carryovers related to IPHC Core operations and to the fisheries-independent setline survey and other related setline survey program income and expenses.

87. The Commission AGREED that the IPHC Secretariat should revise the IPHC Financial Regulations (2014) to incorporate the new methodology, for the consideration of the Commission at its 94th Annual Meeting in January 2018.

88. The Commission AGREED that a goal of revenue neutrality for resource use (fish sales) or long-term revenue neutrality for the IPHC fishery-independent setline survey (FISS) data collections may not be necessary or feasible, particularly given periodic expansion programs into fiscally negatively geared areas. However, the general objective of aligning resource use to cost recovery for research activities should be maintained.

DISCUSSION

PARSING OF HISTORICAL CARRYOVERS: Methodology

The following steps were used to calculate the values and proportions for the 10-year carryover.

1. Parse income and expense for Core Operations vs. FISS for FY2006-2015 (10 years)
2. Determine related Income, Expense and Carryover for each year
3. Use 10-year data as a proxy to prorate carryover prior to FY2006 (~$3.8M).
4. Assign UW lease Accounts Receivable and Agency Bycatch Fund Accounts Payable separately.
5. Split carryover into two funds and assign at fiscal year-end (carryover assigned to dept. 10 and 50).

Recommendation/s

That the Commission:

1) **NOTE** paper IPHC-2018-AM094-19 which reminded the Commission of the endorsed methodology used for parsing the IPHC General and Supplemental Fund carryovers into two distinct accounts. These accounts will be used to independently track annual carryovers related to IPHC Core operations and to the IPHC Fisheries-Independent Setline Survey (FISS) respectively.

Additional Documentation / References

Nil.

Appendices

Nil.

Budget Estimate for FY2018, 2019, and tentatively for 2020

PREPARED BY: IPHC SECRETARIAT (M. LARSEN; 5 JANUARY 2018)

PURPOSE

1. To provide the Commission with the proposed current (FY2018) budget estimate (financial period: 1 October 2017 to 30 September 2018), as well as that for FY2019, and tentatively for 2020.

PROPOSED CONTRIBUTIONS TO THE AUTONOMOUS BUDGET IN FY2018: INCOME (US$)

2. For FY2018, the IPHC anticipates an increase in General/Supplemental income and an increase in expenses. The net result is a projected use of **$723K** in carryover funds to balance overall income and expenses (**Table 1**).
3. The FY2018 proposed budget is in line with trends seen in 2017. A number of items of interest regarding income are:
    a) **U.S. Contribution** – In FY2018, indications are that the U.S. Government will appropriate **$4.2M** to the IPHC (**Table 1**). As currently constructed, the U.S. contributions included funding for pension deficits and headquarters lease costs.
    b) **Canadian Contribution** – In FY2018, the Canadian government contribution is estimated at **$1,511,508 (USD)** (**Table 1**). The Canadian contributions includes **$1,453,704** for general contributions (as proposed at the AM093 meeting), as well as a separate amount of **$54,000** to cover pension deficit payments.
    c) **Fish Sales** – In FY2017 the IPHC saw prices decrease coast-wide. We anticipate a continued decline in the Pacific halibut market with price projections at 90% to 95% of 2017 prices in most areas (92% in aggregate). Total sales from the Fishery-Independent Setline Survey (FISS) program and other Research activities is estimated to be **$5.3M** (**Table 1**).

PROPOSED EXPENDITURES FOR THE FY2018 BUDGET (US$)

4. For FY2018 expenses are anticipated to be 17% higher than FY2017 actuals and 7% higher than the FY 2017 budget (**Table 4**).
5. Items of interest include:
    a) **Office Staff Payroll** – The IPHC currently has multiple unfilled positions undergoing hiring actions, evaluations or are proposed.
        a. Fisheries Statistics and Services Branch
            i. Setline Survey Program – Open position filled 3 January 2018 by Ms Collin Winkowski.
            ii. Port Sampling Program – Elimination of the Bellingham port sampler position. Further analysis is being undertaken to evaluate how to fill the duties within the Fisheries Statistics and Services Branch.

b. Administrative Services Branch – currently hiring for one position. Position was changed with the movement of a staff member to part-time in June 2017.

c. Biological and Ecosystems Sciences Branch

   i. Laboratory Technician – The two new external research grants require preparation and processing of biological samples and other laboratory duties. We are currently planning to hire for a two-year contract in January 2018. Position is funded partially (50%) by the two grants over the two year period.

d. Quantitative Sciences Branch

   i. Management Strategy Evaluations (MSE) programmer position – Anticipate filling a two-year contract position in March 2018. Position had been approved for FY2016 and FY2017 but unfilled due to task sequencing requirements within the MSE process.

   ii. Post-Doctoral position – The proposed budget includes a two-year commitment for a post-doctoral position. The position will be used to work on projects within the Quantitative Sciences Branch

b) **Personnel Benefits** – The IPHC realized higher than average increases in health care costs due to uncertainties with the Affordable Care Act and changes in IPHC demographics. Health care cost increases were 17% and an overall 21% increase with additional staff (see above) for 2018 (**Table 5-1 row7241x**). Other benefit and insurance costs are stable with the exception of the employer pension payments (both per employee and deficit payments) resulting from the triennial valuation of the plan. An additional benefit (Cancer Care) is included for office and port staff (**Table 5-1 row72434 - $15,003**).

c) **I.T Initiatives** – The IPHC is planning a series of additional information technology projects for FY2018 and beyond. These include:

   a. Website redesign: Phase II
   b. Managed IT services
   c. Data Warehouse Development
   d. Security Analysis

d) **Research Lab buildout** – The current lab space will require additional equipment and supplies for conducting a number of the proposed experiments - **$50,000** (**Table 8 row 82832– Scientific Equipment**). The budget for FY2017 was $84,600 and most of the purchases were deferred to FY2018 while the lab was under renovation.

e) **Setline survey Regulatory Area 2B/2C Expansion**– For 2018 the IPHC will expand the survey in Regulatory Areas 2B and 2C. The setline survey is integrated into the Regulatory Area 2B and 2C regions (**Table 6-1**).

f) **Performance Review** – Paper IPHC-2017-AM093-18 described the proposed performance review. FY2018 budget of $28,150 and FY2019 budget of $23,465– Total $51,615.

EXTRA-BUDGETARY FUNDS

6. The IPHC will continue to receive a grant for costs associated to the implementation of the extended sampling in Alaska and a contract for the collection of Sablefish logbooks from

NOAA-Fisheries (National Marine Fisheries Service). Included in FY2018 and FY2019 are two new grants to support the Discard Mortality and Growth Marker projects. The Commission will also receive funds from the Department of Fisheries and Oceans, Canada and Washington Department of Fish and Wildlife for additional work being conducted on the fisheries-independent surveys in 2018 (**Table 3**).

PERSONNEL MATTERS

7. The IPHC Secretariat is currently undertaking a review of numerous processes inherent to the operations. Two changes to the pay tables are proposed below.
   a. *Further extension of the General Series pay table steps*: The Commission approved the extension of the steps from 10 per grade to 13 in 2005 in recognition of the length of service for some staff. However, this has proved inadequate and the recommendation is to extend the table to 15 steps while maintaining the standard 3 years between steps once past step 8.
   b. Removal of the pay table limit: Currently the pay table is limited to the rate for level IV of the US Executive Schedule. This is an artificial limit based on the assumption of higher-grade personnel within the organization. There is no requirement for the IPHC to adhere specifically to the US Federal Civil Service policy.

PROPOSED EXPENDITURES FOR THE FY2019 AND FY2020 BUDGETS (US$)

1. **FY2019 INCOME AND EXPENSES –** The IPHC budget for FY2019 has a proposed $478K USD in expenses above the projected income for the fiscal year. This will reduce the carryover to $2.72M. The primary changes in the income are based on a change in Canadian contribution to $1.57M and $4.4M for the United States. This is a proposed increase of 3% annual increase from FY2018 for both contributions. Change in income (and expenses) for fish sales are based on the setline survey expansion in Regulatory Areas 3A and 3B. Other cost assumptions include a 2.5% increase in salaries (based on cost of living and step increases) and a 5% increase in health care costs.
2. **FY2020 INCOME AND EXPENSES –** The IPHC notional budget for FY2020 has a proposed $570K in expenses above the projected income for the fiscal year. This will reduce the aggregate carryover to $2.2M. The primary changes in the income are based on a 3% increase in U.S. and Canadian contributions to $1.6M and $4.5M respectively. Change in income (and expenses) for fish sales is based a return to the standard series of setline survey stations across the range. Other cost assumptions include a 2.5% increase in

salaries (based on cost of living and step increases) and a 5% increase in health care costs.

RECOMMENDATION/S

1) That the Commission:
    a. **NOTE** paper IPHC-2018-AM094-20 which provided the Commission with the proposed FY2018 budget (financial period: 1 October 2017 to 30 September 2018), as well as FY2019 and tentatively for FY2020.

APPENDICES

Appendix I: Proposed Format for FY2018-FY2020 General and Supplemental Carryover

Appendix II: FY2018 Proposed Financial Budget – Interim Meeting (ver. 0.9)

Appendix III: FY2019 Proposed Financial Budget – Interim Meeting (ver. 0.9)

Appendix IV: FY2020 Proposed Financial Budget – Interim Meeting (ver. 0.9)

International Pacific Halibut Commission

Summary of General and Suppemental Carryover (FY2017-FY2020)

General Account

Core Programs	Actuals FY2017	Budget FY2018	Budget FY2019	Budget FY2020
Income				
U.S. Contributions	$ 4,160,000	$ 4,200,000	$ 4,400,000	$ 4,532,000
CDN Contributions	$ 848,720	$ 1,457,508	$ 1,501,233	$ 1,546,270
CDN Pension Payment	$ 658,984	$ 54,000	$ 72,000	$ 72,000
Grant & Contracts	$ 541,966	$ 452,397	$ 447,551	$ 469,929
Investments	$ -	$ 5,000	$ 5,000	$ 5,000
F.I.S. Program Cost Recovery	$ 314,082	$ 364,295	$ 390,357	$ 404,109
Core Program Income	*$ 6,523,752*	*$ 6,533,200*	*$ 6,816,141*	*$ 7,029,308*
Expenses				
Administration & Scientific	$ (5,186,103)	$ (5,462,311)	$ (5,569,497)	$ (5,493,548)
Port Sampling	$ (547,010)	$ (598,244)	$ (603,313)	$ (618,082)
U.S. Contributions - Survey	$ (750,000)	$ (40,564)	*$ (761,324)*	$ (357,717)
Core Program Expenses	*$ (6,483,112)*	*$ (6,101,119)*	*$ (6,934,134)*	*$ (6,469,346)*
Research Program				
Income				
Fish Sales - Halibut	$ -	$ 320,428	$ 43,428	$ -
Grants & Contracts	$ -	$ 313,175	$ 104,837	$ -
Research Program Income	*$ -*	*$ 633,603*	*$ 148,265*	*$ -*
Research Program Expenses	*$ (480,397)*	*$ (1,158,603)*	*$ (698,265)*	*$ (575,000)*
General Account				
Net Fiscal Year	$ (439,757)	$ (92,919)	$ (667,993)	$ (15,039)
Net Year-end Carryover	$ 1,882,555	$ 1,789,636	$ 1,121,643	$ 1,106,604

Supplemental Account

Survey Program	Actuals FY2017	Budget FY2018	Budget FY2019	Budget FY2020
Income				
Fish Sales - Halibut	$ 3,791,447	$ 4,960,756	$ 5,518,735	$ 4,954,510
Fish Sales - Bycatch	$ 53,953	$ 56,351	$ 56,351	$ 56,351
U.S. Contributions	$ 750,000	$ 40,564	$ 761,324	$ 357,717
Grants & Contracts	$ 47,665	$ 46,100	$ 46,100	$ 46,100
Interest & Reserve Rollover	$ 14,884	$ 11,125	$ 11,125	$ 11,125
Total Income	$ 4,657,949	$ 5,114,896	$ 6,393,635	$ 5,425,803
Expenses				
Program Expenses	$ (5,106,587)	$ (5,381,265)	$ (5,813,998)	$ (5,576,867)
General Account Expenses	$ (314,082)	$ (364,295)	$ (390,357)	$ (404,109)
Total Expenses	$ (5,420,669)	$ (5,745,560)	$ (6,204,355)	$ (5,980,976)
Supplemental Account				
Net Fiscal Year	$ (762,720)	$ (630,664)	$ 189,280	$ (555,173)
Net Year-end Carryover	$ 2,028,965	$ 1,398,301	$ 1,587,581	$ 1,032,408
Total Carryover	$ 3,911,520	$ 3,187,937	$ 2,709,224	$ 2,139,012

TABLE 1. Consolidated Statement

IPHC Income and Expenses

Consolidated General & Supplemental
FY2018 Budget
1 Oct. 2017 to 30 Sept. 2018

Income			***Expenses***		
Contributions			**Core IPHC Activities**		
United States	$	4,200,000	Administration	$	1,937,121
Canada	$	1,511,508	Scientific	$	3,525,190
			Catch Sampling	$	598,244
Fish Sales Income			**Survey Expenses**		
FISS Program	$	5,017,097	FISS Program	$	5,381,265
Other Research	$	320,428			
Other Income			**Research Activities**		
Grants & Contracts	$	811,672	Field Research	$	-
Interest Income	$	16,125	Other Research	$	1,158,603
Misc. Income	$	-			
			Transfer to Restricted Accounts	$	-
Total FY2018 Income	$	11,876,830	Total FY2018 Expenses	$	12,600,423

Total General & Supplemental FY2018	$	(723,593)
Total as % of Income		-6.1%
Unrestricted Funds Balance	$	3,194,788

International Pacific Halibut Commission

Income and Expenses - FY2018 Budget

	INCOME		**FY 2018**
General			
	Carry over from Prior FY	$	250,436
	US Contributions	$	4,200,000
	CDN Contributions	$	1,457,508
	CDN Pension Funding	$	54,000
	Interest	$	5,000
	Other income	$	-
	UW Lease Payments	$	-
	Current FY Income	$	5,716,508
	Appropriations Income Total	**$**	**5,966,944**
Supplemental			
	Supplemental Offset (fish sales, contracts, grants)	**$**	**6,916,104**
TOTAL INCOME		**$**	**12,883,048**

	EXPENSES		
Operations			
	Personnel	$	4,739,071
	Programs	$	502,075
	Administration	$	1,367,523
	Supplies	$	610,239
	Sub-total	$	7,218,908
Stock Assessment			
	Survey Personnel	$	629,294
	Survey Programs	$	183,550
	Survey Vessels and Contracts	$	3,736,452
	Survey Supplies	$	831,969
	Sub-total SSA Surveys	$	5,381,265
TOTAL EXPENSES		**$**	**12,600,173**
GENERAL ACCOUNT CARRYOVER		**$**	**282,875**

Version	Date	Comments
0.8		Interim Meeting Draft
1.0		Annual Meeting - Increased Health Care to 19% from 15% - Adjusted survey WPUE/fish sales price down - Addition of 2A densified grid stations

TABLE 3. Other Accounts I & E

Expected Investment Rate	1.00%

Opening Fund Balance as of October 1, 2017

Restricted Accounts

Leave Liability (30)			Notes
Beginning Balance	$	61,179	
Interest Earned	$	612	
Expenses	$	-	
Funds Transferred	$	-	
Fund Balance	**$**	**61,791**	

Medical Annuitants (40)			
Beginning Balance	$	513,901	
Interest Earned	$	5,139	
Expenses	$	(90,502)	
Funds Transferred	$	-	Additional Funds
Fund Balance	**$**	**428,538**	

Reserve Account (50)			
Beginning Balance	$	1,000,000	
Interest Earned	$	10,000	
Expenses	$	-	
Funds Transferred	$	(10,000)	To Supplemental
Fund Balance	**$**	**1,000,000**	

Scholarship Account (60)			
Beginning Balance	$	253,224	
Interest Earned	$	2,532	
Expenses	$	(6,000)	3 Scholarships
Funds Transferred	$	-	
Fund Balance	**$**	**249,756**	

Total Retricted Funds	**$**	**1,740,085**

Supplemental Account

Income	**Budget**	
Carryover		
Carryover from prior FY	$	3,667,945
Fish Sales		
Halibut Proceeds - FIS	$	4,960,746
Bycatch Proceeds - FIS	$	56,351
DMR Classification	$	125,000
Reproductive Cycle Project	$	195,428
Grants & Contracts		
NMFS - Sampling Grant	$	452,397
NMFS - Sablefish logbooks	$	-
NPRB - Growth Markers	$	57,773
SK- DMR Classification	$	255,402
DFO Rockfish Contract	$	34,520
WDFW Rockfish Contract	$	11,580
Other Income		
Misc. Income	$	-
Rollover from Reserve	$	10,000
Interest	$	1,125
Current FY Income	$	6,160,322
Income Total	$	9,828,267

Expenses	Budget	
Supplemental		
Administration	$	250
Transfer to Restricted Accounts	$	-
Sub-Total	$	250
Offset to General Account	$	6,916,104
Total Expenses	$	6,916,354
Balance	$	2,911,913

TABLE 4. Operations

International Pacific Halibut Commission

Fiscal Year Actuals and Budgets

Year **2018**

	10	20	30	40	60		50		***Prior Fiscal Year***		***% of***	***% of***
Personnel	Administration	Scientific	Statistics	Field Experiments	Other Research	***Sub-Total***	FIS Survey	***Budget***	***Actuals***	***Budget***	***Actuals***	***Budget***
Related Expenses	$ 15,300	$ 1,800	$ 20,600	$ -	$ -	$ 37,700	$ 12,086	$ 49,786	$ 26,228	$ 77,625	190%	64%
Salaries	$ 550,220	$ 2,141,731	$ 348,070	$ -	$ 141,230	$ 3,181,250	$ 523,553	$ 3,704,803	$ 3,491,441	$ 3,519,191	106%	105%
Benefits	$ 407,608	$ 701,803	$ 68,772	$ -	$ 44,694	$ 1,222,878	$ 53,718	$ 1,276,596	$ 992,796	$ 1,077,147	129%	119%
Taxes	$ 38,500	$ 163,636	$ 20,158	$ -	$ -	$ 222,294	$ 39,936	$ 262,230	$ 242,151	$ 256,723	108%	102%
Other	$ 25,200	$ -	$ -	$ -	$ -	$ 25,200	$ -	$ 25,200	$ 11,712	$ 58,350	215%	43%
Contracted	$ -	$ 49,750	$ -	$ -	$ -	$ 49,750	$ -	$ 49,750	$ 25,267	$ 12,500.00	n/a	n/a
Subtotal	**$ 1,036,828**	**$ 3,058,720**	**$ 457,599**	**$ -**	**$ 185,924**	**$ 4,739,071**	**$ 629,294**	**$ 5,368,365**	**$ 4,789,594**	**$ 5,001,536**	**112%**	**107%**
Programs												
Meetings & Conferences	$ 192,250	$ 44,400	$ -	$ -	$ -	$ 236,650	$ -	$ 236,650	$ 178,277	$ 200,250	133%	118%
Travel	$ 73,700	$ 11,500	$ 46,000	$ -	$ 38,190	$ 169,390	$ 100,900	$ 270,290	$ 153,863	$ 210,797	176%	128%
Communications	$ 29,500	$ 300	$ 8,145	$ -	$ 16,340	$ 54,285	$ 82,650	$ 136,935	$ 117,957	$ 163,054	116%	84%
Publications	$ 21,000	$ 15,000	$ 1,750	$ -	$ 4,000	$ 41,750	$ -	$ 41,750	$ 39,600	$ 61,000	105%	68%
Subtotal	**$ 316,450**	**$ 71,200**	**$ 55,895**	**$ -**	**$ 58,530**	**$ 502,075**	**$ 183,550**	**$ 685,625**	**$ 489,697**	**$ 635,101**	**140%**	**108%**
Administration												
Contracts	$ 94,952	$ 236,899	$ 37,250	$ -	$ 410,821	$ 779,922	$ 3,059,070	$ 3,838,993	$ 3,376,607	$ 3,895,442	114%	99%
Maintenance	$ 111,690	$ 43,952	$ -	$ -	$ -	$ 155,642	$ 40,000	$ 195,642	$ 129,907	$ 145,316	151%	135%
Facility Rentals	$ 276,701	$ -	$ 8,100	$ -	$ -	$ 284,801	$ 20,000	$ 304,801	$ 289,373	$ 298,358	105%	102%
Training & Education	$ 40,500	$ 33,990	$ 29,800	$ -	$ -	$ 104,290	$ 52,000	$ 156,290	$ 131,883	$ 186,400	119%	84%
Fees	$ 34,750	$ -	$ 5,600	$ -	$ 2,518	$ 42,868	$ 565,381	$ 608,249	$ 448,574	$ 481,175	136%	126%
Subtotal	**$ 558,593**	**$ 314,841**	**$ 80,750**	**$ -**	**$ 413,339**	**$ 1,367,523**	**$ 3,736,452**	**$ 5,103,975**	**$ 4,376,344**	**$ 5,006,691**	**117%**	**102%**
Supplies & Equipment												
Equipment	$ 5,000	$ 75,229	$ -	$ -	$ 37,561	$ 117,790	$ 1,400	$ 119,190	$ 38,766	$ 116,020	307%	103%
Supplies	$ 20,000	$ 5,200	$ 4,000	$ -	$ 463,249	$ 492,449	$ 830,569	$ 1,323,018	$ 1,052,231	$ 981,720	126%	135%
Subtotal	**$ 25,000**	**$ 80,429**	**$ 4,000**	**$ -**	**$ 500,810**	**$ 610,239**	**$ 831,969**	**$ 1,442,208**	**$ 1,090,997**	**$ 1,097,740**	**132%**	131%
Grand Total	**$ 1,936,871**	**$ 3,525,190**	**$ 598,244**	**$ -**	**$ 1,158,603**	**$ 7,218,908**	**$ 5,381,265**	**$ 12,600,173**	**$ 10,746,632**	**$ 11,741,068**	**117%**	**107%**
Prior FY Actuals	$ 1,780,653	$ 2,841,974	$ 547,010	$ -	$ 480,397	$ 5,650,033	$ 5,106,587					
Prior FY Budget	$ 1,911,556	$ 3,050,610	$ 663,064	$ -	$ 625,000	$ 6,250,231	$ 5,488,335					
% of Actuals	109%	124%	109%	n/a	241%	128%	105%					
% of Budget	101%	116%	90%	n/a	185%	115%	98%					

TABLE 5. Personnel Summary

	Item	10 Administration	2x Scientific	30 Statistics	60 Other Research	Subtotal	50 FIS Survey	Personnel Budget	Prior Fiscal Year Actuals	Prior Fiscal Year Budget	% of Actual	% of Budget
	Personnel Related Expenses											
70511	Vehicle Mileage Reimbursed	$ -	$ -	$ 9,350	$ -	$ 9,350	$ -	$ 9,350	$ 8,852	$ 11,850	106%	79%
70521	Hiring Expenses	$ 10,000	$ -	$ 9,000	$ -	$ 19,000	$ 2,000	$ 21,000	$ 2,439	$ 41,000	861%	51%
70522	Employee Separation Expenses	$ 5,000	$ -	$ -	$ -	$ 5,000	$ -	$ 5,000	$ 1,875	$ 10,000	267%	50%
70531	Gear Allowance	$ 300	$ 1,800	$ 2,250	$ -	$ 4,350	$ 10,086	$ 14,436	$ 13,062	$ 14,775	111%	98%
	Subtotal	**15,300**	**$ 1,800**	**$ 20,600**	**$ -**	**$ 37,700**	**$ 12,086**	**$ 49,786**	**$ 26,228**	**$ 77,625**	**190%**	**64%**
	Salaries											
72211	Salary - Full-Time	$ 542,720	$ 2,090,679	$ -	$ -	$ 2,633,398	$ -	$ 2,633,398	$ 2,586,234	$ 2,539,790	102%	104%
72221	Part-Time Salary	$ -	$ -	$ 317,307	$ -	$ 317,307	$ -	$ 317,307	$ 335,651	$ 333,976	95%	95%
72222	AK Cola	$ -	$ -	$ 17,863	$ -	$ 17,863	$ -	$ 17,863	$ 17,755	$ 17,221	101%	104%
72231	Temporary Pay	$ -	$ 48,352	$ -	$ 141,230	$ 189,582	$ 516,455	$ 706,037	$ 520,298	$ 548,150	136%	129%
72241	Hourly Pay	$ 5,000	$ -	$ 500	$ -	$ 5,500	$ 5,598	$ 11,098	$ 21,725	$ 58,754	51%	19%
72251	Sea Duty Pay	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 8,426	$ -	0%	n/a
72252	Port Duty Pay	$ -	$ -	$ 10,900	$ -	$ 10,900	$ -	$ 10,900	$ 1,352	$ 13,400	806%	81%
72253	On-Call Duty Pay	$ -	$ 2,700	$ -	$ -	$ 2,700	$ -	$ 2,700	$ -	$ 2,400	n/a	113%
72261	Performance Bonus	$ 2,500	$ -	$ 1,500	$ -	$ 4,000	$ 1,500	$ 5,500	$ -	$ 5,500	n/a	100%
	Subtotal	**$ 550,220**	**$ 2,141,731**	**$ 348,070**	**$ 141,230**	**$ 3,181,250**	**$ 523,553**	**$ 3,704,803**	**$ 3,491,441**	**$ 3,519,191**	**106%**	**105%**
	Benefits											
7241x	Medical Benefits	$ 124,930	$ 425,864	$ 57,780	$ 27,097	$ 635,671	$ 15,467	$ 651,137	$ 468,573	$ 537,490	139%	121%
72311	Pension	$ 23,406	$ 47,737	$ -	$ -	$ 71,144	$ -	$ 71,144	$ 53,838	$ 53,840	132%	132%
72421	403(b) - Base Contribution	$ 26,848	$ 125,558	$ -	$ -	$ 152,406	$ -	$ 152,406	$ 131,214	$ 128,107	116%	119%
72422	403(b) - Matching Contribution	$ 15,342	$ 71,747	$ -	$ -	$ 87,089	$ -	$ 87,089	$ 75,024	$ 73,204	116%	119%
72312	Pension Shortfall Contributions	$ 203,508	$ -	$ -	$ -	$ 203,508	$ -	$ 203,508	$ 191,016	$ 191,016	107%	107%
72431	Life Insurance	$ 2,629	$ 10,624	$ 2,029	$ -	$ 15,282	$ -	$ 15,282	$ 14,646	$ 14,870	104%	103%
72432	AD&D Insurance	$ 282	$ 1,139	$ 217	$ -	$ 1,638	$ -	$ 1,638	$ 1,585	$ 1,600	103%	102%
72434	Cancer Care Insurance	$ 2,748	$ 10,417	$ 1,838	$ -	$ 15,003	$ -	$ 15,003	$ -	$ -	n/a	n/a
72441	BC Workers Compensation	$ -	$ -	$ 183	$ -	$ 183	$ -	$ 183	$ 1,244	$ 179	15%	102%
72433	Accident Indemnity	$ 1,915	$ 8,717	$ 2,225	$ -	$ 12,858	$ 143	$ 13,001	$ 17,107	$ 13,137	76%	99%
72452	Tuition Benefit	$ -	$ -	$ -	$ 17,597	$ 17,597	$ -	$ 17,597	$ 1,578	$ 8,000	1115%	220%
72453	Housing Allowance Benefit	$ -	$ -	$ 4,500	$ -	$ 4,500	$ -	$ 4,500	$ 400	$ 4,500	1125%	100%
72461	Travel & Accident Insurance	$ 6,000	$ -	$ -	$ -	$ 6,000	$ -	$ 6,000	$ 5,841	$ 6,000	103%	100%
72462	Vessel P&I Insurance	$ -	$ -	$ -	$ -	$ -	$ 38,108	$ 38,108	$ 27,130	$ 39,704	140%	96%
	Subtotal	**$ 407,608**	**$ 701,803**	**$ 68,772**	**$ 44,694**	**$ 1,222,878**	**$ 53,718**	**$ 1,276,596**	**$ 989,196**	**$ 1,071,647**	**129%**	119%
	Taxes											
72511	Social Security	$ 38,500	$ 163,636	$ 20,158	$ -	$ 222,294	$ 39,936	$ 262,230	$ 242,151	$ 256,723	108%	102%
	Subtotal	**$ 38,500**	**$ 163,636**	**$ 20,158**	**$ -**	**$ 222,294**	**$ 39,936**	**$ 262,230**	**$ 242,151**	**$ 256,723**	**108%**	102%
	Other											
75311	Legal Fees	$ 5,000	**$ -**	**$ -**	**$ -**	$ 5,000	$ -	$ 5,000	$ -	$ 5,000	n/a	100%
75312	Consultation	$ 10,000	**$ -**	**$ -**	**$ -**	$ 10,000	$ -	$ 10,000	$ 4,530	$ 43,150	221%	23%
75411	Cobra TPA	$ 2,000	$ -	$ -	$ -	$ 2,000	$ -	$ 2,000	$ 1,200	$ 2,000	167%	100%
75413	Section 125/132 Plan TPA	$ 5,000	$ -	$ -	$ -	$ 5,000	$ -	$ 5,000	$ 3,276	$ 5,000	153%	100%
75412	Defined Benefit TPA	$ 3,200	$ -	$ -	$ -	$ 3,200	$ -	$ 3,200	$ 2,706	$ 3,200	118%	100%
	Subtotal	**$ 25,200**	**$ -**	**$ -**	**$ -**	**$ 25,200**	**$ -**	**$ 25,200**	**$ 11,712**	**$ 58,350**	**215%**	43%
	Contracted											
75511	Contracted Employees	$ -	$ 49,750	$ -	$ -	$ 49,750	$ -	$ 49,750	$ 25,267	$ 12,500	197%	398%
	Subtotal	**$ -**	**$ 49,750**	**$ -**	**$ -**	**$ 49,750**	**$ -**	**$ 49,750**	**$ 25,267**	**$ 12,500**	**197%**	398%
	Grand Total	**$ 1,036,828**	**$ 3,058,720**	**$ 457,599**	**$ 185,924**	**$ 4,739,071**	**$ 629,294**	**$ 5,368,365**	**$ 4,785,994**	**$ 4,996,036**	**112%**	107%
	Prior FY Actuals	$ 1,002,395	$ 2,737,001	$ 428,919	$ 4,076	$ 4,172,392	$ 601,804					
	Prior FY Budget	$ 1,027,533	$ 2,783,615	$ 461,876	$ 24,912	$ 4,297,936	$ 628,323					
	% of Actuals	103%	112%	107%	4561%	114%	105%					
	% of Budget	101%	110%	99%	746%	110%	100%					

TABLE 6. Programs

Item	10 Administration	2x Scientific	30 Statistics	60 Other Research	Sub-Totals	50 FIS Survey	Operations Budget	Actuals	Prior Fiscal Year Budget	Prior Fiscal Year % of Actuals
Meetings & Conferences										
Interim Meeting	$ 12,000	$ -	$ -	$ -	$ 12,000	$ -	$ 12,000	$ 11,224	$ 6,000	107%
Annual Meeting	$ 55,000	$ -	$ -	$ -	$ 55,000	$ -	$ 55,000	$ 42,926	$ 45,000	128%
Research Advisory Board	$ 5,500	$ -	$ -	$ -	$ 5,500	$ -	$ 5,500	$ 5,051	$ 5,500	109%
Scholarship Committee	$ 750	$ -	$ -	$ -	$ 750	$ -	$ 750	$ -	$ 750	n/a
MSAB Meetings	$ 40,000	$ -	$ -	$ -	$ 40,000	$ -	$ 40,000	$ 29,375	$ 25,000	136%
SRB Meetings	$ 35,000	$ -	$ -	$ -	$ 35,000	$ -	$ 35,000	$ 30,785	$ 20,000	114%
U.S. Council	$ 15,000	$ -	$ -	$ -	$ 15,000	$ -	$ 15,000	$ 19,628	$ 12,500	76%
HAB - Canada	$ 1,500	$ -	$ -	$ -	$ 1,500	$ -	$ 1,500	$ 1,684	$ 3,000	89%
Workshops/Retreat	$ 5,000	$ -	$ -	$ -	$ 5,000	$ -	$ 5,000	$ 5,319	$ 5,000	94%
Scientific Meeting & Symposia	$ -	$ 44,400	$ -	$ -	$ 44,400	$ -	$ 44,400	$ 17,434	$ 47,500	255%
Scientific Meeting Support	$ 12,500	$ -	$ -	$ -	$ 12,500	$ -	$ 12,500	$ 3,058	$ 10,000	409%
Local & Trade Show	$ 10,000	$ -	$ -	$ -	$ 10,000	$ -	$ 10,000	$ 11,794	$ 20,000	85%
Subtotal	**$ 192,250**	**$ 44,400**	**$ -**	**$ -**	**$ 192,250**	**$ -**	**$ 192,250**	**$ 178,278**	**$ 200,250**	**108%**
Travel										
General Travel - Staff	$ 11,000	$ 11,500	$ 14,000	$ 38,190	$ 74,690	$ 100,900	$ 175,590	$ 108,075	$ 138,297	162%
On Job Training Travel	$ -	$ -	$ 21,000	$ -	$ 21,000	$ -	$ 21,000	$ 17,765	$ 21,500	118%
Follow-up Travel	$ -	$ -	$ 11,000	$ -	$ 11,000	$ -	$ 11,000	$ 8,811	$ 11,000	125%
General Travel - Director	$ 62,700	$ -	$ -	$ -	$ 62,700	$ -	$ 62,700	$ 19,212	$ 40,000	326%
Subtotal	**$ 73,700**	**$ 11,500**	**$ 46,000**	**$ 38,190**	**$ 157,890**	**$ 100,900**	**$ 258,790**	**$ 153,863**	**$ 210,797**	**168%**
Communications										
Phone Tolls	$ 7,000	$ -	$ -	$ -	$ 7,000	$ -	$ 7,000	$ 6,282	$ 7,000	111%
Long Distance	$ 750	$ -	$ 625	$ -	$ 1,375	$ 3,150	$ 4,525	$ 4,162	$ 6,245	109%
Reimbursed Communications	$ 3,500	$ -	$ 4,170	$ -	$ 7,670	$ -	$ 7,670	$ 5,262	$ 12,040	146%
Internet Service	$ 2,500	$ -	$ -	$ -	$ 2,500	$ -	$ 2,500	$ 2,296	$ 2,750	109%
Postage	$ 10,000	$ -	$ 2,100	$ -	$ 12,100	$ -	$ 12,100	$ 11,221	$ 15,600	108%
Mail Prep Services	$ 1,000	$ 300	$ 1,250	$ 14,340	$ 16,890	$ -	$ 16,890	$ 4,670	$ 4,500	362%
Express Mail	$ -	$ -	$ -	$ 2,000	$ 2,000	$ 1,000	$ 3,000	$ 3,785	$ 12,123	79%
Heavy Shipping	$ 4,750	$ -	$ -	$ -	$ 4,750	$ 78,500	$ 83,250	$ 80,279	$ 102,796	104%
Subtotal	**$ 29,500**	**$ 300**	**$ 8,145**	**$ 16,340**	**$ 53,985**	**$ 82,650**	**$ 136,935**	**$ 117,957**	**$ 163,054**	**116%**
Publications										
Annual Report	$ 14,000	$ -	$ -	$ -	$ 14,000	$ -	$ 14,000	$ 28,888	$ 13,500	48%
Regulations	$ 5,000	$ -	$ -	$ -	$ 5,000	$ -	$ 5,000	$ 4,906	$ 4,000	102%
Blue Book	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,538	$ 3,750	0%
RARA Report	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 660	$ 2,000	0%
IPHC Publications	$ -	$ 15,000	$ -	$ -	$ 15,000	$ -	$ 15,000	$ 2,544	$ 30,000	590%
External Journals	$ -	$ -	$ -	$ 4,000	$ 4,000	$ -	$ 4,000	$ -	$ 2,500	n/a
Misc. Printing	$ 2,000	$ -	$ -	$ -	$ 2,000	$ -	$ 2,000	$ 1,064	$ 2,000	188%
Logbooks	$ -	$ -	$ 1,750	$ -	$ 1,750	$ -	$ 1,750	$ -	$ 3,250	n/a
Subtotal	**$ 21,000**	**$ 15,000**	**$ 1,750**	**$ 4,000**	**$ 41,750**	**$ -**	**$ 41,750**	**$ 39,600**	**$ 61,000**	**105%**
Grand Total	**$ 316,450**	**$ 71,200**	**$ 55,895**	**$ 58,530**	**$ 445,875**	**$ 183,550**	**$ 629,425**	**$ 489,698**	**$ 635,101**	**129%**
Prior FY Actuals	$ 250,040	$ 38,380	$ 36,846	$ 13,294	$ 338,561	$ 151,135				
Prior FY Budget	$ 262,750	$ 88,550	$ 61,785	$ 16,473	$ 429,558	$ 205,543				
% of Actuals	127%	186%	152%	440%	132%	121%				

TABLE 7. Administration

	Item	10 Administration	20 Scientific	30 Statistics	60 Other Research	Sub-Totals	50 FIS Survey	Operations Budget	Prior Fiscal Year Actuals	Prior Fiscal Year Budget	% of Actuals	% of Budget
	Contracts											
82611	Leased Vehicle Fees	$ 4,000	$ -	$ 17,250	$ -	$ 21,250	$ -	$ 21,250	$ 16,979	$ 25,003	125%	68%
85611	Software Leases	$ 20,952	$ 22,021	$ 4,800	$ -	$ 47,773	$ -	$ 38,067	$ 39,056	$ 34,395	97%	114%
85931	Vendor Contracts	$ 70,000	$ 214,878	$ 15,200	$ 410,821	$ 710,899	$ 3,059,070	$ 3,340,571	$ 3,320,571	$ 3,836,044	101%	87%
	Subtotal	**$ 94,952**	**$ 236,899**	**$ 37,250**	**$ 410,821**	**$ 779,922**	**$ 3,059,070**	**$ 3,838,993**	**$ 3,376,606**	**$ 3,895,442**	**114%**	**87%**
	Maintenance											
82612	Copier Maintenance	$ 2,000	$ -	$ -	$ -	$ 2,000	$ -	$ 2,000	$ 2,054	$ 1,500	97%	137%
82613	Equipment Maintenance	$ -	$ 43,952	$ -	$ -	$ 43,952	$ 40,000	$ 83,952	$ 37,524	$ 48,000	224%	78%
82614	Vehicle Maintenance	$ 250	$ -	$ -	$ -	$ 250	$ -	$ 250	$ 80	$ 250	313%	32%
82615	Building Maintenance	$ 91,440	$ -	$ -	$ -	$ 91,440	$ -	$ 91,440	$ 73,558	$ 77,566	124%	95%
82212	Building Utilities	$ 18,000	$ -	$ -	$ -	$ 18,000	$ -	$ 18,000	$ 16,692	$ 18,000	108%	93%
	Subtotal	**$ 111,690**	**$ 43,952**	**$ -**	**$ -**	**$ 155,642**	**$ 40,000**	**$ 195,642**	**$ 129,908**	**$ 145,316**	**151%**	**89%**
	Facility Rentals											
82121	Field Office Rental	$ -	$ -	$ 8,100	$ -	$ 8,100	$ -	$ 8,100	$ 3,205	$ 8,100	253%	40%
82122	Archival Storage Rental	$ 4,000	$ -	$ -	$ -	$ 4,000	$ -	$ 4,000	$ 4,923	$ 5,500	81%	90%
82131	Bait Storage	$ -	$ -	$ -	$ -	$ -	$ 20,000	$ 20,000	$ 16,361	$ 20,000	122%	82%
82111	Office Lease	$ 258,898	$ -	$ -	$ -	$ 258,898	$ -	$ 258,898	$ 251,358	$ 251,358	103%	100%
82123	Storage Lease	$ 13,803	$ -	$ -	$ -	$ 13,803	$ -	$ 13,803	$ 13,527	$ 13,400	102%	101%
	Subtotal	**$ 276,701**	**$ -**	**$ 8,100**	**$ -**	**$ 284,801**	**$ 20,000**	**$ 304,801**	**$ 289,374**	**$ 298,358**	**105%**	**97%**
	Training & Education											
85411	Field Staff Orientation	$ -	$ -	$ 21,300	$ -	$ 21,300	$ 52,000	$ 73,300	$ 81,554	$ 81,300	90%	100%
85421	Management Training	$ 20,000	$ -	$ -	$ -	$ 20,000	$ -	$ 20,000	$ 19,422	$ 20,000	103%	97%
85422	Skill Training	$ -	$ 30,490	$ 8,500	$ -	$ 38,990	$ -	$ 38,990	$ 11,828	$ 63,100	330%	19%
81811	Fisheries Journals	$ 2,500	$ 2,000	$ -	$ -	$ 4,500	$ -	$ 4,500	$ 2,544	$ 3,000	177%	85%
81812	Professional Journals	$ 18,000	$ 1,500	$ -	$ -	$ 19,500	$ -	$ 19,500	$ 16,535	$ 19,000	118%	87%
	Subtotal	**$ 40,500**	**$ 33,990**	**$ 29,800**	**$ -**	**$ 104,290**	**$ 52,000**	**$ 156,290**	**$ 131,883**	**$ 186,400**	**119%**	**71%**
	Fees											
85911	Audit	$ 8,000	$ -	$ -	$ -	$ 8,000	$ -	$ 8,000	$ -	$ 8,000	n/a	0%
85921	Bank Charges	$ 8,000	$ -	$ -	$ -	$ 8,000	$ -	$ 8,000	$ 8,782	$ 8,000	91%	110%
85211	Vehicle Insurance	$ 4,250	$ -	$ 5,600	$ -	$ 9,850	$ -	$ 9,850	$ 9,388	$ 4,250	105%	221%
85212	General Liability Insurance	$ 5,500	$ -	$ -	$ 200	$ 5,700	$ -	$ 5,700	$ 6,283	$ 5,500	91%	114%
85213	Bonding	$ 500	$ -	$ -	$ -	$ 500	$ -	$ 500	$ 494	$ 500	101%	99%
85214	Customs	$ 1,000	$ -	$ -	$ -	$ 1,000	$ -	$ 1,000	$ 313	$ 1,500	320%	21%
85941	Legal Fees	$ 7,500	$ -	$ -	$ -	$ 7,500	$ -	$ 7,500	$ 2,338	$ 10,000	321%	23%
85932	Vessel Revenue Share	$ -	$ -	$ -	$ 2,318	$ 2,318	$ 527,502	$ 529,820	$ 411,133	$ 410,664	129%	100%
81155	Agency Revenue Share	$ -	$ -	$ -	$ -	$ -	$ 28,175	$ 28,175	$ -	$ 28,747	n/a	0%
67111	Realized Gain/loss	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 4,510	$ -	0%	n/a
85951	Dockside Monitoring	$ -	$ -	$ -	$ -	$ -	$ 7,704	$ 7,704	$ 5,333	$ 4,014	144%	133%
	Subtotal	**$ 34,750**	**$ -**	**$ 5,600**	**$ 2,518**	**$ 42,868**	**$ 565,381**	**$ 606,249**	**$ 448,574**	**$ 481,175**	**135%**	**93%**
	Grand Total	**$ 558,593**	**$ 314,841**	**$ 80,750**	**$ 413,339**	**$ 1,367,523**	**$ 3,736,452**	**$ 5,103,975**	**$ 4,376,345**	**$ 5,006,691**	**117%**	**87%**
	Prior FY Actuals	$ 506,169	$ 26,007	$ 77,833	$ 138,817	$ 748,826	$ 3,639,842					
	Prior FY Budget	$ 595,974	$ 73,195	$ 127,453	$ 346,252	$ 1,142,874	$ 3,921,817					
	% of Actuals	110%	1211%	104%	298%	183%	103%					
	% of Budget	94%	430%	63%	119%	120%	95%					

TABLE 8. Supplies & Equipment

	Item	10 Administration	20 Scientific	30 Statistics	60 Other Research	Sub-Totals	50 FIS Survey	Budget	Prior Fiscal Year Actuals	Prior Fiscal Year Budget	% of Actuals	% of Budget
	Equipment											
82811	Computer Equipment - Replace	$ -	$ 7,400	$ -	$ -	$ 7,400	$ -	$ 7,400	$ 5,825	$ 5,000	127%	148%
82812	Computer Equipment - Long Term	$ -	$ 17,600	$ -	$ -	$ 17,600	$ -	$ 17,600	$ 7,872	$ 2,900	224%	607%
82831	Field Equipment - Capital	$ -	$ -	$ -	$ 37,561	$ 37,561	$ -	$ 37,561	$ -	$ 14,000	n/a	268%
82821	Field Equipment - non-Capital	$ -	$ -	$ -	$ -	$ -	$ 1,400	$ 1,400	$ 1,407	$ 2,270	100%	62%
82832	Scientific Equipment - Capital	$ -	$ 50,000	$ -	$ -	$ 50,000	$ -	$ 50,000	$ 23,353	$ 84,600	214%	59%
82822	Scientific Equipment - non-Capital	$ -	$ 229	$ -	$ -	$ 229	$ -	$ 229	$ 309	$ 2,250	74%	10%
82833	Office Equipment - Capital	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	n/a	n/a
82823	Office Equipment - non-Capital	$ 5,000	$ -	$ -	$ -	$ 5,000	$ -	$ 5,000	$ -	$ 5,000	n/a	100%
	SubTotal	**$ 5,000**	**$ 75,229**	**$ -**	**$ 37,561**	**$ 117,790**	**$ 1,400**	**$ 119,190**	**$ 38,766**	**$ 116,020**	**307%**	**103%**
	Supplies											
81121	Supplies	$ 20,000	$ 5,200	$ 4,000	$ 404,241	$ 433,441	$ 28,800	$ 462,241	$ 397,444	$ 280,493	116%	165%
81122	Tag Recoveries	$ -	$ -	$ -	$ 17,150	$ 17,150	$ -	$ 17,150	$ 3,731	$ 8,800	460%	195%
81151	Bait	$ -	$ -	$ -	$ 41,450	$ 41,450	$ 670,337	$ 711,787	$ 565,560	$ 580,630	126%	123%
81152	Ice	$ -	$ -	$ -	$ -	$ -	$ 13,700	$ 13,700	$ 11,962	$ 11,680	115%	117%
81153	Gear Replacement	$ -	$ -	$ -	$ 408	$ 408	$ 89,732	$ 90,140	$ 65,197	$ 67,275	138%	134%
81154	Misc. Expenses	$ -	$ -	$ -	$ -	$ -	$ 28,000	$ 28,000	$ 8,337	$ 32,842	336%	85%
	SubTotal	**$ 20,000**	**$ 5,200**	**$ 4,000**	**$ 463,249**	**$ 492,449**	**$ 830,569**	**$ 1,323,018**	**$ 1,052,231**	**$ 981,720**	**126%**	**135%**
	Grand Total	**$ 25,000**	**$ 80,429**	**$ 4,000**	**$ 500,810**	**$ 610,239**	**$ 831,969**	**$ 1,442,208**	**$ 1,090,997**	**$ 1,097,740**	**132%**	**131%**

	10 Administration	20 Scientific	30 Statistics	60 Other Research	Sub-Totals	50 FIS Survey
Prior FY Actuals	$ 22,049	$ 40,585	$ 3,411	$ 324,209	$ 390,254	$ 713,805
Prior FY Budget	$ 25,300	$ 105,250	$ 11,950	$ 237,363	$ 379,863	$ 732,652
% of Actuals	113%	198%	117%	154%	156%	117%
% of Budget	99%	76%	33%	211%	161%	114%

Catch Effort Program

	WA/OR/CA Ports	WA/OR/CA General	WA/OR/CA Total	Canada Ports	Canada General	Canada Total	Alaska Ports	Alaska General	Alaska Total	Grand Total	FY2017 Budget	% of Budget	2017 Actuals	% of Actuals
	51-53	00	64	61-63	00	82	71-92	00 12	81					
Salaries and Benefits														
Part-Time Salary	$ -	$ -	$ -	$ 56,081	$ -	$ 56,081	$ 261,225	$ -	$ 261,225	$ 317,307	$ 333,545	95%	$ 336,755	94%
AK Cola	$ -	$ -	$ -	$ -	$ -	$ -	$ 17,863	$ -	$ 17,863	$ 17,863	$ 17,871	100%	$ 15,061	119%
Port Premium Pay	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	n/a	$ -	n/a
Temporary	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	n/a	$ -	n/a
Hourly	$ 500	$ -	$ 500	$ -	$ -	$ -	$ -	$ -	$ -	$ 500	$ 500	100%	$ 1,348	37%
Port Duty	$ 900	$ -	$ 900	$ 1,500	$ -	$ 1,500	$ 8,500	$ -	$ 8,500	$ 10,900	$ 13,400	81%	$ 1,148	949%
Medical Benefits	$ -	$ -	$ -	$ 12,341	$ -	$ 12,341	$ 45,439	$ -	$ 45,439	$ 57,780	$ 61,933	93%	$ 52,740	110%
Life Insurance	$ -	$ -	$ -	$ 339	$ -	$ 339	$ 1,690	$ -	$ 1,690	$ 2,029	$ 2,128	95%	$ 1,579	129%
AD&D	$ -	$ -	$ -	$ 36	$ -	$ 36	$ 181	$ -	$ 181	$ 217	$ 228	95%	$ 170	128%
BC Workers Comp.	$ -	$ -	$ -	$ 183	$ -	$ 183	$ -	$ -	$ -	$ 183	$ 179	102%	$ 257	71%
Accident Indemnity	$ -	$ -	$ -	$ 475	$ -	$ 475	$ 1,750	$ -	$ 1,750	$ 2,225	$ 2,439	91%	$ 2,551	87%
Cancer Care	$ -	$ -	$ -	$ 393	$ -	$ 393	$ 1,445	$ -	$ 1,445	$ 1,838	$ -	n/a	$ -	n/a
Performance Bonus	$ -	$ -	$ -	$ -	$ 500	$ 500	$ -	$ 1,000	$ 1,000	$ 1,500	$ 1,500	100%	$ -	n/a
Housing Allowance	$ -	$ -	$ -	$ -	$ -	$ -	$ 4,500	$ -	$ 4,500	$ 4,500	$ 4,500	100%	$ 4,000	113%
Social Security	$ 200	$ -	$ 200	$ -	$ -	$ -	$ 19,958	$ -	$ 19,958	$ 20,158	$ 21,486	94%	$ 18,109	111%
Hiring Expenses	$ -	$ -	$ -	$ -	$ 3,000	$ 3,000	$ -	$ 6,000	$ 6,000	$ 9,000	$ 9,000	100%	$ 708	1271%
Employee Separation Expenses	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	n/a	$ -	n/a
Subtotal - Salary and Benefits	$ 1,600	$ -	$ 1,600	$ 71,349	$ 3,500	$ 74,849	$ 362,550	$ 7,000	$ 369,550	$ 445,999	$ 460,861	97%	$ 417,101	107%
Programs														
General Travel - Staff	$ 3,000	$ -	$ 3,000	$ -	$ -	$ -	$ 7,000	$ 4,000	$ 11,000	$ 14,000	$ 21,000	67%	$ 5,541	253%
On Job Training Travel	$ 1,500	$ -	$ 1,500	$ -	$ 6,500	$ 6,500	$ -	$ 13,000	$ 13,000	$ 21,000	$ 17,500	120%	$ 17,603	119%
Follow-up Travel	$ -	$ -	$ -	$ -	$ 3,000	$ 3,000	$ -	$ 8,000	$ 8,000	$ 11,000	$ 9,000	122%	$ 10,855	101%
Long Distance	$ -	$ -	$ -	$ -	$ 200	$ 200	$ -	$ 425	$ 425	$ 625	$ 545	115%	$ 488	128%
Comm Allow - Port	$ -	$ -	$ -	$ 1,360	$ -	$ 1,360	$ 2,810	$ -	$ 2,810	$ 4,170	$ 7,280	57%	$ 2,184	191%
USPS Postage	$ -	$ 100	$ 100	$ -	$ 1,000	$ 1,000	$ -	$ 1,000	$ 1,000	$ 2,100	$ 3,100	68%	$ 859	244%
Express Mail	$ -	$ 50	$ 50	$ -	$ 200	$ 200	$ -	$ 1,000	$ 1,000	$ 1,250	$ 2,250	56%	$ 993	126%
Logbooks	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,750	$ 1,750	$ 1,750	$ 1,750	100%	$ 3,495	50%
Subtotal - Programs	$ 4,500	$ 150	$ 4,650	$ 1,360	$ 10,900	$ 12,260	$ 9,810	$ 29,175	$ 38,985	$ 55,895	$ 62,425	90%	$ 42,018	133%
Administration														
Leased Vehicle Fees	$ -	$ -	$ -	$ -	$ -	$ -	$ 17,250	$ -	$ 17,250	$ 17,250	$ 21,000	82%	$ 13,083	132%
Vehicle Mileage Reimbursed	$ -	$ -	$ -	$ 3,850	$ -	$ 3,850	$ 5,500	$ -	$ 5,500	$ 9,350	$ 11,850	79%	$ 9,495	98%
Software Leases	$ -	$ -	$ -	$ -	$ 1,800	$ 1,800	$ -	$ 3,000	$ 3,000	$ 4,800	$ 2,800	171%	$ 4,544	106%
Vendor Contracts	$ -	$ -	$ -	$ -	$ 200	$ 200	$ -	$ 15,000	$ 15,000	$ 15,200	$ 45,000	34%	$ 8,995	169%
Field Office Rental	$ -	$ -	$ -	$ -	$ -	$ -	$ 8,100	$ -	$ 8,100	$ 8,100	$ 5,700	142%	$ 3,205	253%
Field Staff Orientation	$ -	$ 300	$ 300	$ -	$ 4,000	$ 4,000	$ -	$ 17,000	$ 17,000	$ 21,300	$ 25,300	84%	$ 22,513	95%
Skill Training	$ -	$ -	$ -	$ -	$ 1,000	$ 1,000	$ -	$ 7,500	$ 7,500	$ 8,500	$ 12,650	67%	$ 3,034	280%
Vehicle Insurance	$ -	$ -	$ -	$ -	$ -	$ -	$ 5,600	$ -	$ 5,600	$ 5,600	$ 7,050	79%	$ 5,585	100%
Customs	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	n/a	$ 32	0%
Area 4 Clearances	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	n/a	$ -	n/a
Subtotal - Administration	$ -	$ 300	$ 300	$ 3,850	$ 7,000	$ 10,850	$ 36,450	$ 42,500	$ 78,950	$ 90,100	$ 131,350	69%	$ 70,486	128%
Supplies and Equipment														
Field Equipment - Non-Capital	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	n/a	$ 8,915	0%
Office Equipment - Non-Capital	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	n/a	$ -	n/a
Supplies	$ -	$ 400	$ 400	$ -	$ 800	$ 800	$ -	$ 2,800	$ 2,800	$ 4,000	$ 5,800	69%	$ 9,312	43%
Gear Allowance	$ 150	$ -	$ 150	$ 300	$ -	$ 300	$ 1,800	$ -	$ 1,800	$ 2,250	$ 3,050	74%	$ 1,704	132%
Subtotal - Supplies and Equipment	$ 150	$ 400	$ 550	$ 300	$ 800	$ 1,100	$ 1,800	$ 2,800	$ 4,600	$ 6,250	$ 8,850	71%	$ 19,931	31%
Prior Fiscal Year Expense	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	n/a	$ -	n/a
Catch Effort Program Totals	$ 6,250	$ 850	$ 7,100	$ 76,859	$ 22,200	$ 99,059	$ 410,610	$ 81,475	$ 492,085	$ 598,244	$ 663,486	90%	$ 549,537	109%

Dept

Catch Effort Program - by ports

Dept		Bellingham	Petersburg	Sitka	Juneau	Seward	Homer	Kodiak	Sandpoint	Dutch Harbor	St. Paul	AK Total
30	**Grant ID**	81	81	81	81	81	81	81	81	81	81	
	Port ID	61	71	72	73	81	82	83	89	91	92	
	U.S Ports											
5121	Part-Time Salary	$ -	$ 38,603	$ 35,472	$ 36,516	$ 34,428	$ 38,603	$ 34,428	$ -	$ 32,341	$ 10,834	$ 261,225
5122	AK Cola	$ -	$ 2,640	$ 2,426	$ 2,497	$ 2,354	$ 2,640	$ 2,354	$ -	$ 2,212	$ 741	$ 17,863
5123	Port Premium Pay	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
5131	Temporary	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
5132	Hourly	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
5142	Port Duty	$ -	$ 500	$ 500	$ 500	$ 500	$ 500	$ 500	$ -	$ 500	$ 5,000	$ 8,500
5211	Medical	$ -	$ 5,142	$ 5,142	$ 5,142	$ 5,142	$ 5,142	$ -	$ -	$ 5,142	$ 1,870	$ 32,723
5212	Medical Reimbursement	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
5214	HRA Expenses	$ -	$ 1,028	$ 1,028	$ 1,028	$ 1,028	$ 1,028	$ 6,171	$ -	$ 1,028	$ 374	$ 12,715
5215	Medical Benefit (Taxable)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
5231	Life Insurance	$ -	$ 250	$ 229	$ 236	$ 223	$ 250	$ 223	$ -	$ 209	$ 70	$ 1,690
5232	AD&D	$ -	$ 27	$ 25	$ 25	$ 24	$ 27	$ 24	$ -	$ 22	$ 8	$ 181
5241	BC Workers Comp.	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
5242	Accident Indemnity	$ -	$ 238	$ 238	$ 238	$ 238	$ 238	$ 238	$ -	$ 238	$ 86	$ 1,750
5243	Cancer Care	$ -	$ 196	$ 196	$ 196	$ 196	$ 196	$ 196	$ -	$ 196	$ 71	$ 1,445
5254	Housing Allowance	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 4,500	$ -	$ 4,500
5311	Social Security	$ -	$ 2,949	$ 2,710	$ 2,790	$ 2,630	$ 2,949	$ 2,630	$ -	$ 2,471	$ 828	$ 19,958
	Salary and Benefits	**$ -**	**$ 51,572**	**$ 47,967**	**$ 49,169**	**$ 46,764**	**$ 51,572**	**$ 46,764**	**$ -**	**$ 48,859**	**$ 19,882**	$ 362,550
6211	General Travel - Staff	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 7,000	$ 7,000
6313	Comm Allow - Port	$ -	$ 315	$ 315	$ 315	$ 315	$ 315	$ 315	$ -	$ 680	$ 240	$ 2,810
7111	Leased Vehicle Fees	$ -	$ -	$ -	$ 4,000	$ 4,000	$ -	$ 5,000	$ -	$ 4,250	$ -	$ 17,250
7112	Vehicle Mileage Reimbursed	$ -	$ 500	$ 2,000	$ -	$ -	$ 3,000	$ -	$ -	$ -	$ -	$ 5,500
7311	Field Office Rental	$ -	$ -	$ 2,400	$ 2,400	$ -	$ 3,300	$ -	$ -	$ -	$ -	$ 8,100
7513	Vehicle Insurance	$ -	$ -	$ -	$ 1,100	$ 1,200	$ -	$ 1,000	$ 1,200	$ 1,100	$ -	$ 5,600
8225	Gear Allowance	$ -	$ 150	$ 150	$ 150	$ 350	$ 150	$ 150	$ -	$ 350	$ 350	$ 1,800
	Total	**$ -**	**$ 52,537**	**$ 52,832**	**$ 57,134**	**$ 52,629**	**$ 58,337**	**$ 53,229**	**$ 1,200**	**$ 55,239**	**$ 27,472**	**$ 410,610**

		Aging/General	Tribal (2A)	Newport (2A)	Washington (2A)	Area 2A Total	Vancouver	Port Hardy	Prince Rupert	Cdn Total	US Total	Grand Total
	Grant ID	64	64	64	64		82	82	82			
	Port ID	00	51	52	53		61	62	63			
5121	Part-Time Salary	-	-	-	-	-	$ -	$ 25,703	$ 30,378	$ 56,081	$ 261,225	$ 317,307
5122	AK Cola	-	-	-	-	-	$ -	$ -	$ -	$ -	$ 17,863	$ 17,863
5123	Port Premium Pay	-	-	-	-	-	$ -	$ -	$ -	$ -	$ -	$ -
5132	Hourly	-	-	500	-	500	$ -	$ -	$ -	$ -	$ 500	$ 500
5142	Port Duty	-	-	900	-	900	$ 500	$ 500	$ 500	$ 1,500	$ 9,400	$ 10,900
5211	Medical	-	-	-	-	-	$ -	$ -	$ -	$ -	$ 32,723	$ 32,723
5212	Medical Reimbursement	-	-	-	-	-	$ -	$ -	$ -	$ -	$ -	$ -
5214	HRA Expenses	-	-	-	-	-	$ -	$ -	$ -	$ -	$ 12,715	$ 12,715
5215	Medical Benefit (Taxable)	-	-	-	-	-	$ -	$ 6,171	$ 6,171	$ 12,341	$ -	$ 12,341
5231	Life Insurance	-	-	-	-	-	$ -	$ 156	$ 184	$ 339	$ 1,690	$ 2,029
5232	AD&D	-	-	-	-	-	$ -	$ 17	$ 20	$ 36	$ 181	$ 217
5241	BC Workers Comp.	-	-	-	-	-	$ -	$ 84	$ 99	$ 183	$ -	$ 183
5242	Accident Indemnity	-	-	-	-	-	$ -	$ 238	$ 238	$ 475	$ 1,750	$ 2,225
5243	Cancer Care	-	-	-	-	-	$ -	$ 196	$ 196	$ 393	$ 1,445	$ 1,838
5254	Housing Allowance	-	-	-	-	-	$ -	$ -	$ -	$ -	$ 4,500	$ 4,500
5311	Social Security	-	100	100	-	200	$ -	$ -	$ -	$ -	$ 20,158	$ 20,158
	Salary and Benefits	**-**	**100**	**1,500**	**-**	**1,600**	**$ 500**	**$ 33,064**	**$ 37,785**	**$ 71,349**	**$ 364,150**	**$ 435,499**
6211	General Travel - Staff	-	-	3,000	-	3,000	$ -	$ -	$ -	$ -	$ 10,000	$ 10,000
6212	On Job Training Travel	-	1,500	-	-	1,500	$ -	$ -	$ -	$ -	$ 1,500	$ 1,500
6313	Comm Allow - Port	-	-	-	-	-	$ -	$ 680	$ 680	$ 1,360	$ 2,810	$ 4,170
7111	Leased Vehicle Fees	-	-	-	-	-	$ -	$ -	$ -	$ -	$ 17,250	$ 17,250
7112	Vehicle Mileage Reimbursed	-	-	-	-	-	$ -	$ 350	$ 3,500	$ 3,850	$ 5,500	$ 9,350
7311	Field Office Rental	-	-	-	-	-	$ -	$ -	$ -	$ -	$ 8,100	$ 8,100
7513	Vehicle Insurance	-	-	-	-	-	$ -	$ -	$ -	$ -	$ 5,600	$ 5,600
8225	Gear Allowance	-	-	150	-	150	$ -	$ 150	$ 150	$ 300	$ 1,950	$ 2,250
	Total	**-**	**1,600**	**4,650**	**-**	**6,250**	**$ 500**	**$ 34,244**	**$ 42,115**	**$ 76,859**	**$ 416,860**	**$ 493,719**

FIS Cost/Revenue Projections

FIS Program Totals	
Total Pounds Landed	789,098
Net Halibut Proceeds	$4,960,746
Net Bycatch proceeds	$56,351
Vessel Expenses	($5,030,978)
Office Expenses	($293,845)
Trawl Survey	($56,442)
Net Proceeds	**($364,167)**

Assumptions	Rate/Amt	% Prior Yr. Actual
Price	$6.29	92%
WPUE	83	105%
Vessel Costs	$5,030,978	112%
Personnel COLA	2.11%	

Reg. Area Totals	2A All Regions	2B All Regions	2C All Regions	3A All Regions	3B All Regions	4A All Regions	4B All Regions	4D All Regions	Totals
Net Halibut proceeds	$199,733	$1,139,483	$1,303,127	$1,412,629	$456,641	$202,618	$116,613	$129,902	$4,960,746
Bycatch proceeds	$1,069	$14,358	$14,179	$11,274	$8,664	$4,088	$1,883	$837	$56,351
Office Expenses (prorated)	($28,078)	($60,446)	($32,758)	($72,925)	($45,042)	($23,983)	($17,354)	($13,259)	($293,845)
Vessel expenses	($474,325)	($920,311)	($584,018)	($1,227,766)	($776,582)	($408,393)	($415,706)	($223,876)	($5,030,978)
Net Per Reg Area	**($301,602)**	**$173,084**	**$700,530**	**$123,211**	**($356,318)**	**($225,671)**	**($314,564)**	**($106,396)**	**($307,726)**

Hal. Sale Proceeds	2A All Regions	2B All Regions	2C All Regions	3A All Regions	3B All Regions	4A All Regions	4B All Regions	4D All Regions	Totals
Number of charters regions	2	4	3	8	5	2	2	1	27
Number of stations	142.6	306.9	166.3	370.3	228.7	121.8	88.1	67.3	1,492
Standard skates fished	1140.5	1841.4	997.9	2221.6	1372.1	756.6	616.8	538.6	9,485
Average WPUE	30	78	200	106	59	52	42	54	83
Total pounds sold	34,439	143,668	199,966	235,106	81,510	39,387	25,787	29,234	789,098
Avg. price per pound	$5.80	$7.93	$6.52	$6.01	$5.60	$5.14	$4.52	$4.44	$ 6.29
Less fish sale taxes	$0	$0	$0	$7,365	$16,562	$6,877	$3,607	$4,018	38,428
Net Halibut Proceeds	$199,733	$1,139,483	$1,303,127	$1,412,629	$456,641	$202,618	$116,613	$129,902	$4,960,746

Vessel Expenses	2A All Regions	2B All Regions	2C All Regions	3A All Regions	3B All Regions	4A All Regions	4B All Regions	4D All Regions	Totals
Charter days	77	151	80	184	118	51	59	45	767
Sea Sampler salary	$ 32,329	$ 92,575	$ 49,727	$ 114,668	$ 73,699	$ 32,824	$ 37,832	$ 28,274	$ 461,927
Sea Sampler benefits	$ 958	$ 2,744	$ 1,474	$ 3,399	$ 2,184	$ 973	$ 1,121	$ 838	$ 13,692
Payroll taxes	$ 2,473	$ 7,082	$ 3,804	$ 8,772	$ 5,638	$ 2,511	$ 2,894	$ 2,163	$ 35,337
Vessel P&I	$ 2,649	$ 3,143	$ 1,380	$ 10,682	$ 7,985	$ 3,305	$ 6,054	$ 2,911	$ 38,108
Travel Expenses	$ 3,000	$ 7,850	$ 8,250	$ 24,000	$ 18,000	$ 11,200	$ 18,000	$ 5,600	$ 95,900
Lump sum payments	$ 317,520	$ 521,143	$ 294,699	$ 727,033	$ 498,150	$ 271,010	$ 282,838	$ 125,460	$ 3,037,852
Vessel share halibut/bycatch revenue	$ 20,439	$ 124,448	$ 137,402	$ 146,900	$ 49,996	$ 22,306	$ 12,603	$ 13,409	$ 527,502
Running bonus	$ -	$ -	$ -	$ -	$ 2,000	$ -	$ -	$ -	$ 2,000
Dockside Monitoring Fees	$ -	$ 5,887	$ 1,817	$ -	$ -	$ -	$ -	$ -	$ 7,704
Misc. expenses	$ 2,000	$ 4,000	$ 3,000	$ 8,000	$ 5,000	$ 2,000	$ 3,000	$ 1,000	$ 28,000
Bait inc. storage	$ 80,598	$ 130,132	$ 70,523	$ 156,998	$ 96,969	$ 53,470	$ 43,587	$ 38,060	$ 670,337
Ice	$ 1,000	$ 2,000	$ 1,500	$ 4,000	$ 2,500	$ 1,000	$ 1,200	$ 500	$ 13,700
Longline gear maint./replace	$ 10,789	$ 17,420	$ 9,440	$ 21,016	$ 12,980	$ 7,158	$ 5,835	$ 5,095	$ 89,732
Gear Allowance	$ 571	$ 1,887	$ 1,003	$ 2,300	$ 1,480	$ 637	$ 742	$ 567	$ 9,186
Total Vessel Expenses	***$ 474,325***	***$ 920,311***	***$ 584,018***	***$ 1,227,766***	***$ 776,582***	***$ 408,393***	***$ 415,706***	***$ 223,876***	***$ 5,030,978***

Office Expenses

Category	All Regions
Temporary Staff Salary	$5,598
Sea Sampler Training Salary	$7,200
Temporary Staff benefits	$1,025
Performance Bonus	$1,500
Payroll taxes	$979
Hiring Expenses	$2,000
Communications	$2,750
Express Shipping	$1,000
Bait & Gear Shipping	$78,500
Profiler Equipment (non-capital)	$1,400
Profiler Maintenance	$40,000
Bait Storage	$20,000
Profiler Contract	$21,218
Sea Sampler train/debrief	$52,000
Agency bycatch share	$28,175
Supervision Travel	$2,000
Survey gear/supplies	$28,500
Total Office Expenses	***$293,845***

NMFS Trawl Survey (P604)

Category	Budget
Temporary	$47,328
Medical	$750
Industrial Ins.	$143
Payroll Taxes	$3,621
Personnel Total	**$51,842**
Travel	$3,000
Communications	$400
Programs Total	**$3,400**
Field Supplies	$300
Gear Allowance	$900
Supplies Total	**$1,200**
Trawl Survey Total	***$56,442***

Detailed Expenses

Personnel	Expense	
Salaries		
Sea Samplers	$	516,455
Temporary Personnel	$	5,598
Benefits		
Sea Samplers Medical	$	14,442
Office Staff Medical	$	1,025
Industrial Insurance	$	143
Performance Bonus	$	1,500
Payroll Taxes		
Sea Samplers	$	38,958
Office Staff	$	979
Other		
Vessel P&I	$	38,108
Hiring Expenses	$	2,000
Total	**$**	**619,208**
Programs		
Travel		
Travel Expenses	$	100,900
Communications		
Phone Communications	$	3,150
Express Shipping	$	1,000
Shipping	$	78,500
SubTotal	$	82,650
Total	**$**	**183,550**
Administration		
Rentals & Contracts		
Lump Sum Contracts	$	3,037,852
Other Contracts	$	21,218
Gear Maintenance	$	40,000
Bait Storage	$	20,000
Training	$	52,000
Fees		
Revenue Share	$	527,502
Agency Bycatch Share	$	28,175
Running Bonus	$	2,000
Dockside Monitoring	$	7,704
Total	**$**	**3,736,452**
Supplies & Equipment		
Supplies		
Survey Supplies	$	28,800
Survey Bait	$	670,337
Ice	$	13,700
Gear Replacement	$	89,732
Gear Allowance	$	10,086
Misc. Expenses	$	28,000
Equipment		
Field Equipment	$	1,400
Total	**$**	**842,055**
SSA Program Total	**$**	**5,381,265**

TABLE 12. Other Research (2018)

FY2018 BUDGET
OTHER RESEARCH

On-going Projects

Item	621-16-00 Genetic Sex ID - Genome	642-00-00 ADEC/EPA Contaminants	650-18-00 Archival Tag - Geomag	661-11-00 *Ichthyophonus* Prevalance	673.13 Genome Sequencing	675.11 Tail Patterns	650.21 Area 4B PAT Tags	672.12 Condition Factor	669.11 Weights-at-sea	670-11-00 NMFS Trawl Tagging	Projects Sub-Total
PERSONNEL											
Salaries											
Temporary	$ -	$ -	$ -	$ -	$ -	$ -		$ -	$ -	$ -	$ -
Salary	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Personnel Subtotal	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
PROGRAMS											
Travel											
General Travel - Staff	$ -	$ 2,500	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 2,500
Travel	$ -	$ 2,500	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 2,500
Communications											
Express Mail	$ -	$ 2,500	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 2,500
Heavy Shipping	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Communications	$ -	$ 2,500	$ -	$ -	$ -	$ -	$ -		$ -	$ -	$ 2,500
Publications											
External Journals	$ -	$ -	$ -	$ -			$ 2,000	$ -	$ -	$ -	$ 2,000
Publications	$ -	$ -	$ -	$ -	$ -	$ -	$ 2,000	$ -	$ -	$ -	$ 2,000
Programs Subtotal	**$ -**	**$ 5,000**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 2,000**	**$ -**	**$ -**	**$ -**	**$ 7,000**
Administration											$ -
Contracts & Fees											
Vendor Contracts			$ -	$ 6,255	$ 30,000		$ 3,800	$ -	$ -	$ -	$ 40,055
Contracts & Leases	$ -	$ -	$ -	$ 6,255	$ 30,000	$ -	$ 3,800	$ -	$ -	$ -	$ 40,055
Administration Subtotal	**$ -**	**$ -**	**$ -**	**$ 6,255**	**$ 30,000**	**$ -**	**$ 3,800**	**$ -**	**$ -**	**$ -**	**$ 40,055**
Supplies & Equipment											$ -
Supplies											
Supplies	$ 33,928	$ 3,600	$ -	$ 2,500	$ 2,500	$ 3,100		$ -	$ -	$ 7,490	$ 53,118
Tag Recoveries	$ -	$ -	$ 800	$ -	$ -	$ -	$ 1,000	$ -	$ -	$ 5,350	$ 7,150
Bait	$ -	$ -	$ -	$ -				$ -	$ -	$ -	$ -
Supplies	$ 33,928	$ 3,600	$ 800	$ 2,500	$ 2,500	$ 3,100	$ 1,000	$ -	$ -	$ 12,840	$ 60,268
Equipment											
Field Equipment - Capital	$ -	$ -	$ -	$ -		$ 800		$ 9,116	$ 7,645	$ -	$ 17,561
Scientific Equipment - Capital	$ -	$ -	$ -	$ -				$ -	$ -	$ -	$ -
Equipment	$ -	$ -	$ -	$ -	$ -	$ 800		$ 9,116	$ 7,645	$ -	**$ 17,561**
Supplies & Equipment Subtotal	**$ 33,928**	**$ 3,600**	**$ 800**	**$ 2,500**	**$ 2,500**	**$ 3,900**	**$ 1,000**	**$ 9,116**	**$ 7,645**	**$ 12,840**	**$ 77,829**
Total	**$ 33,928**	**$ 8,600**	**$ 800**	**$ 8,755**	**$ 32,500**	**$ 3,900**	**$ 6,800**	**$ 9,116**	**$ 7,645**	**$ 12,840**	**$ 124,884**
Income											
Total Income	**$ -**	**$ -**	**$ -**	**$ -**						**$ -**	**$ -**
FY2016 Actuals	$ 93,853	$ 233	$ 3,000	$ 2,245						$ 2,562	$ 101,894
FY2016 Budget	$ 190,361	$ 4,900	$ 3,500	$ 500						$ 6,500	$ 205,761

TABLE 13. Other Research (2018)

FY2018 BUDGET
OTHER RESEARCH

New Projects

Item	Ongoing Projects Subtotal	673.14 Growth markers	672.13 DMR Classification	NEW Larval connectivity	674.11 Reproductive Cycle	NEW Thermal growth history	NEW Whale detection	NEW Captive holding	Projects Total
PERSONNEL									
Salaries									
Temporary	$ -	$ 21,401	$ 15,200	$ 20,000	$ 80,849	$ 3,780	$ -	$ -	$ 141,230
Salary	$ -	$ 21,401	$ 15,200	$ 20,000	$ 80,849	$ 3,780	$ -	$ -	$ 141,230
Benefits									
Medical	$ -	$ 4,280	$ 4,037	$ -	$ 18,670	$ 110			$ 27,097
Life Insurance	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Tuition	$ -	$ -	$ -	$ -	$ 17,597	$ -	$ -	$ -	$ 17,597
Benefits	$ -	$ 4,280	$ 4,037		$ 36,267	$ 110	$ -	$ -	$ 44,694
Personnel Subtotal	**$ -**	**$ 25,681**	**$ 19,237**	**$ 20,000**	**$ 117,116**	**$ 3,890**	**$ -**	**$ -**	**$ 185,924**
PROGRAMS									
Travel									
General Travel - Staff	$ 2,500	$ 2,050	$ 6,340	$ -	$ 23,800	$ 3,500	$ -	$ -	$ 38,190
Travel	$ 2,500	$ 2,050	$ 6,340	$ -	$ 23,800	$ 3,500	$ -	$ -	$ 38,190
Communications									
Express Mail	$ 2,500	$ 500	$ 5,440	$ -	$ -	$ 5,900	$ -	$ -	$ 14,340
Heavy Shipping	$ -		$ -	$ -	$ 2,000	$ -	$ -	$ -	$ 2,000
Communications	$ 2,500	$ 500	$ 5,440	$ -	$ 2,000	$ 5,900	$ -	$ -	$ 16,340
Publications									
External Journals	$ 2,000		$ -	$ -	$ 2,000	$ -	$ -	$ -	$ 4,000
Publications	$ 2,000		$ -	$ -	$ 2,000	$ -	$ -	$ -	$ 4,000
Programs Subtotal	**$ 7,000**	**$ 2,550**	**$ 11,780**	**$ -**	**$ 27,800**	**$ 9,400**	**$ -**	**$ -**	**$ 58,530**
Administration									$ -
Contracts & Fees									
Vendor Contracts	$ 40,055	$ 22,542	$ 140,713	$ -	$ 126,000	$ 14,000	$ 37,511	$ 30,000	$ 410,821
Vessel Revenue Share	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 2,318	$ 2,318
Contracts & Leases	$ 40,055	$ 22,542	$ 140,713	$ -	$ 126,000	$ 14,000	$ 37,511	$ 32,318	$ 413,139
Insurance									
General Liability Insurance	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 200	$ 200
Insurance	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 200	$ 200
Administration Subtotal	**$ 40,055**	**$ 22,542**	**$ 140,713**	**$ -**	**$ 126,000**	**$ 14,000**	**$ 37,511**	**$ 32,518**	**$ 413,339**
Supplies & Equipment									$ -
Supplies									
Supplies	$ 53,118	$ 7,000	$ 188,409	$ -	$ 12,000	$ 98,714	$ -	$ 45,000	$ 404,241
Tag Recoveries	$ 7,150		$ -	$ -	$ -	$ 10,000	$ -	$ -	$ 17,150
Bait	$ -		$ 21,300	$ -	$ 16,500	$ -	$ -	$ 3,650	$ 41,450
Gear Replacement	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 408	$ 408
Supplies	$ 60,268	$ 7,000	$ 209,709	$ -	$ 28,500	$ 108,714	$ -	$ 49,058	$ 463,249
Equipment									
Field Equipment - Capital	$ 17,561		$ -	$ -	$ 20,000	$ -	$ -	$ -	$ 37,561
Equipment	$ 17,561		$ -	$ -	$ 20,000	$ -	$ -	$ -	**$ 37,561**
Supplies & Equipment Subtotal	**$ 77,829**	**$ 7,000**	**$ 209,709**	**$ -**	**$ 48,500**	**$ 108,714**	**$ -**	**$ 49,058**	**$ 500,810**
Total	**$ 124,884**	**$ 57,773**	**$ 381,439**	**$ 20,000**	**$ 319,416**	**$ 136,004**	**$ 37,511**	**$ 81,576**	**$ 1,158,603**
Income									
US Federal Grant	$ -	$ 57,773	$ 255,402	$ -	$ -	$ -	$ -	$ -	$ 313,175
Halibut Sales	$ -	$ -	$ 125,000	$ -	$ 195,428	$ -	$ -	$ -	$ 320,428
Total Income	**$ -**	**$ 57,773**	**$ 380,402**		**$ 195,428**	**$ -**		**$ -**	**$ 633,603**
Net	**$ 124,884**	**$ -**	**$ 1,037**	**$ 20,000**	**$ 123,988**	**$ 136,004**	**$ 37,511**	**$ 81,576**	**$ 525,000**
FY2016 Actuals	$ 101,894		$ -		$ -	$ -			$ -
FY2016 Budget	$ 205,761		$ -	$ -	$ -	$ -			$ -

TABLE 1. Consolidated Statement

IPHC Income and Expenses

Consolidated General & Supplemental
FY2019 Budget
1 Oct. 2018 to 30 Sept. 2019

Income			***Expenses***		
Contributions			**Core IPHC Activities**		
United States	$	4,400,000	Administration	$	1,974,546
Canada	$	1,573,233	Scientific	$	3,595,200
			Catch Sampling	$	603,313
Fish Sales Income			**Survey Expenses**		
FISS Program	$	5,575,086	FISS Program	$	5,813,748
Other Research	$	43,428			
Other Income			**Research Activities**		
Grants & Contracts	$	598,488	Field Research	$	-
Interest Income	$	16,125	Other Research	$	698,265
Misc. Income	$	-			
			Transfer to Restricted Accounts	$	-
Total FY2019 Income	$	12,206,360	Total FY2019 Expenses	$	12,685,073

Total General & Supplemental FY2019	$	(478,713)
Total as % of Income		-3.9%
Unrestricted Funds Balance	$	2,716,075

International Pacific Halibut Commission

Income and Expenses - FY2019 Budget

	INCOME		**FY 2019**
General			
	Carry over from Prior FY	$	282,875
	US Contributions	$	4,400,000
	CDN Contributions	$	1,501,233
	CDN Pension Funding	$	72,000
	Interest	$	5,000
	Other income	$	-
	UW Lease Payments	$	-
	Current FY Income	$	5,978,233
	Appropriations Income Total	**$**	**6,261,108**
Supplemental			
	Supplemental Offset (fish sales, contracts, grants)	**$**	**6,718,777**
TOTAL INCOME		**$**	**12,979,885**

	EXPENSES		
Operations			
	Personnel	$	4,902,858
	Programs	$	464,830
	Administration	$	1,077,861
	Supplies	$	425,526
	Sub-total	$	6,871,075
FISS Program			
	Personnel	$	605,407
	Programs	$	190,470
	Vessels and Contracts	$	3,804,831
	Supplies	$	1,213,040
	Sub-total SSA Surveys	$	5,813,748
TOTAL EXPENSES		**$**	**12,684,823**
	GENERAL ACCOUNT CARRYOVER	**$**	**295,062**

Version	Date	Comments
0.9		Interim Meeting Draft
1.0		Annual Meeting Draft

TABLE 3. Other Accounts I & E

Expected Investment Rate	1.00%

Opening Fund Balance as of October 1, 2018

Restricted Accounts

Leave Liability (30)			Notes
Beginning Balance	$	62,348	
Interest Earned	$	623	
Expenses	$	-	
Funds Transferred	$	-	
Fund Balance	**$**	**61,791**	

Medical Annuitants (40)			
Beginning Balance	$	428,538	
Interest Earned	$	4,285	
Expenses	$	(86,002)	
Funds Transferred	$	-	Additional Funds
Fund Balance	**$**	**346,821**	

Reserve Account (50)			
Beginning Balance	$	1,000,000	
Interest Earned	$	10,000	
Expenses	$	-	
Funds Transferred	$	(10,000)	To Supplemental
Fund Balance	**$**	**1,000,000**	

Scholarship Account (60)			
Beginning Balance	$	249,759	
Interest Earned	$	2,498	
Expenses	$	-	
Funds Transferred	$	-	
Fund Balance	**$**	**252,257**	

Total Retricted Funds	**$**	**1,660,869**

Supplemental Account

Income	**Budget**	
Carryover		
Carryover from prior FY	$	2,911,913
Fish Sales		
Halibut Proceeds - FISS	$	5,518,735
Bycatch Proceeds - FISS	$	56,351
DMR Classification	$	-
Reproductive Cycle Project	$	43,428
Grants & Contracts		
NMFS - Sampling Grant	$	447,551
NMFS - Sablefish logbooks	$	-
NPRB - Growth Markers	$	74,118
SK- DMR Classification	$	30,719
DFO Rockfish Contract	$	34,520
WDFW Rockfish Contract	$	11,580
Other Income		
Misc. Income	$	-
Rollover from Reserve	$	10,000
Interest	$	1,125
Current FY Income	$	6,228,127
Income Total	$	9,140,040

Expenses	Budget	
Supplemental		
Administration	$	250
Transfer to Restricted Accounts	$	-
Sub-Total	$	250
Offset to General Account	$	6,718,777
Total Expenses	$	6,719,027
Balance	$	2,421,013

TABLE 4. Operations

International Pacific Halibut Commission

Fiscal Year Actuals and Budgets

Year 2019

	10 Administration	20 Scientific	30 Statistics	40 Field Experiments	60 Other Research	***Sub-Total***	50 FIS Survey	***Budget***	***Prior Year Budget***	***% of P.Y.Budget***
Personnel										
Related Expenses	$ 15,300	$ 1,800	$ 21,000	$ -	$ -	$ 38,100	$ 11,625	$ 49,725	$ 49,786	100%
Salaries	$ 563,788	$ 2,208,590	$ 345,794	$ -	$ 68,510	$ 3,186,681	$ 502,383	$ 3,689,064	$ 3,704,803	100%
Benefits	$ 463,189	$ 758,815	$ 72,978	$ -	$ 29,533	$ 1,324,515	$ 53,082	$ 1,377,597	$ 1,276,596	108%
Taxes	$ 39,463	$ 168,743	$ 20,657	$ -	$ -	$ 228,862	$ 38,317	$ 267,179	$ 262,230	102%
Other	$ 25,200	$ -	$ -	$ -	$ -	$ 25,200	$ -	$ 25,200	$ 25,200	100%
Contracted	$ -	$ 99,500	$ -	$ -	$ -	$ 99,500	$ -	$ 99,500	$ 49,750	200%
Subtotal	**$ 1,106,939**	**$ 3,237,447**	**$ 460,428**	**$ -**	**$ 98,043**	**$ 4,902,858**	**$ 605,407**	**$ 5,508,265**	**$ 5,368,365**	**103%**
Programs										
Meetings & Conferences	$ 189,000	$ 44,400	$ -	$ -	$ -	$ 233,400	$ -	$ 233,400	$ 236,650	99%
Travel	$ 58,390	$ 11,500	$ 46,000	$ -	$ 18,105	$ 133,995	$ 109,920	$ 243,915	$ 270,290	90%
Communications	$ 29,450	$ 300	$ 10,335	$ -	$ 13,600	$ 53,685	$ 80,550	$ 134,235	$ 136,935	98%
Publications	$ 21,000	$ 15,000	$ 1,750	$ -	$ 6,000	$ 43,750	$ -	$ 43,750	$ 41,750	105%
Subtotal	**$ 297,840**	**$ 71,200**	**$ 58,085**	**$ -**	**$ 37,705**	**$ 464,830**	**$ 190,470**	**$ 655,300**	**$ 685,625**	**96%**
Administration										
Contracts	$ 89,952	$ 204,712	$ 37,300	$ -	$ 182,286	$ 514,250	$ 3,114,716	$ 3,628,966	$ 3,838,993	95%
Maintenance	$ 114,433	$ 41,252	$ -	$ -	$ -	$ 155,685	$ -	$ 155,685	$ 195,642	80%
Facility Rentals	$ 284,882	$ -	$ 8,100	$ -	$ -	$ 292,982	$ 20,000	$ 312,982	$ 304,801	103%
Training & Education	$ 20,500	$ 21,600	$ 29,800	$ -	$ -	$ 71,900	$ 52,000	$ 123,900	$ 156,290	79%
Fees	$ 34,750	$ -	$ 5,600	$ -	$ 2,694	$ 43,044	$ 618,115	$ 661,159	$ 608,249	109%
Subtotal	**$ 544,517**	**$ 267,564**	**$ 80,800**	**$ -**	**$ 184,980**	**$ 1,077,861**	**$ 3,804,831**	**$ 4,882,692**	**$ 5,103,975**	**96%**
Supplies & Equipment										
Equipment	$ 5,000	$ 13,529	$ -	$ -	$ 800	$ 19,329	$ -	$ 19,329	$ 119,190	16%
Supplies	$ 20,000	$ 5,460	$ 4,000	$ -	$ 376,737	$ 406,197	$ 1,213,040	$ 1,619,237	$ 1,323,018	122%
Subtotal	**$ 25,000**	**$ 18,989**	**$ 4,000**	**$ -**	**$ 377,537**	**$ 425,526**	**$ 1,213,040**	**$ 1,638,566**	**$ 1,442,208**	**114%**
Prior FY Expenses	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**		**$ -**	**$ -**	**0%**
Grand Total	**$ 1,974,296**	**$ 3,595,200**	**$ 603,313**	**$ -**	**$ 698,265**	**$ 6,871,075**	**$ 5,813,748**	**$ 12,684,823**	**$ 12,600,173**	**101%**
Prior FY Budget	$ 1,936,871	$ 3,525,190	$ 598,244	$ -	$ 1,158,603	$ 7,218,908	$ 5,381,265			
% of P.Y. Budget	102%	102%	101%	n/a	60%	95%	108%			

TABLE 5. Personnel Summary

Item	10 Administration	2x Scientific	30 Statistics	60 Other Research	Subtotal	50 FIS Survey	Personnel Budget	Prior Fiscal Yr Budget	% of P.Y.Budget
Personnel Related Expenses									
Vehicle Mileage Reimbursed	$ -	$ -	$ 9,350	$ -	$ 9,350	$ -	$ 9,350	$ 9,350	100%
Hiring Expenses	$ 10,000	$ -	$ 9,000	$ -	$ 19,000	$ 2,000	$ 21,000	$ 21,000	100%
Employee Separation Expenses	$ 5,000	$ -	$ -	$ -	$ 5,000	$ -	$ 5,000	$ 5,000	100%
Gear Allowance	$ 300	$ 1,800	$ 2,650	$ -	$ 4,750	$ 9,625	$ 14,375	$ 14,436	100%
Subtotal	15,300	$ 1,800	$ 21,000	$ -	$ 38,100	$ 11,625	$ 49,725	$ 49,786	100%
Salaries									
Salary - Full-Time	$ 556,288	$ 2,142,946	$ -	$ -	$ 2,699,233	$ -	$ 2,699,233	$ 2,633,398	103%
Part-Time Salary	$ -	$ -	$ 325,484	$ -	$ 325,484	$ -	$ 325,484	$ 317,307	103%
AK Cola	$ -	$ -	$ 18,309	$ -	$ 18,309	$ -	$ 18,309	$ 17,863	103%
Temporary Pay	$ -	$ 62,844	$ -	$ 68,510	$ 131,354	$ 488,063	$ 619,417	$ 706,037	88%
Hourly Pay	$ 5,000	$ -	$ 500	$ -	$ 5,500	$ 12,820	$ 18,320	$ 11,098	165%
Sea Duty Pay	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	n/a
Port Duty Pay	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 10,900	0%
On-Call Duty Pay	$ -	$ 2,800	$ -	$ -	$ 2,800	$ -	$ 2,800	$ 2,700	104%
Performance Bonus	$ 2,500	$ -	$ 1,500	$ -	$ 4,000	$ 1,500	$ 5,500	$ 5,500	100%
Subtotal	**$ 563,788**	**$ 2,208,590**	**$ 345,794**	**$ 68,510**	**$ 3,186,681**	**$ 502,383**	**$ 3,689,064**	**$ 3,704,803**	**100%**
Benefits									
Medical Benefits	$ 135,570	$ 464,149	$ 60,669	$ 11,056	$ 671,444	$ 14,831	$ 686,275	$ 651,137	105%
Pension	$ 25,264	$ 51,527	$ -	$ -	$ 76,791	$ -	$ 76,791	$ 71,144	108%
403(b) - Base Contribution	$ 27,519	$ 132,444	$ -	$ -	$ 159,963	$ -	$ 159,963	$ 152,406	105%
403(b) - Matching Contribution	$ 15,725	$ 75,682	$ -	$ -	$ 91,408	$ -	$ 91,408	$ 87,089	105%
Pension Shortfall Contributions	$ 239,508	$ -	$ -	$ -	$ 239,508	$ -	$ 239,508	$ 203,508	118%
Life Insurance	$ 2,695	$ 10,969	$ 2,082	$ -	$ 15,746	$ -	$ 15,746	$ 15,282	103%
AD&D Insurance	$ 289	$ 1,176	$ 439	$ -	$ 1,903	$ -	$ 1,903	$ 1,638	116%
Cancer Care Insurance	$ 3,655	$ 13,855	$ 2,444	$ -	$ 19,955	$ -	$ 19,955	$ 15,003	133%
BC Workers Compensation	$ -	$ -	$ 620	$ -	$ 620	$ -	$ 620	$ 183	338%
Accident Indemnity	$ 1,963	$ 9,012	$ 2,225	$ -	$ 13,200	$ 143	$ 13,343	$ 13,001	103%
Employee Parking	$ -	$ -	$ -	$ -	$ -	$ -	$ -		n/a
Tuition Benefit	$ 5,000	$ -	$ -	$ 18,477	$ 23,477	$ -	$ 23,477	$ 17,597	133%
Housing Allowance Benefit	$ -	$ -	$ 4,500	$ -	$ 4,500	$ -	$ 4,500	$ 4,500	100%
Travel & Accident Insurance	$ 6,000	$ -	$ -	$ -	$ 6,000	$ -	$ 6,000	$ 6,000	100%
Vessel P&I Insurance	$ -	$ -	$ -	$ -	$ -	$ 38,108	$ 38,108	$ 38,108	100%
Subtotal	**$ 463,189**	**$ 758,815**	**$ 72,978**	**$ 29,533**	**$ 1,324,515**	**$ 53,082**	**$ 1,377,597**	**$ 1,276,596**	**108%**
Taxes									
Social Security	$ 39,463	$ 168,743	$ 20,657	$ -	$ 228,862	$ 38,317	$ 267,179	$ 262,230	102%
Subtotal	**$ 39,463**	**$ 168,743**	**$ 20,657**	**$ -**	**$ 228,862**	**$ 38,317**	**$ 267,179**	**$ 262,230**	**102%**
Other									
Legal Fees	$ 5,000	**$ -**	**$ -**	**$ -**	$ 5,000	$ -	$ 5,000	$ 5,000	100%
Consultation	$ 10,000	**$ -**	**$ -**	**$ -**	$ 10,000	$ -	$ 10,000	$ 10,000	100%
Cobra TPA	$ 2,000	$ -	$ -	$ -	$ 2,000	$ -	$ 2,000	$ 2,000	100%
Section 125/132 Plan TPA	$ 5,000	$ -	$ -	$ -	$ 5,000	$ -	$ 5,000	$ 5,000	100%
Defined Benefit TPA	$ 3,200	$ -	$ -	$ -	$ 3,200	$ -	$ 3,200	$ 3,200	100%
Subtotal	**$ 25,200**	**$ -**	**$ -**	**$ -**	**$ 25,200**	**$ -**	**$ 25,200**	**$ 25,200**	**100%**
Contracted									
Contracted Employees	$ -	$ 99,500	$ -	$ -	$ 99,500	$ -	$ 99,500	$ 49,750	200%
Subtotal	**$ -**	**$ 99,500**	**$ -**	**$ -**	**$ 99,500**	**$ -**	**$ 99,500**	**$ 49,750**	**200%**
Grand Total	**$ 1,106,939**	**$ 3,237,447**	**$ 460,428**	**$ 98,043**	**$ 4,902,858**	**$ 605,407**	**$ 5,508,265**	**$ 5,368,365**	**103%**
Prior FY Budget	$ 1,036,828	$ 3,058,720	$ 457,599	$ 185,924	$ 4,739,071	$ 629,294			
% P.Y. of Budget	107%	106%	101%	53%	103%	96%			

TABLE 6. Programs

Item	10 Administration	2x Scientific	30 Statistics	40 Field Exp.	60 Other Research	Sub-Totals	50 FIS Survey	Operations Budget	Prior Fiscal Year Budget	% of P.Y. Budget
Meetings & Conferences										
Interim Meeting	$ 12,000	$ -	$ -	$ -	$ -	$ 12,000	$ -	$ 12,000	$ 12,000	100%
Annual Meeting	$ 55,000	$ -	$ -	$ -	$ -	$ 55,000	$ -	$ 55,000	$ 55,000	100%
Research Advisory Board	$ 5,500	$ -	$ -	$ -	$ -	$ 5,500	$ -	$ 5,500	$ 5,500	100%
Scholarship Committee	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 750	0%
MSAB Meetings	$ 40,000	$ -	$ -	$ -	$ -	$ 40,000	$ -	$ 40,000	$ 40,000	100%
SRB Meetings	$ 35,000	$ -	$ -	$ -	$ -	$ 35,000	$ -	$ 35,000	$ 35,000	100%
U.S. Council	$ 15,000	$ -	$ -	$ -	$ -	$ 15,000	$ -	$ 15,000	$ 15,000	100%
HAB - Canada	$ 1,500	$ -	$ -	$ -	$ -	$ 1,500	$ -	$ 1,500	$ 1,500	100%
Workshops/Retreat	$ 5,000	$ -	$ -	$ -	$ -	$ 5,000	$ -	$ 5,000	$ 5,000	100%
Scientific Meeting & Symposia	$ -	$ 44,400	$ -	$ -	$ -	$ 44,400	$ -	$ 44,400	$ 44,400	100%
Scientific Meeting Support	$ 10,000	$ -	$ -	$ -	$ -	$ 10,000	$ -	$ 10,000	$ 12,500	80%
Local & Trade Show	$ 10,000	$ -	$ -	$ -	$ -	$ 10,000	$ -	$ 10,000	$ 10,000	100%
Subtotal	**$ 189,000**	**$ 44,400**	**$ -**	**$ -**	**$ -**	**$ 189,000**	**$ -**	**$ 189,000**	**$ 192,250**	98%
Travel										
General Travel - Staff	$ 11,000	$ 11,500	$ 14,000	$ -	$ 18,105	$ 54,605	$ 109,920	$ 164,525	$ 175,590	94%
On Job Training Travel	$ -	$ -	$ 21,000	$ -	$ -	$ 21,000	$ -	$ 21,000	$ 21,000	100%
Follow-up Travel	$ -	$ -	$ 11,000	$ -	$ -	$ 11,000	$ -	$ 11,000	$ 11,000	100%
General Travel - Director	$ 47,390	$ -	$ -	$ -	$ -	$ 47,390	$ -	$ 47,390	$ 62,700	76%
Subtotal	**$ 58,390**	**$ 11,500**	**$ 46,000**	**$ -**	**$ 18,105**	**$ 122,495**	**$ 109,920**	**$ 232,415**	**$ 258,790**	90%
Communications										
Phone Tolls	$ 7,000	$ -	$ -	$ -	$ -	$ 7,000	$ -	$ 7,000	$ 7,000	100%
Long Distance	$ 750	$ -	$ 625	$ -	$ -	$ 1,375	$ 3,150	$ 4,525	$ 4,525	100%
Reimbursed Communications	$ 3,500	$ -	$ 6,360	$ -	$ -	$ 9,860	$ -	$ 9,860	$ 7,670	129%
Internet Service	$ 2,500	$ -	$ -	$ -	$ -	$ 2,500	$ -	$ 2,500	$ 2,500	100%
Postage	$ 10,000	$ -	$ 2,100	$ -	$ -	$ 12,100	$ -	$ 12,100	$ 12,100	100%
Mail Prep Services	$ 950	$ 300	$ 1,250	$ -	$ 6,500	$ 9,000	$ -	$ 9,000	$ 16,890	53%
Express Mail	$ -	$ -	$ -	$ -	$ 7,100	$ 7,100	$ 1,000	$ 8,100	$ 3,000	270%
Heavy Shipping	$ 4,750	$ -	$ -	$ -	$ -	$ 4,750	$ 76,400	$ 81,150	$ 83,250	97%
Subtotal	**$ 29,450**	**$ 300**	**$ 10,335**	**$ -**	**$ 13,600**	**$ 53,385**	**$ 80,550**	**$ 134,235**	**$ 136,935**	98%
Publications										
Annual Report	$ 14,000	$ -	$ -	$ -	$ -	$ 14,000	$ -	$ 14,000	$ 14,000	100%
Regulations	$ 5,000	$ -	$ -	$ -	$ -	$ 5,000	$ -	$ 5,000	$ 5,000	100%
Blue Book	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	n/a
RARA Report	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	n/a
IPHC Publications	$ -	$ 15,000	$ -	$ -	$ -	$ 15,000	$ -	$ 15,000	$ 15,000	100%
External Journals	$ -	$ -	$ -	$ -	$ 6,000	$ 6,000	$ -	$ 6,000	$ 4,000	150%
Misc. Printing	$ 2,000	$ -	$ -	$ -	$ -	$ 2,000	$ -	$ 2,000	$ 2,000	100%
Logbooks	$ -	$ -	$ 1,750	$ -	$ -	$ 1,750	$ -	$ 1,750	$ 1,750	100%
Subtotal	**$ 21,000**	**$ 15,000**	**$ 1,750**	**$ -**	**$ 6,000**	**$ 43,750**	**$ -**	**$ 43,750**	**$ 41,750**	105%
Grand Total	**$ 297,840**	**$ 71,200**	**$ 58,085**	**$ -**	**$ 37,705**	**$ 408,630**	**$ 190,470**	**$ 599,100**	**$ 629,425**	95%
Prior FY Budget	$ 316,450	$ 71,200	$ 55,895	$ -	$ 58,530	$ 445,875	$ 183,550			
% of P.Y. Budget	94%	100%	104%	n/a	64%	92%	104%			

TABLE 7. Administration

Item	10 Administration	20 Scientific	30 Statistics	40 Field Exp.	60 Other Research	Sub-Totals	50 SSA Surveys	Operations Budget	Prior Fiscal Year Budget	% of P.Y. Budget
Contracts										
Leased Vehicle Fees	$ 4,000	$ -	$ 17,250	$ -	$ -	$ 21,250	$ -	$ 21,250	$ 21,250	100%
Software Leases	$ 20,952	$ 19,387	$ 4,800	$ -	$ -	$ 45,139	$ -	$ 38,067	$ 38,067	100%
Vendor Contracts	$ 65,000	$ 185,325	$ 15,250	$ -	$ 182,286	$ 447,861	$ 3,114,716	$ 3,340,571	$ 3,340,571	100%
Subtotal	**$ 89,952**	**$ 204,712**	**$ 37,300**	**$ -**	**$ 182,286**	**$ 514,250**	**$ 3,114,716**	**$ 3,628,966**	**$ 3,838,993**	95%
Maintenance										
Copier Maintenance	$ 2,000	$ -	$ -	$ -	$ -	$ 2,000	$ -	$ 2,000	$ 2,000	100%
Equipment Maintenance	$ -	$ 41,252	$ -	$ -	$ -	$ 41,252	$ -	$ 41,252	$ 83,952	49%
Vehicle Maintenance	$ 250	$ -	$ -	$ -	$ -	$ 250	$ -	$ 250	$ 250	100%
Building Maintenance	$ 94,183	$ -	$ -	$ -	$ -	$ 94,183	$ -	$ 94,183	$ 91,440	103%
Building Utilities	$ 18,000	$ -	$ -	$ -	$ -	$ 18,000	$ -	$ 18,000	$ 18,000	100%
Subtotal	**$ 114,433**	**$ 41,252**	**$ -**	**$ -**	**$ -**	**$ 155,685**	**$ -**	**$ 155,685**	**$ 195,642**	80%
Facility Rentals										
Field Office Rental	$ -	$ -	$ 8,100	$ -	$ -	$ 8,100	$ -	$ 8,100	$ 8,100	100%
Archival Storage Rental	$ 4,000	$ -	$ -	$ -	$ -	$ 4,000	$ -	$ 4,000	$ 4,000	100%
Bait Storage	$ -	$ -	$ -	$ -	$ -	$ -	$ 20,000	$ 20,000	$ 20,000	100%
Office Lease	$ 266,665	$ -	$ -	$ -	$ -	$ 266,665	$ -	$ 266,665	$ 258,898	103%
Storage Lease	$ 14,217	$ -	$ -	$ -	$ -	$ 14,217	$ -	$ 14,217	$ 13,803	103%
Subtotal	**$ 284,882**	**$ -**	**$ 8,100**	**$ -**	**$ -**	**$ 292,982**	**$ 20,000**	**$ 312,982**	**$ 304,801**	103%
Training & Education										
Field Staff Orientation	$ -	$ -	$ 21,300	$ -	$ -	$ 21,300	$ 52,000	$ 73,300	$ 73,300	100%
Management Training	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 20,000	0%
Skill Training	$ -	$ 18,100	$ 8,500	$ -	$ -	$ 26,600	$ -	$ 26,600	$ 38,990	68%
Fisheries Journals	$ 2,500	$ 2,000	$ -	$ -	$ -	$ 4,500	$ -	$ 4,500	$ 4,500	100%
Professional Journals	$ 18,000	$ 1,500	$ -	$ -	$ -	$ 19,500	$ -	$ 19,500	$ 19,500	100%
Subtotal	**$ 20,500**	**$ 21,600**	**$ 29,800**	**$ -**	**$ -**	**$ 71,900**	**$ 52,000**	**$ 123,900**	**$ 156,290**	79%
Fees										
Audit	$ 8,000	$ -	$ -	$ -	$ -	$ 8,000	$ -	$ 8,000	$ 8,000	100%
Bank Charges	$ 8,000	$ -	$ -	$ -	$ -	$ 8,000	$ -	$ 8,000	$ 8,000	100%
Vehicle Insurance	$ 4,250	$ -	$ 5,600	$ -	$ -	$ 9,850	$ -	$ 9,850	$ 9,850	100%
General Liability Insurance	$ 5,500	$ -	$ -	$ -	$ 214	$ 5,714	$ -	$ 5,714	$ 5,700	100%
Bonding	$ 500	$ -	$ -	$ -	$ -	$ 500	$ -	$ 500	$ 500	100%
Customs	$ 1,000	$ -	$ -	$ -	$ -	$ 1,000	$ -	$ 1,000	$ 1,000	100%
Misc. Consultation	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 7,500	0%
Legal Fees	$ 7,500	$ -	$ -	$ -	$ -	$ 7,500	$ -	$ 7,500	$ 529,820	1%
Vessel Revenue Share	$ -	$ -	$ -	$ -	$ 2,480	$ 2,480	$ 583,301	$ 585,781	$ 28,175	2079%
Agency Revenue Share	$ -	$ -	$ -	$ -	$ -	$ -	$ 28,175	$ 28,175	$ -	n/a
Running Bonus	$ -	$ -	$ -	$ -	$ -	$ -	$ 2,000	$ -	$ -	n/a
Realized Gain/loss	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	n/a
Dockside Monitoring	$ -	$ -	$ -	$ -	$ -	$ -	$ 4,639	$ 4,639	$ 7,704	60%
Subtotal	**$ 34,750**	**$ -**	**$ 5,600**	**$ -**	**$ 2,694**	**$ 43,044**	**$ 618,115**	**$ 659,159**	**$ 606,249**	109%
Grand Total	**$ 544,517**	**$ 267,564**	**$ 80,800**	**$ -**	**$ 184,980**	**$ 1,077,861**	**$ 3,804,831**	**$ 4,882,692**	**$ 5,103,975**	96%
Prior FY Budget	$ 558,593	$ 314,841	$ 80,750	$ -	$ 413,339	$ 1,367,523	$ 3,736,452			
% of P.Y.Budget	97%	85%	100%	n/a	45%	79%	102%			

TABLE 8. Supplies & Equipment

Item	10 Administration	20 Scientific	30 Statistics	40 Field Exp.	60 Other Research	Sub-Totals	50 SSA Surveys	Budget	Prior Fiscal Year Budget	% of P.Y. Actuals
Equipment										
Computer Equipment - Replace	$ -	$ 7,400	$ -	$ -	$ -	$ 7,400	$ -	$ 7,400	$ 7,400	100%
Computer Equipment - Long Term	$ -	$ 5,900	$ -	$ -	$ -	$ 5,900	$ -	$ 5,900	$ 17,600	34%
Field Equipment - Capital	$ -	$ -	$ -	$ -	$ 800	$ 800	$ -	$ 800	$ 37,561	2%
Field Equipment - non-Capital	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,400	0%
Scientific Equipment - Capital	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 50,000	0%
Scientific Equipment - non-Capital	$ -	$ 229	$ -	$ -	$ -	$ 229	$ -	$ 229	$ 229	100%
Office Equipment - Capital	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	n/a
Office Equipment - non-Capital	$ 5,000	$ -	$ -	$ -	$ -	$ 5,000	$ -	$ 5,000	$ 5,000	100%
SubTotal	**$ 5,000**	**$ 13,529**	**$ -**	**$ -**	**$ 800**	**$ 19,329**	**$ -**	**$ 19,329**	**$ 119,190**	16%
Supplies										
Supplies	$ 20,000	$ 5,460	$ 4,000	$ -	$ 336,171	$ 365,631	$ 27,300	$ 392,931	$ 462,241	85%
Tag Recoveries	$ -	$ -	$ -	$ -	$ 31,725	$ 31,725	$ -	$ 31,725	$ 17,150	185%
Bait	$ -	$ -	$ -	$ -	$ 8,405	$ 8,405	$ 1,018,882	$ 1,027,287	$ 711,787	144%
Ice	$ -	$ -	$ -	$ -	$ -	$ -	$ 16,200	$ 16,200	$ 13,700	118%
Gear Replacement	$ -	$ -	$ -	$ -	$ 436	$ 436	$ 113,658	$ 114,094	$ 90,140	127%
Misc. Expenses	$ -	$ -	$ -	$ -	$ -	$ -	$ 37,000	$ 37,000	$ 28,000	132%
SubTotal	**$ 20,000**	**$ 5,460**	**$ 4,000**	**$ -**	**$ 376,737**	**$ 406,197**	**$ 1,213,040**	**$ 1,619,237**	**$ 1,323,018**	122%
Grand Total	**$ 25,000**	**$ 18,989**	**$ 4,000**	**$ -**	**$ 377,537**	**$ 425,526**	**$ 1,213,040**	**$ 1,638,566**	**$ 1,442,208**	114%
Prior FY Budget	$ 25,000	$ 80,429	$ 4,000	$ -	$ 500,810	$ 610,239	$ 831,969			
% of P.Y. Budget	100%	24%	100%	n/a	75%	70%	146%			

Catch Effort Program

	51-53	00	64	61-63	00	82	71-92	00 12	81					
		WA/OR/CA			Canada			Alaska		Grand	Prior Yr	% of	2017	% of
	Ports	General	Total	Ports	General	Total	Ports	General	Total	Total	Budget	Budget	Actuals	Actuals
Salaries and Benefits														
Part-Time Salary	$ -	$ -	$ -	$ 57,483	$ -	$ 57,483	$ 267,756	$ -	$ 267,756	$ 325,239	$ 333,545	98%	$ 336,755	97%
AK Cola	$ -	$ -	$ -	$ -	$ -	$ -	$ 18,309	$ -	$ 18,309	$ 18,309	$ 17,871	102%	$ 15,061	122%
Port Premium Pay	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	n/a	$ -	n/a
Temporary	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	n/a	$ -	n/a
Hourly	$ 500	$ -	$ 500	$ -	$ -	$ -	$ -	$ -	$ -	$ 500	$ 500	100%	$ 1,348	37%
Port Duty	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 13,400	0%	$ 1,148	0%
Medical Benefits	$ -	$ -	$ -	$ 12,958	$ -	$ 12,958	$ 47,710	$ -	$ 47,710	$ 60,669	$ 61,933	98%	$ 52,740	115%
Life Insurance	$ -	$ -	$ -	$ 348	$ -	$ 348	$ 1,732	$ -	$ 1,732	$ 2,080	$ 2,128	98%	$ 1,579	132%
AD&D	$ 144	$ -	$ 144	$ 37	$ -	$ 37	$ 186	$ -	$ 186	$ 367	$ 228	161%	$ 170	216%
BC Workers Comp.	$ 216	$ 72	$ 288	$ 260	$ -	$ 260	$ 72	$ -	$ 72	$ 620	$ 179	346%	$ 257	241%
Accident Indemnity	$ -	$ -	$ -	$ 475	$ -	$ 475	$ 1,750	$ -	$ 1,750	$ 2,225	$ 2,439	91%	$ 2,551	87%
Cancer Care	$ -	$ -	$ -	$ 393	$ -	$ 393	$ 1,445	$ -	$ 1,445	$ 1,838	$ -	n/a	$ -	n/a
Performance Bonus	$ -	$ -	$ -	$ -	$ 500	$ 500	$ -	$ 1,000	$ 1,000	$ 1,500	$ 1,500	100%	$ -	n/a
Housing Allowance	$ -	$ -	$ -	$ -	$ -	$ -	$ 4,500	$ -	$ 4,500	$ 4,500	$ 4,500	100%	$ 4,000	113%
Social Security	$ 200	$ -	$ 200	$ -	$ -	$ -	$ 20,457	$ -	$ 20,457	$ 20,657	$ 21,486	96%	$ 18,109	114%
Hiring Expenses	$ -	$ -	$ -	$ -	$ 3,000	$ 3,000	$ -	$ 6,000	$ 6,000	$ 9,000	$ 9,000	100%	$ 708	1271%
Employee Separation Expenses	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	n/a	$ -	n/a
Subtotal - Salary and Benefits	$ 1,060	$ 72	$ 1,132	$ 71,954	$ 3,500	$ 75,454	$ 363,917	$ 7,000	$ 370,917	$ 447,503	$ 460,861	97%	$ 417,101	107%
Programs														
General Travel - Staff	$ 3,000	$ -	$ 3,000	$ -	$ -	$ -	$ 7,000	$ 4,000	$ 11,000	$ 14,000	$ 21,000	67%	$ 5,541	253%
On Job Training Travel	$ 1,500	$ -	$ 1,500	$ -	$ 6,500	$ 6,500	$ -	$ 13,000	$ 13,000	$ 21,000	$ 17,500	120%	$ 17,603	119%
Follow-up Travel	$ -	$ -	$ -	$ -	$ 3,000	$ 3,000	$ -	$ 8,000	$ 8,000	$ 11,000	$ 9,000	122%	$ 10,855	101%
Long Distance	$ -	$ -	$ -	$ -	$ 200	$ 200	$ -	$ 425	$ 425	$ 625	$ 545	115%	$ 488	128%
Comm Allow - Port	$ -	$ -	$ -	$ 1,360	$ -	$ 1,360	$ 5,000	$ -	$ 5,000	$ 6,360	$ 7,280	87%	$ 2,184	291%
USPS Postage	$ -	$ 100	$ 100	$ -	$ 1,000	$ 1,000	$ -	$ 1,000	$ 1,000	$ 2,100	$ 3,100	68%	$ 859	244%
Express Mail	$ -	$ 50	$ 50	$ -	$ 200	$ 200	$ -	$ 1,000	$ 1,000	$ 1,250	$ 2,250	56%	$ 993	126%
Logbooks	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,750	$ 1,750	$ 1,750	$ 1,750	100%	$ 3,495	50%
Subtotal - Programs	$ 4,500	$ 150	$ 4,650	$ 1,360	$ 10,900	$ 12,260	$ 12,000	$ 29,175	$ 41,175	$ 58,085	$ 62,425	93%	$ 42,018	138%
Administration														
Leased Vehicle Fees	$ -	$ -	$ -	$ -	$ -	$ -	$ 17,250	$ -	$ 17,250	$ 17,250	$ 21,000	82%	$ 13,083	132%
Vehicle Mileage Reimbursed	$ -	$ -	$ -	$ 3,850	$ -	$ 3,850	$ 5,500	$ -	$ 5,500	$ 9,350	$ 11,850	79%	$ 9,495	98%
Software Leases	$ -	$ -	$ -	$ -	$ 1,800	$ 1,800	$ -	$ 3,000	$ 3,000	$ 4,800	$ 2,800	171%	$ 4,544	106%
Vendor Contracts	$ -	$ -	$ -	$ -	$ 250	$ 250	$ -	$ 15,000	$ 15,000	$ 15,250	$ 45,000	34%	$ 8,995	170%
Field Office Rental	$ -	$ -	$ -	$ -	$ 1,800	$ 1,800	$ 8,100	$ -	$ 8,100	$ 9,900	$ 5,700	174%	$ 3,205	309%
Field Staff Orientation	$ -	$ 300	$ 300	$ -	$ 4,000	$ 4,000	$ -	$ 17,000	$ 17,000	$ 21,300	$ 25,300	84%	$ 22,513	95%
Skill Training	$ -	$ -	$ -	$ -	$ 1,000	$ 1,000	$ -	$ 7,500	$ 7,500	$ 8,500	$ 12,650	67%	$ 3,034	280%
Vehicle Insurance	$ -	$ -	$ -	$ -	$ -	$ -	$ 5,600	$ -	$ 5,600	$ 5,600	$ 7,050	79%	$ 5,585	100%
Customs	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	n/a	$ 32	0%
Area 4 Clearances	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	n/a	$ -	n/a
Subtotal - Administration	$ -	$ 300	$ 300	$ 3,850	$ 8,850	$ 12,700	$ 36,450	$ 42,500	$ 78,950	$ 91,950	$ 131,350	70%	$ 70,486	130%
Supplies and Equipment														
Field Equipment - Non-Capital	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	n/a	$ 8,915	0%
Office Equipment - Non-Capital	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	n/a	$ -	n/a
Supplies	$ -	$ 400	$ 400	$ -	$ 800	$ 800	$ -	$ 2,800	$ 2,800	$ 4,000	$ 5,800	69%	$ 9,312	43%
Gear Allowance	$ 200	$ -	$ 200	$ 400	$ -	$ 400	$ 2,050	$ -	$ 2,050	$ 2,650	$ 3,050	87%	$ 1,704	156%
Subtotal - Supplies and Equipment	$ 200	$ 400	$ 600	$ 400	$ 800	$ 1,200	$ 2,050	$ 2,800	$ 4,850	$ 6,650	$ 8,850	75%	$ 19,931	33%
Prior Fiscal Year Expense	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	n/a	$ -	n/a
Catch Effort Program Totals	$ 5,760	$ 922	$ 6,682	$ 77,564	$ 24,050	$ 101,614	$ 414,417	$ 81,475	$ 495,892	$ 604,188	$ 663,486	91%	$ 549,537	110%

Catch Effort Program - by ports

Dept		Bellingham	Petersburg	Sitka	Juneau	Seward	Homer	Kodiak	Sandpoint	Dutch Harbor	St. Paul	AK Total
30	**Grant ID**	81	81	81	81	81	81	81	81	81	81	
	Port ID	61	71	72	73	81	82	83	89	91	92	
	U.S Ports											
5121	Part-Time Salary	$ -	$ 39,568	$ 36,359	$ 37,429	$ 35,289	$ 39,568	$ 35,289	$ -	$ 33,149	$ 11,105	$ 267,756
5122	AK Cola	$ -	$ 2,706	$ 2,486	$ 2,559	$ 2,413	$ 2,706	$ 2,413	$ -	$ 2,267	$ 759	$ 18,309
5123	Port Premium Pay	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
5131	Temporary	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
5132	Hourly	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
5142	Port Duty	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
5211	Medical	$ -	$ 5,399	$ 5,399	$ 5,399	$ 5,399	$ 5,399	$ -	$ -	$ 5,399	$ 1,963	$ 34,359
5212	Medical Reimbursement	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
5214	HRA Expenses	$ -	$ 1,080	$ 1,080	$ 1,080	$ 1,080	$ 1,080	$ 6,479	$ -	$ 1,080	$ 393	$ 13,351
5215	Medical Benefit (Taxable)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
5231	Life Insurance	$ -	$ 256	$ 235	$ 242	$ 228	$ 256	$ 228	$ -	$ 214	$ 72	$ 1,732
5232	AD&D	$ -	$ 27	$ 25	$ 26	$ 24	$ 27	$ 24	$ -	$ 23	$ 8	$ 186
5241	BC Workers Comp.	$ 72	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 72
5242	Accident Indemnity	$ -	$ 238	$ 238	$ 238	$ 238	$ 238	$ 238	$ -	$ 238	$ 86	$ 1,750
5243	Cancer Care	$ -	$ 196	$ 196	$ 196	$ 196	$ 196	$ 196	$ -	$ 196	$ 71	$ 1,445
5254	Housing Allowance	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 4,500	$ -	$ 4,500
5311	Social Security	$ -	$ 3,023	$ 2,778	$ 2,860	$ 2,696	$ 3,023	$ 2,696	$ -	$ 2,533	$ 848	$ 20,457
	Salary and Benefits	**$ 72**	**$ 52,493**	**$ 48,797**	**$ 50,029**	**$ 47,564**	**$ 52,493**	**$ 47,564**	**$ -**	**$ 49,599**	**$ 15,306**	$ 363,917
6211	General Travel - Staff	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 7,000	$ 7,000
6313	Comm Allow - Port	$ -	$ 680	$ 680	$ 680	$ 680	$ 680	$ 680	$ 120	$ 680	$ 120	$ 5,000
7111	Leased Vehicle Fees	$ -	$ -	$ -	$ 4,000	$ 4,000	$ -	$ 5,000	$ -	$ 4,250	$ -	$ 17,250
7112	Vehicle Mileage Reimbursed	$ -	$ 500	$ 2,000	$ -	$ -	$ 3,000	$ -	$ -	$ -	$ -	$ 5,500
7311	Field Office Rental	$ -	$ -	$ 2,400	$ 2,400	$ -	$ 3,300	$ -	$ -	$ -	$ -	$ 8,100
7513	Vehicle Insurance	$ -	$ -	$ -	$ 1,100	$ 1,200	$ -	$ 1,000	$ 1,200	$ 1,100	$ -	$ 5,600
8225	Gear Allowance	$ -	$ 200	$ 200	$ 200	$ 200	$ 200	$ 350	$ -	$ 350	$ 350	$ 2,050
	Total	**$ 72**	**$ 53,873**	**$ 54,077**	**$ 58,409**	**$ 53,644**	**$ 59,673**	**$ 54,594**	**$ 1,320**	**$ 55,979**	**$ 22,776**	**$ 414,417**

		Aging/General	Tribal (2A)	Newport (2A)	Washington (2A)	Area 2A Total	Vancouver	Port Hardy	Prince Rupert	Cdn Total	US Total	Grand Total
	Grant ID	64	64	64	64		82	82	82			
	Port ID	00	51	52	53		61	62	63			
5121	Part-Time Salary	-	-	-	-	-	$ -	$ 26,346	$ 31,138	$ 57,483	$ 267,756	$ 325,239
5122	AK Cola	-	-	-	-	-	$ -	$ -	$ -	$ -	$ 18,309	$ 18,309
5123	Port Premium Pay	-	-	-	-	-	$ -	$ -	$ -	$ -	$ -	$ -
5132	Hourly	-	-	500	-	500	$ -	$ -	$ -	$ -	$ 500	$ 500
5142	Port Duty	-	-	-	-	-	$ -	$ -	$ -	$ -	$ -	$ -
5211	Medical	-	-	-	-	-	$ -	$ -	$ -	$ -	$ 34,359	$ 34,359
5212	Medical Reimbursement	-	-	-	-	-	$ -	$ -	$ -	$ -	$ -	$ -
5214	HRA Expenses	-	-	-	-	-	$ -	$ -	$ -	$ -	$ 13,351	$ 13,351
5215	Medical Benefit (Taxable)	-	-	-	-	-	$ -	$ 6,479	$ 6,479	$ 12,958	$ -	$ 12,958
5231	Life Insurance	-	-	-	-	-	$ -	$ 159	$ 188	$ 348	$ 1,732	$ 2,080
5232	AD&D	-	72	72	-	144	$ -	$ 17	$ 20	$ 37	$ 330	$ 367
5241	BC Workers Comp.	72	72	72	72	216	$ 72	$ 86	$ 102	$ 260	$ 288	$ 620
5242	Accident Indemnity	-	-	-	-	-	$ -	$ 238	$ 238	$ 475	$ 1,750	$ 2,225
5243	Cancer Care	-	-	-	-	-	$ -	$ 196	$ 196	$ 393	$ 1,445	$ 1,838
5254	Housing Allowance	-	-	-	-	-	$ -	$ -	$ -	$ -	$ 4,500	$ 4,500
5311	Social Security	-	100	100	-	200	$ -	$ -	$ -	$ -	$ 20,657	$ 20,657
	Salary and Benefits	**72**	**244**	**744**	**72**	**1,060**	**$ 72**	**$ 33,522**	**$ 38,361**	**$ 71,954**	**$ 364,977**	**$ 437,003**
6211	General Travel - Staff	-	-	3,000	-	3,000	$ -	$ -	$ -	$ -	$ 10,000	$ 10,000
6212	On Job Training Travel	-	1,500	-	-	1,500	$ -	$ -	$ -	$ -	$ 1,500	$ 1,500
6313	Comm Allow - Port	-	-	-	-	-	$ -	$ 680	$ 680	$ 1,360	$ 5,000	$ 6,360
7111	Leased Vehicle Fees	-	-	-	-	-	$ -	$ -	$ -	$ -	$ 17,250	$ 17,250
7112	Vehicle Mileage Reimbursed	-	-	-	-	-	$ -	$ 350	$ 3,500	$ 3,850	$ 5,500	$ 9,350
7311	Field Office Rental	-	-	-	-	-	$ -	$ -	$ -	$ -	$ 8,100	$ 8,100
7513	Vehicle Insurance	-	-	-	-	-	$ -	$ -	$ -	$ -	$ 5,600	$ 5,600
8225	Gear Allowance	-	-	200	-	200	$ -	$ 200	$ 200	$ 400	$ 2,250	$ 2,650
	Total	**72**	**1,744**	**3,944**	**72**	**5,760**	**$ 72**	**$ 34,752**	**$ 42,741**	**$ 77,564**	**$ 420,177**	**$ 497,813**

TABLE 11. SSA Reg. Areas

FIS Cost/Revenue Projections

FIS Program Totals	
Total Pounds Landed	859,946
Net Halibut Proceeds	$5,518,734
Net Bycatch proceeds	$56,351
Vessel Expenses	($5,423,773)
Office Expenses	($333,269)
Trawl Survey	($56,706)
Net Proceeds	**($238,663)**

Assumptions	Rate/Amt	% Prior Yr. Actual
Price	$6.42	94%
WPUE	86	102%
Vessel Costs	$5,423,773	120%
Personnel COLA	2.64%	

P.Y. Budget

Reg. Area Totals	2A All Regions	2B All Regions	2C All Regions	3A All Regions	3B All Regions	4A All Regions	4B All Regions	4D All Regions	Totals
Net Halibut proceeds	$139,605	$748,272	$1,181,369	$2,172,565	$785,631	$241,616	$126,418	$123,259	$5,518,734
Bycatch proceeds	$1,069	$14,358	$14,179	$11,274	$8,664	$4,088	$1,883	$837	$56,351
Office Expenses (prorated)	($24,053)	($38,392)	($28,447)	($108,469)	($69,152)	($28,447)	($20,584)	($15,727)	($333,269)
Vessel expenses	($359,772)	($574,285)	($500,597)	($1,736,696)	($1,124,458)	($460,264)	($435,010)	($232,692)	($5,423,773)
Net Per Reg Area	**($243,151)**	**$149,953**	**$666,504**	**$338,674**	**($399,314)**	**($243,008)**	**($327,293)**	**($124,323)**	**($181,957)**

Hal. Sale Proceeds	2A All Regions	2B All Regions	2C All Regions	3A All Regions	3B All Regions	4A All Regions	4B All Regions	4D All Regions	Totals
Number of charters regions	2	4	3	8	5	2	2	1	27
Number of stations	103.0	164.3	121.8	464.3	296.0	121.8	88.1	67.3	1,427
Standard skates fished	720.7	1150.4	852.4	3250.2	2072.1	878.4	616.8	471.2	10,012
Average WPUE	23	78	202	105	65	53	43	56	86
Total pounds sold	22,308	89,722	171,450	343,525	133,206	46,971	26,484	26,279	859,946
Avg. price per pound	$6.26	$8.34	$6.89	$6.32	$5.90	$5.14	$4.77	$4.69	$ 6.42
Less fish sale taxes	$0	$0	$0	$11,359	$28,494	$8,204	$3,910	$3,812	55,779
Net Halibut Proceeds	$139,605	$748,272	$1,181,369	$2,172,565	$785,631	$241,616	$126,418	$123,259	$5,518,734

Vessel Expenses	2A All Regions	2B All Regions	2C All Regions	3A All Regions	3B All Regions	4A All Regions	4B All Regions	4D All Regions	Totals
Charter days	49	82	59	231	153	51	53	38	716
Sea Sampler salary	$ 22,292	$ 51,682	$ 37,267	$ 143,385	$ 95,018	$ 32,994	$ 33,967	$ 23,884	$ 440,489
Sea Sampler benefits	$ 661	$ 1,532	$ 1,105	$ 4,250	$ 2,816	$ 978	$ 1,007	$ 708	$ 13,056
Payroll taxes	$ 1,705	$ 3,954	$ 2,851	$ 10,969	$ 7,269	$ 2,524	$ 2,598	$ 1,827	$ 33,697
Vessel P&I	$ 2,649	$ 3,143	$ 1,380	$ 10,682	$ 7,985	$ 3,305	$ 6,054	$ 2,911	$ 38,108
Travel Expenses	$ 3,600	$ 9,420	$ 9,900	$ 28,800	$ 21,600	$ 13,440	$ 13,440	$ 6,720	$ 106,920
Lump sum payments	$ 229,320	$ 278,496	$ 219,450	$ 932,383	$ 660,573	$ 277,620	$ 289,737	$ 128,520	$ 3,016,098
Vessel share halibut/bycatch revenue	$ 14,426	$ 85,327	$ 125,226	$ 222,893	$ 82,895	$ 26,205	$ 13,583	$ 12,744	$ 583,301
Running bonus	$ -	$ -	$ -	$ -	$ 2,000	$ -	$ -	$ -	$ 2,000
Dockside Monitoring Fees	$ -	$ 3,178	$ 1,461	$ -	$ -	$ -	$ -	$ -	$ 4,639
Misc. expenses	$ 2,000	$ 4,000	$ 3,000	$ 8,000	$ 5,000	$ 2,000	$ 3,000	$ 1,000	$ 28,000
Bait inc. storage	$ 73,344	$ 117,068	$ 86,743	$ 330,753	$ 210,864	$ 89,389	$ 62,765	$ 47,956	$ 1,018,882
Ice	$ 1,200	$ 2,400	$ 1,800	$ 4,800	$ 3,000	$ 1,200	$ 1,200	$ 600	$ 16,200
Longline gear maint./replace	$ 8,182	$ 13,059	$ 9,676	$ 36,896	$ 23,522	$ 9,971	$ 7,002	$ 5,350	$ 113,658
Gear Allowance	$ 394	$ 1,026	$ 738	$ 2,885	$ 1,916	$ 637	$ 657	$ 472	$ 8,725
Total Vessel Expenses	***$ 359,772***	***$ 574,285***	***$ 500,597***	***$ 1,736,696***	***$ 1,124,458***	***$ 460,264***	***$ 435,010***	***$ 232,692***	***$ 5,423,773***

Office Expenses Category	All Regions
Temporary Staff Salary	$5,620
Sea Sampler Training Salary	$7,200
Temporary Staff benefits	$1,025
Performance Bonus	$1,500
Payroll taxes	$980
Hiring Expenses	$2,000
Communications	$2,750
Express Shipping	$1,000
Bait & Gear Shipping	$76,400
Profiler Equipment (non-capital)	$0
Profiler Maintenance	$0
Bait Storage	$20,000
Profiler Contract	$98,618
Sea Sampler train/debrief	$52,000
Agency bycatch share	$28,175
Interns/Volunteers/Thirds	$9,000
Survey gear/supplies	$27,000
Total Office Expenses	***$333,269***

NMFS Trawl Survey (P604) Category	Budget
Temporary	$47,574
Medical	$750
Industrial Ins.	$143
Payroll Taxes	$3,639
Personnel Total	**$52,106**
Travel	$3,000
Communications	$400
Programs Total	**$3,400**
Field Supplies	$300
Gear Allowance	$900
Supplies Total	**$1,200**
Trawl Survey Total	***$56,706***

Detailed Expenses		
Personnel		Expense
Salaries		
Sea Samplers	$	495,263
Temporary Personnel	$	5,620
Benefits		
Sea Samplers Medical	$	13,806
Office Staff Medical	$	1,025
Industrial Insurance	$	143
Performance Bonus	$	1,500
Payroll Taxes		
Sea Samplers	$	37,337
Office Staff	$	980
Other		
Vessel P&I	$	38,108
Hiring Expenses	$	2,000
Total	**$**	**595,783**
Programs		
Travel		
Travel Expenses	$	109,920
Communications		
Phone Communications	$	3,150
Express Shipping	$	1,000
Shipping	$	76,400
SubTotal	$	80,550
Total	**$**	**190,470**
Administration		
Rentals & Contracts		
Lump Sum Contracts	$	3,016,098
Other Contracts	$	98,618
Gear Maintenance	$	-
Bait Storage	$	20,000
Training	$	52,000
Fees		
Revenue Share	$	583,301
Agency Bycatch Share	$	28,175
Running Bonus	$	2,000
Dockside Monitoring	$	4,639
Total	**$**	**3,804,831**
Supplies & Equipment		
Supplies		
Survey Gear	$	27,300
Survey Bait	$	1,018,882
Ice	$	16,200
Gear Replacement	$	113,658
Gear Allowance	$	9,625
Misc. Expenses	$	37,000
Equipment		
Field Equipment	$	-
Total	**$**	**1,222,665**
SSA Program Total	**$**	**5,813,748**

FY2019 BUDGET
OTHER RESEARCH

On-going Projects

Object Code	Item	621-16-00 Genetic Sex ID - Genome	642-00-00 ADEC/EPA Contaminants	661-11-00 *Ichthyophonus* Prevalance	673.13 2017-03-00 Genome Sequencing	675.11 2017-07-00 Tail Patterns	650.21 2017-05-00 Area 4B PAT Tags	672.12 2017-01-00 Condition Factor	670-11-00 NMFS Trawl Tagging	On-going Projects Sub-Total
	PROGRAMS									
	Travel									
83111	General Travel - Staff	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Travel	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Communications									
81412	Express Mail	$ -	$ 2,600	$ -	$ -	$ -	$ -	$ -	$ -	$ 2,600
	Communications	$ -	$ 2,600	$ -	$ -	$ -	$ -	$ -	$ -	$ 2,600
	Programs Subtotal	**$ -**	**$ 2,600**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 2,600**
	Administration									$ -
	Contracts & Fees									
85931	Vendor Contracts			$ 6,800	$ -	$ -	$ -	$ -	$ -	$ 6,800
	Contracts & Leases	$ -	$ -	$ 6,800	$ -	$ -	$ -	$ -	$ -	$ 6,800
	Administration Subtotal	**$ -**	**$ -**	**$ 6,800**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 6,800**
	Supplies & Equipment									$ -
	Supplies									
81121	Supplies	$ 36,303	$ 3,700	$ 2,750	$ -	$ 3,100	$ -	$ -	$ 8,575	$ 54,428
81122	Tag Recoveries	$ -	$ -	$ -	$ -	$ -	$ 1,000	$ -	$ 5,725	$ 6,725
81151	Bait	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
	Supplies	$ 36,303	$ 3,700	$ 2,750	$ -	$ 3,100	$ 1,000	$ -	$ 14,300	$ 61,153
	Equipment									
82831	Field Equipment - Capital	$ -	$ -	$ -		$ 800			$ -	$ 800
	Equipment	$ -	$ -	$ -	$ -	$ 800			$ -	**$ 800**
	Supplies & Equipment Subtotal	**$ 36,303**	**$ 3,700**	**$ 2,750**	**$ -**	**$ 3,900**	**$ 1,000**	**$ -**	**$ 14,300**	**$ 61,953**
	Total	**$ 36,303**	**$ 6,300**	**$ 9,550**	**$ -**	**$ 3,900**	**$ 1,000**	**$ -**	**$ 14,300**	**$ 71,353**
	Income									
	Total Income	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**

TABLE 13. Other Research (2019)

FY2019 BUDGET
OTHER RESEARCH

New Projects

Object Code	Item	Ongoing Projects Subtotal	673.14 2017-06-00 Growth markers	672.13 2017-02-00 DMR Classification	674.11 2017-04-00 Reproductive Cycle	Thermal growth history	Whale detection	Captive holding	Projects Total
	PERSONNEL								
	Salaries								
72231	Temporary	$ -	$ 21,615	$ 1,662	$ 41,453	$ 3,780			$ 68,510
	Salary	$ -	$ 21,615	$ 1,662	$ 41,453	$ 3,780			$ 68,510
	Benefits								
72411	Medical	$ -	$ 4,323	$ 1,394	$ 5,229	$ 110	$ -	$ -	$ 11,056
72452	Tuition	$ -	$ -	$ -	$ 18,477	$ -	$ -	$ -	$ 18,477
	Benefits	$ -	$ 4,323	$ 1,394	$ 23,706	$ 110	$ -	$ -	$ 29,533
	Personnel Subtotal	**$ -**	**$ 25,938**	**$ 3,056**	**$ 65,159**	**$ 3,890**	**$ -**		**$ 98,043**
	PROGRAMS								
	Travel								
83111	General Travel - Staff	$ -	$ 7,000	$ 3,405	$ 4,200	$ 3,500			$ 18,105
	Travel	$ -	$ 7,000	$ 3,405	$ 4,200	$ 3,500	$ -		$ 18,105
	Communications								
81412	Express Mail	$ 2,600	$ -	$ -	$ -	$ 3,900			$ 6,500
81413	Heavy Shipping	$ -		$ 1,600	$ 500	$ -			$ 2,100
	Communications	$ 2,600	$ -	$ 1,600	$ 500	$ 3,900	$ -		$ 8,600
	Publications								
81932	External Journals	$ -	$ 4,000	$ 2,000	$ -	$ -	$ -		$ 6,000
	Publications	$ -	$ 4,000	$ 2,000	$ -	$ -	$ -		$ 6,000
	Programs Subtotal	**$ 2,600**	**$ 11,000**	**$ 7,005**	**$ 4,700**	**$ 7,400**	**$ -**		**$ 32,705**
	Administration								$ -
	Contracts & Fees	$ -							
85931	Vendor Contracts	$ 6,800	$ 26,180	$ 9,775	$ 44,100	$ 14,400	$ -	$ 30,000	$ 131,255
85932	Vessel Revenue Share	$ -	$ -	$ -	$ -	$ -	$ -	$ 2,480	$ 2,480
	Contracts & Leases	$ 6,800	$ 26,180	$ 9,775	$ 44,100	$ 14,400	$ -	$ 32,480	$ 133,735
	Insurance								
85212	General Liability Insurance	$ -	$ -	$ -	$ -	$ -	$ -	$ 214	$ 214
	Insurance	$ -	$ -	$ -	$ -	$ -	$ -	$ 214	$ 214
	Administration Subtotal	**$ 6,800**	**$ 26,180**	**$ 9,775**	**$ 44,100**	**$ 14,400**		**$ 32,694**	**$ 133,949**
	Supplies & Equipment								$ -
	Supplies								
81121	Supplies	$ 54,428	$ 8,500	$ 152,964	$ 7,500	$ 64,629		$ 48,150	$ 336,171
81122	Tag Recoveries	$ 6,725	$ -	$ -	$ -	$ 25,000			$ 31,725
81151	Bait	$ -	$ -		$ 4,500	$ -	$ -	$ 3,905	$ 8,405
81153	Gear Replacement	$ -	$ -	$ -	$ -	$ -	$ -	$ 436	$ 436
	Supplies	$ 61,153	$ 8,500	$ 152,964	$ 12,000	$ 89,629		$ 52,491	$ 376,737
	Equipment								
82831	Field Equipment - Capital	$ 800	$ -	$ -		$ -			$ 800
	Equipment	$ 800	$ -	$ -	$ -	$ -			**$ 800**
	Supplies & Equipment Subtotal	**$ 61,953**	**$ 8,500**	**$ 152,964**	**$ 12,000**	**$ 89,629**		**$ 52,491**	**$ 377,537**
	Total	**$ 71,353**	**$ 71,618**	**$ 172,800**	**$ 125,959**	**$ 115,319**		**$ 85,185**	**$ 642,234**
	Income								
4021	US Federal Grant	$ -	$ 74,118	$ 30,719	$ -	$ -	$ -	$ -	$ 104,837
4061	Halibut Sales	$ -	$ -	$ -	$ 43,428	$ -	$ -	$ -	$ 43,428
	Total Income	**$ -**	**$ 74,118**	**$ 30,719**	**$ 43,428**	**$ -**			**$ 148,265**
	Net	**$ -**	**$ (2,500)**	**$ 142,081**	**$ 82,531**	**$ 115,319**	**$ -**	**$ 85,185**	**$ 422,616**

TABLE 1. Consolidated Statement

IPHC Income and Expenses

Consolidated General & Supplemental
FY2020 Budget
Oct. 1, 2019 to Sept. 30, 2020

Income			***Expenses***		
Contributions			**Core IPHC Activities**		
United States	$	4,532,000	Administration	$	1,988,967
Canada	$	1,618,270	Scientific	$	3,504,831
			Catch Sampling	$	618,082
Fish Sales Income			**Survey Expenses**		
FIS Program	$	5,010,861	SSA Expenses	$	5,576,617
Other Research	$	-			
Other Income			**Research Activities**		
Grants & Contracts	$	516,029	Field Research	$	-
Interest Income	$	16,125	Other Research	$	575,000
Misc. Income	$	-			
			Transfer to Restricted Accounts	$	-
Total FY2020 Income	$	11,693,285	Total FY2020 Expenses	$	12,263,497

Total General & Supplemental FY2020	$	(570,212)
Total as % of Income		-4.9%
Unrestricted Funds Balance	$	2,196,817

International Pacific Halibut Commission
Income and Expenses - FY2020 Budget

	INCOME		FY 2020
General			
	Carry over from Prior FY	$	295,062
	US Contributions	$	4,532,000
	CDN Contributions	$	1,546,270
	CDN Pension Funding	$	72,000
	Interest	$	5,000
	Other income	$	-
	UW Lease Payments	$	-
	Current FY Income	$	6,155,270
	Appropriations Income Total	**$**	**6,450,332**
Supplemental			
	Supplemental Offset (fish sales, contracts, grants)	**$**	**6,116,829**
TOTAL INCOME		**$**	**12,567,160**

	EXPENSES		
Operations			
	Personnel	$	4,922,490
	Programs	$	476,890
	Administration	$	984,711
	Supplies	$	302,538
	Sub-total	$	6,686,629
Stock Assessment			
	Survey Personnel	$	554,027
	Survey Programs	$	179,450
	Survey Vessels and Contracts	$	3,556,468
	Survey Supplies	$	1,286,673
	Sub-total SSA Surveys	$	5,576,617
TOTAL EXPENSES		**$**	**12,263,247**
GENERAL ACCOUNT CARRYOVER		**$**	**303,914**

Version	Date	Comments
0.9		Interim Meeting Draft

TABLE 3. Other Accounts I & E

Opening Fund Balance as of	October 1, 2018	

Expected Investment Rate	1.00%

Restricted Accounts

Leave Liability (30)			Notes
Beginning Balance	$	62,348	
Interest Earned	$	623	
Expenses	$	-	
Funds Transferred	$	-	
Fund Balance	**$**	**62,971**	

Medical Annuitants (40)			
Beginning Balance	$	459,772	
Interest Earned	$	4,598	
Expenses	$	(86,002)	
Funds Transferred	$	-	Additional Funds
Fund Balance	**$**	**378,368**	

Reserve Account (50)			
Beginning Balance	$	1,000,000	
Interest Earned	$	10,000	
Expenses	$	-	
Funds Transferred	$	(10,000)	To Supplemental
Fund Balance	**$**	**1,000,000**	

Scholarship Account (60)		
Beginning Balance	$	240,578
Interest Earned	$	2,406
Expenses	$	-
Funds Transferred	$	-
Fund Balance	**$**	**242,984**

Total Retricted Funds	**$**	**1,684,323**

Supplemental Account

Income	**Budget**	
Carryover		
Carryover from prior FY	$	2,471,967
Fish Sales		
Halibut Proceeds - FIS	$	4,954,510
Bycatch Proceeds - FIS	$	56,351
DMR Classification	$	-
Reproductive Cycle Project	$	-
Grants & Contracts		
NMFS - Sampling Grant	$	469,929
NMFS - Sablefish logbooks	$	-
NPRB - Growth Markers	$	-
SK- DMR Classification	$	-
DFO Rockfish Contract	$	34,520
WDFW Rockfish Contract	$	11,580
Other Income		
Misc. Income	$	-
Rollover from Reserve	$	10,000
Interest	$	1,125
Current FY Income	$	5,538,015
Income Total	$	8,009,982

Expenses	Budget	
Supplemental		
Administration	$	250
Transfer to Restricted Accounts	$	-
Sub-Total	$	250
Offset to General Account	$	6,116,829
Total Expenses	$	6,117,079
Balance	$	1,892,904

TABLE 4. Operations

International Pacific Halibut Commission

Fiscal Year Actuals and Budgets

Year 2020

	10 Administration	20 Scientific	30 Statistics	40 Field Experiments	60 Other Research	***Sub-Total***	50 SSA Surveys	***Budget***	***Prior Year Budget***	***% of P.Y.Budget***
Personnel										
Related Expenses	$ 15,300	$ 1,800	$ 22,000	$ -	$ -	$ 39,100	$ 10,604	$ 49,704	$ 49,725	100%
Salaries	$ 577,695	$ 2,222,679	$ 354,389	$ -	$ 68,510	$ 3,223,273	$ 453,324	$ 3,676,597	$ 3,689,064	100%
Benefits	$ 471,804	$ 776,310	$ 76,090	$ -	$ 29,533	$ 1,353,737	$ 55,535	$ 1,409,272	$ 1,377,597	102%
Taxes	$ 40,449	$ 169,813	$ 21,168	$ -	$ -	$ 231,430	$ 34,564	$ 265,994	$ 267,179	100%
Other	$ 25,200	$ -	$ -	$ -	$ -	$ 25,200	$ -	$ 25,200	$ 25,200	100%
Contracted	$ -	$ 49,750	$ -	$ -	$ -	$ 49,750	$ -	$ 49,750	$ 99,500	50%
Subtotal	**$ 1,130,448**	**$ 3,220,353**	**$ 473,647**	**$ -**	**$ 98,043**	**$ 4,922,490**	**$ 554,027**	**$ 5,476,517**	**$ 5,508,265**	**99%**
Programs										
Meetings & Conferences	$ 184,250	$ 44,400	$ -	$ -	$ -	$ 228,650	$ -	$ 228,650	$ 233,400	98%
Travel	$ 73,700	$ 11,500	$ 46,000	$ -	$ 18,105	$ 149,305	$ 98,900	$ 248,205	$ 243,915	102%
Communications	$ 29,450	$ 300	$ 10,335	$ -	$ 13,600	$ 53,685	$ 80,550	$ 134,235	$ 134,235	100%
Publications	$ 21,000	$ 15,000	$ 3,250	$ -	$ 6,000	$ 45,250	$ -	$ 45,250	$ 43,750	103%
Subtotal	**$ 308,400**	**$ 71,200**	**$ 59,585**	**$ -**	**$ 37,705**	**$ 476,890**	**$ 179,450**	**$ 656,340**	**$ 655,300**	**100%**
Administration										
Contracts	$ 59,952	$ 130,660	$ 37,350	$ -	$ 182,286	$ 410,248	$ 2,922,775	$ 3,333,023	$ 3,628,966	92%
Maintenance	$ 117,259	$ 41,752	$ -	$ -	$ -	$ 159,011	$ -	$ 159,011	$ 155,685	102%
Facility Rentals	$ 293,308	$ -	$ 8,100	$ -	$ -	$ 301,408	$ 20,000	$ 321,408	$ 312,982	103%
Training & Education	$ 20,500	$ 21,600	$ 29,800	$ -	$ -	$ 71,900	$ 52,000	$ 123,900	$ 123,900	100%
Fees	$ 33,850	$ -	$ 5,600	$ -	$ 2,694	$ 42,144	$ 561,693	$ 603,837	$ 661,159	91%
Subtotal	**$ 524,869**	**$ 194,012**	**$ 80,850**	**$ -**	**$ 184,980**	**$ 984,711**	**$ 3,556,468**	**$ 4,541,178**	**$ 4,882,692**	**93%**
Supplies & Equipment										
Equipment	$ 5,000	$ 13,529	$ -	$ -	$ 800	$ 19,329	$ -	$ 19,329	$ 19,329	100%
Supplies	$ 20,000	$ 5,737	$ 4,000	$ -	$ 253,472	$ 283,209	$ 1,286,673	$ 1,569,882	$ 1,619,237	97%
Subtotal	**$ 25,000**	**$ 19,266**	**$ 4,000**	**$ -**	**$ 254,272**	**$ 302,538**	**$ 1,286,673**	**$ 1,589,211**	**$ 1,638,566**	**97%**
Prior FY Expenses	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**		**$ -**	**$ -**	**0%**
Grand Total	**$ 1,988,717**	**$ 3,504,831**	**$ 618,082**	**$ -**	**$ 575,000**	**$ 6,686,629**	**$ 5,576,617**	**$ 12,263,247**	**$ 12,684,823**	**97%**
Prior FY Budget	$ 1,974,296	$ 3,595,200	$ 603,313	$ -	$ 698,265	$ 6,871,075	$ 5,813,748			
% of P.Y. Budget	101%	97%	102%	n/a	82%	97%	96%			

Amendment of the IPHC Financial Regulations (2014)

PREPARED BY: IPHC SECRETARIAT (M. LARSEN, D. WILSON & S. KEITH; 21 DECEMBER 2017)

PURPOSE

To provide the Commission with an opportunity to consider proposed amendments to the IPHC Financial Regulations (2014).

BACKGROUND

In accordance with Regulation 18, paragraphs 2 and 3 of the IPHC Financial Regulations (2014), which states:

> "*2. These Regulations may be amended only by the Commission.*"

> "*3. These Rules should be reviewed by the Finance and Administration Committee at least biennially*."

at the 93rd Session of the IPHC Interim Meeting (28-29 November 2017), the Commission reviewed the draft revisions to the IPHC Financial Regulations (2014), as per the following:

> *12.4 Draft: IPHC Financial Regulations (2018)*
>
> *94. The Commission NOTED paper IPHC-2017-IM093-18 which provided the Commission with an initial opportunity to consider proposed amendments to the IPHC Financial Regulations.*
>
> *95. The Commission NOTED that a detailed revision of the IPHC Financial Regulations will be provided for consideration at the 94th Session of the IPHC Annual Meeting in January 2018.*

DISCUSSION

Since 2014 a number of potential changes to the IPHC Financial Regulations (2014), as well as the IPHC Finance and Investment Policy (2014), have been identified to clarify and update the Commission's financial operations, including:

1. Further definition of the general and supplemental funds and how they are used, including a clearer separation of funding for core and setline survey operations.
2. Clarification of how carryover (surplus and unobligated funds) is managed.
3. Clarification of the timeline for budget approval.
4. Incorporation of investment guidance directly into the Financial Regulations, rather than maintaining it as a separate document.

Appendix I provides draft text modification to the IPHC Financial Regulations (2014), as well as the IPHC Finance and Investment Policy (2014) which is now incorporated as an Appendix to the Regulations.

RECOMMENDATIONS

That the Commission:

1) **NOTE** paper IPHC-2018-AM094-21, which provides the Commission with an opportunity to consider proposed amendments to the IPHC Financial Regulations (2014) and the IPHC Finance and Investment Policy (2014).
2) **ADOPT** the revised IPHC Financial Regulations (2018) by consensus in accordance with the provisions of the Convention.

APPENDICES

APPENDIX I Proposed: International Pacific Halibut Commission Financial Regulations (2018)

INTERNATIONAL PACIFIC HALIBUT COMMISSION

INTERNATIONAL PACIFIC HALIBUT COMMISSION

FINANCIAL REGULATIONS

(2018)

Table of Contents

Regulation 1 – Definitions

For the purpose of these Financial Regulations, the following definitions apply:

Convention: the Convention between the United States of America and Canada for the Preservation of the Halibut Fishery of the Northern Pacific Ocean and Bering Sea, signed at Ottawa, Canada on 2 March 1953, as amended by the Protocol Amending the Convention, signed at Washington 29 March 1979, and includes the regulations promulgated thereunder.

Commission: the International Pacific Halibut Commission provided for by Article III, paragraph 1 of the Convention.

Contracting Parties: Consisting of the two Members, Canada and the United States of America (3 Commissioners from each Party).

Executive Director: the Director of the Commission.

Pacific halibut: fish of the species *Hippoglossus stenolepis*.

Rules of Procedure: The Rules of Procedure (2017, or subsequent revision) of the Commission.

Session: Any meeting of the Commission or its subsidiary bodies

Regulation ~~1~~ 2 – Authority, Purpose, and Scope~~Applicability~~

~~The following Regulations shall govern the financial administration of the International Pacific Halibut Commission and are established pursuant to the Commission's Rules of Procedure. The terms "Commission," "Convention," Contracting Parties," "Chair," and "Staff" are used in these Regulations as defined in the Rules of Procedure.~~

1. **Authority**: These Financial Regulations consist of regulations adopted by the International Pacific Halibut Commission, hereinafter referred to as "the Commission," pursuant to the Convention between Canada and the United States of America for the Preservation of the Halibut Fishery of the Northern Pacific Ocean and Bering Sea, hereinafter referred to as "the Convention," signed first in 1923 and revised several times since, most recently in 1953, as amended by the Protocol signed by both countries, hereinafter referred to as "the Contracting Parties," in 1979.

2. **Purpose**: The purpose of this document is to provide the regulations to govern the financial administration of the International Pacific Halibut Commission and established pursuant to the Commission's Rules of Procedure (2017, or any subsequent revision).

3. **Scope**: The IPHC Secretariat, Commission and the Finance and Administration Committee. All subsidiary bodies shall operate under the Rules of Procedure of the Commission *mutatis*

mutandis, except where specific provisions are laid down in the Convention or in these Financial Regulations.

Regulation ~~2~~ 3 – Finance and Administration Committee

1. The Commission shall designate a Finance and Administration Committee (FAC) composed from among current Commissioners, tasked with reviewing and making recommendations on financial matters. The Finance and Administration Committee ~~Committee's~~ recommendations shall be considered and approved by the Commission subject to Article III, Paragraph 1 of the Convention.

2. In addition to general oversight of financial matters and other duties specified in these Regulations, the Finance and Administration Committee shall carry out the following duties on behalf of the Commission:

   a) Overseeing the financial reporting style and methodology;

   b) Overseeing accounting policies and practices;

   c) Approving the hiring, performance, and independence of the external auditor;

   d) Discussing financial risk management policies and practices with ~~Staff~~IPHC Secretariat staff.

Regulation ~~3~~ 4 – Fiscal Year and Currency

1. The fiscal year shall be the period from 1 October ~~1~~ to the following 30 September ~~30~~, both dates inclusive. Funds may be held in either U.S. (USD) or Canadian (CAD) dollars. All monetary figures in these Regulations are expressed in U.S. dollars, and all financial accounting of the Commission shall be in U.S. dollars.

Regulation ~~4~~ 5 – Budget

1. Annual budget estimates shall cover income and expenditures for the fiscal year to which they relate.

2. Annual budget estimates shall be divided into categories corresponding to programs and departments. Each category shall be accompanied by such information, annexes and

explanatory statements as may be requested on behalf of the Commission, and such further annexes or statements as the Executive Director may deem necessary and useful.

3. The Executive Director shall prepare and submit to the Finance and Administration Committee, Contracting Parties, and Commissioners, no later than 30~~20~~ days before the Commission's Interim Meeting, budget estimates for the next three fiscal years.

NOTE: Dates should be 30 days to be consistent with the ROP (2017)

4. At the Commission's Interim Meeting, the Finance and Administration Committee shall review income and expenses for the prior fiscal year, and review and recommend changes to the budget estimates for the next three fiscal years.

5. At its regular Annual Meeting, the Commission shall review income and expenses for the prior fiscal year, review and adopt a budget for the next two fiscal years, and review the budget estimates for the ~~following~~ subsequent ~~two~~ fiscal year~~s~~. The Commission may amend or adjust the budgets as necessary to reflect changing priorities or contingencies.

6. In preparing budget estimates for consideration of the Commission, the Executive Director shall fully take into account any unobligated funds carried over from previous years' national contributions, and any other income, which may be available for expenditure in the year for which the budget estimates are prepared.

7. The Executive Director shall assess the Contracting Parties on the basis of the budget adopted by the Commission and in accordance with Article III, Paragraph 1 of the Convention.

8. Should either of the Contracting Parties not approve its assessment in whole or in part, the Executive Director shall forthwith notify the other Contracting Party and, after consulting with the Chairperson of the Commission, shall recommend revisions to the budget as may appear necessary.

9. Any revisions to a budget or supplementary estimates shall be prepared by the Executive Director and submitted to the Chairperson for approval. Subject to consultation with the other Commissioners, the Chairperson may approve the revisions, obtain the Commissioners' approval through the established procedures for interim voting, or call a special meeting to collect a vote. After approval, the estimates shall be acted upon in the same manner as regular budgets or estimates.

10. The Executive Director may, in any fiscal year, transfer funds in an amount not exceeding 1% of the total budget (including any unobligated funds carried over from previous year/s, as described in Rule 5, paragraph 6) between categories within the current years' budget. The

Chairperson of the Commission may, in any fiscal year, authorize the Executive Director to transfer funds in an amount exceeding 1% of the total budget between categories.

Regulation ~~5~~ 6 – Publication of Budget

1. A summary of the budget of the Commission shall be available at the Commission's website and ~~or~~ by other electronic communication means approved by the Commission.

Regulation ~~6~~ 7 – National Contributions

1. The receipt of national contributions from the Contracting Parties shall constitute an authorization to the Executive Director to incur obligations and make payments for the purposes and up to the amounts authorized by the Commission.

2. The Executive Director may use existing funds to incur obligations before a budget is approved or before national contributions are voted, when such obligations are necessary for the continued effective functioning of the Commission and provided such obligations do not exceed the scale of such requirements as authorized in the most recent approved budget. -The Executive Director must obtain approval for significant deviations from this level of spending from the Commission.

Regulation ~~7~~ 8 – Provision of Funds

1. The Commission operations shall be financed by national contributions in U.S. dollars made by the Contracting Parties, in accordance with Article III, Paragraph 1 of the Convention. Pending the receipt of such contributions, the operations may be financed from the General and Supplementary Accounts as described in Regulation ~~6~~7.2.

2. -After the Commission has adopted a budget, revisions to a budget, or a supplementary budget, the Executive Director shall:

   a) Transmit to the Contracting Parties such documents and information as may be required by the government departments responsible for approving national contributions and appropriating the funds;

   b) Request that the funds be remitted in accordance with procedures agreed upon by each of the Contracting Parties.

3. Funds shall remain available for twelve (12) months following the end of the fiscal year to which the funds relate, to discharge obligations incurred during that fiscal year.

4. At the end of the twelve-month period, any obligation incurred in the prior year which remains unliquidated shall be cancelled, or where the obligation remains a valid charge, transferred as an obligation against current-year funds. Any balance in funds shall be accounted for in accordance with the provisions of Regulations ~~4~~5.10 and ~~9~~10.7.

Regulation ~~8~~ 9 – Other Income

1. The Commission may receive revenue from the sales of fish harvested during the course of research or other scientific operations, pursuant to Article III, Paragraph 2 of the Convention. ~~Such revenues shall be credited to the Supplemental Fund (described in Regulation 910).~~ Revenue from the sale of fish ~~shall be used to support the~~related to the ~~Standardized~~ IPHC's Fishery-Independent Setline ~~Stock Assessment (SSA)~~ Survey (FISS) shall be credited to the Supplemental Fund. ~~and approved research.~~ Revenue from the sale of fish for Pacific halibut research or operations not related to the IPHC's Fishery-Independent Setline Survey (FISS) shall be credited to the General Fund.

2. The Commission may receive, on occasion, monies in addition to those received from the Contracting Parties to fund the Commission's annual budget. –Such funds may be from contracted or granted research agreements or from private organizations or other government agencies for the purpose of funding Pacific halibut research or operations. ~~Such funds will be managed in the Supplemental Fund.~~ Funds related to the IPHC's Fishery-Independent Setline Survey (FISS) shall be credited to the Supplemental Fund. Funds received for Pacific halibut research or operations not related to the IPHC's Fishery-Independent Setline Survey (FISS) shall be credited to the General Fund.

NOTE: - Discussion of 'Funds' should come before 'Other Income' which details the funds.

Regulation ~~9~~ 10 - Funds

1. All monetary holdings shall be subject to the Funds and Investment Policy of the Commission (provided at **Appendix I**), which will include the approved purposes, limits, and specific rules of use for each fund. ~~The Funds and Investment Policy shall be prepared by the Executive Director, reviewed by the Finance and Administration Committee, and approved by the Commission. The Finance and Administration Committee shall review the Funds and Investment Policy at least biennially and recommend any changes to the Commission.~~

2. There shall be established a General Fund and a Supplemental Fund for the purposes of accounting for the income and expenditures of the Commission. ~~–~~Other funds may be established by the Commission as necessary.

3. The General Fund shall be a national contributions fund and shall be used to support the general operations and administrative expenditures of the Commission~~.~~ (For historical purposes, note that at times in the past the General Fund was known as the “Appropriations Fund.”).

4. The following monies shall be credited to the General Fund:

   a) Contributions received from the Contracting Parties;

   b) Receipts from the sale of surplus Commission property purchased from the General Fund;

   c) Interest income earned by the General Fund;~~.~~

   d) Receipts from the sale of fish related to Pacific halibut research or operations;

   ~~c)~~e) Receipts from grants and contracts related to Pacific halibut research or operations.

5. The Supplemental Fund shall be a working capital fund and shall be used to support the IPHC’s Fishery-Independent Setline Survey (FISS)~~Standardized Stock Assessment (SSA) Survey~~ and approved research.

6. The following monies shall be credited to the Supplemental Fund:

   a) Receipts from the sale of fish related to the IPHC’s Fishery-Independent Setline Survey (FISS);

   b) Receipts from the sales of surplus Commission property purchased from the Supplemental Fund;

   c) Interest income earned by the Supplemental Fund;

   d) Receipts from grants and contracts fish related to the IPHC’s Fishery-Independent Setline Survey (FISS) ;

   e) Any other income not specified elsewhere in these Regulations or in the Funds and Investment Policy.

7. The Executive Director may transfer funds from the Supplemental Fund to the General Fund temporarily to the extent necessary to finance expenditures pending receipt of national contributions from the Contracting Parties as described in Regulation ~~6~~7.2.

8. The Executive Director may transfer funds between the ~~Supplemental~~ General Fund and other established funds as allowed by the approved budget and defined purposes, limits, and rules of use for each fund.

9. Previous year's surplus and unobligated funds shall be retained in the General and Supplemental Fund based on the stated fund policy in this section. Surplus and unobligated funds shall be reviewed and approved by the Finance and Administration Committee on an annual basis, in conjunction with approval of the previous year's expenses.

Regulation ~~10~~ 11 – Custody of Funds

1. The Executive Director shall designate the bank or banks in which the funds of the Commission shall be kept and shall report the identity of the bank or banks so designated to the Commission.

Regulation ~~11~~ 12 – Internal Controls

1. The Executive Director shall be accountable to the Commission for the proper management of the Commission's financial resources in accordance with the Commission's Rules of Procedure (2017, or any subsequent revision) and these Regulations.
2. No obligations shall be incurred until allotments or other appropriate authorizations have been made in writing under the authority of the Executive Director.
3. The Executive Director shall:
   a) Establish detailed financial procedures to ensure effective financial administration and the exercise of economy;
   b) Sign on behalf of the Commission for all financial and ordinary business matters of the Commission;
   c) Cause all payments to be made on the basis of supporting vouchers and other documents and ensure that services or goods contracted for have been received;
   d) Designate in writing the ~~members of the~~ Commission's Secretariat ~~S~~staff who may receive monies, incur obligations, sign on behalf of the Commission, and make payments on behalf of the Commission.
4. The Executive Director may, after full investigation, authorize the writing off of losses of cash, stores, and other assets, provided that a statement explaining the losses shall be submitted to the Commission and the Auditors with the annual accounts.
5. The Executive Director may, with the approval of the Chairperson of the Commission, authorize the transfer of surplus stores or assets to charitable organizations or to scientific

societies associated with the Commission. The record of all such transfers shall be submitted to the Auditors with the annual accounts.

6. For the issuance of purchase orders and contracts in excess of $50,000 and all vessel charter agreements the Executive Director shall obtain the approval of the Chairperson or Vice-Chairperson.

7. In the case of unforeseen conditions, the Executive Director may deviate from approved total budget levels at the discretion of the Chairperson.

Regulation ~~12~~ 13 - Reporting

1. The Executive Director shall maintain such accounting records as are necessary for each fiscal year and shall submit to the Contracting Parties annual accounting records for the fiscal year to which they relate, including the following:

   a) Outstanding obligations at the beginning and end of the year;

   b) Unobligated funds at the beginning and end of the year;

   c) Income and expenditures of all funds;

   d) The status of all funds, including:

      i. The original budgeted funding for the year;

      ii. The national contributions as modified by any transfers;

      iii. Credits, if any, other than national contributions;

      iv. The amounts charged against those national contributions and other credits;

      v. The status of the General and Supplemental Accounts, and of all other accounts which have been be established;

      vi. Such other information as may be appropriate to indicate the current financial position of the Commission.

Regulation ~~13~~14 – External Audit

1. The accounts of the Commission shall be audited annually by external auditors recommended by the Finance and Administration Committee and appointed by the Commission. The Auditors shall be appointed for a term of three (3) years, and may be reappointed to multiple

terms. ~~The appointment is subject to annual Finance and Administration Committee approval within the term.~~

2. The annual accounts shall be submitted by the Executive Director to the Auditors appointed by the Commission not later than sixty (60) days after the end of a fiscal year.

3. The Auditors shall perform such an audit as they deem necessary to determine:

    a) That the financial statements are in accord with the books and records of the Commission;

    b) That the financial transactions reflected in the statements are in accordance with these Financial Regulations;

    c) That the monies on deposit and on hand are vouched for by the Commission's depositories or by actual count.

    d) Equity proportions for the Contracting Parties based on their contributions to the joint expenses shared by them under Article III, Paragraph 1 of the Convention.

4. The Auditors shall be sole judges as to the acceptance in whole or in part of certifications by the Executive Director or delegated Secretariat s~~S~~taff, and they may proceed to detailed examination and verifications of such financial records as they choose.

5. The Auditors, in addition to certifying the correctness of the accounts, may make such observations as they deem desirable with respect to the efficiency of the financial procedures, the accounting system, the internal financial controls, and in general, the financial consequences of administrative practices.

6. The Auditors shall have no power to disallow items in the accounts, but shall draw to the attention of the Executive Director for appropriate action any transaction with respect to which they entertain doubt as to legality or propriety.

7. The Auditors shall prepare a report on the accounts certified, and shall discuss their report with the Executive Director prior to submission to the Commission. The Auditors shall submit their report to the Commission not later than ~~six~~ three (3) months following the end of the fiscal year to which the accounts relate.

8. The Commission may request the Auditors to perform certain specific examinations and issue separate reports on the results.

Regulation ~~14~~ 15 – Bonding

1. The Executive Director and such other members of the IPHC's Secretariat s~~S~~taff as may be deemed necessary shall be bonded in United States currency by a reputable bonding company

in amounts determined by the Commission.~~ ~~ The cost of the premiums for bonding shall be assumed by the Commission.

Regulation ~~15~~ 16 – Insurance

1. The Commission may take out suitable insurance policies with reputable financial institutions against normal risks to its assets, operations, and personnel.

Regulation ~~16~~ 17 – Delegation of Authority

1. The Executive Director may delegate to other members of the IPHC's Secretariat s~~S~~taff or the Commission such of his powers as he or she considers necessary for the effective implementation of these Regulations.

Regulation ~~17~~ 18 – Interpretation

- The Chairperson may rule, after such consultation with the Commissioner's as the Chairperson deems necessary, in cases of doubt as to the interpretation and application of any of these Regulations.

Regulation ~~18~~ 19 – General Provisions

1. These Financial Regulations should be reviewed for their consistency and appropriateness at least biennially.
2. These Financial Regulations may be amended from time to time by vote of the Commission in accordance with the voting procedure noted in Rule 11 of the IPHC Rules of Procedure (2017, or any subsequent revision), provided such amendment is not inconsistent with the provisions of the Convention.
3. Copies of superseded Financial Regulations shall be archived by the Executive Director.
4. These Financial Regulations were adopted by consensus on XX January 2018, and supersede those previously adopted by the Commission on 17 September 2014.

~~1. These Financial Regulations were adopted September 17, 2014. They replace those adopted by the Commission in January 1972, as amended through January 2001, and shall become~~

~~effective on the first day of the fiscal year beginning October 1, 2014. All previous financial rules and regulations shall become null and void at that time. Copies of previous financial rules and regulations shall be archived by the Executive Director for reference.~~

2. ~~These Regulations may be amended only by the Commission.~~

3. ~~These Rules should be reviewed by the Finance and Administration Committee at least biennially.~~

APPENDIX I
IPHC FUNDS AND INVESTMENT POLICY

I. Introduction

This statement of funds and investment policy was adopted by the International Pacific Halibut Commission (IPHC) on September 17, 2014, pursuant to the Commission's Financial Regulations, to define the various funds held by the Commission and issue guidelines for their management. These policies supersede any previous funds and investment policies.

II. Responsibilities

Finance and Administration Committee (FAC).

As constituted by the Commission's Financial Regulations, the FAC~~&A Committee~~ is responsible for monitoring the management of the Commission's financial assets.

The ~~F&A Committee~~FAC shall review this funds and investment policy annually, to ensure it is consistent with the mission of the IPHC and accurately reflects current financial conditions. The ~~F&A Committee~~FAC shall recommend any changes in this policy to the Commission.

Executive Director

The Executive Director is the Commission's fiduciary. As specified by the Commission's Financial Regulations, the Executive Director is accountable to the Commission for the proper management of the Commission's financial resources.

The Executive Director is authorized to delegate certain responsibilities to Staff members. With Commission approval, the Executive Director may also delegate certain responsibilities to professional financial experts in various fields. These professional financial services include, but are not limited to, investment management, investment custodian, and additional specialists. In particular, it is anticipated that the services of a registered investment manager may be engaged to manage portions of the Reserve and/or Endowment Funds if the total funds exceed $10 million USD.

Professional Financial Services

The following procedure shall be used to engage or replace professional financial services, using the example of an investment manager:

1. If the ~~F&A Committee~~FAC deems it necessary, the Executive Director will recommend the hiring or replacing of an investment manager to the F~~&A Committee~~AC.
2. The Administrative Officer will nominate prospective candidates and send a request for proposal to each candidate.
3. The Administrative Officer, Assistant Director, and Executive Director will review proposals and interview candidates to determine appropriate investment manager(s) and pass their findings to the ~~F&A Committee~~FAC.
4. The F~~&A Committee~~AC will make the hiring recommendation to the Commissioners, who shall have the final approval.

III. Suitable and Authorized Investments

For the purposes of managing investment risk the following investment vehicles will be permitted by this policy:

- **Interest-Bearing Savings Account** – Federally insured (FDIC/NCUA) institutional saving account. Institution defined as state or federally chartered bank or credit union.
- **Certificate of Deposit (CD)** – Federally insured (FDIC/NCUA) institutional time deposit. Institution defined as state or federally chartered bank or credit union. Aggregate investments per entity must be at or below insurable limit.
- **Money Market Mutual Funds** – Mutual Fund investing in short-term debt securities and U.S. treasury obligations for preservation of capital and maintaining liquidity. Funds include, but are not limited to, Wells Fargo Government Money Market (WFGXX) and Wells Fargo Advantage Money Market (WMMXX)
- **Interest Bearing Checking Account** – Federally insured (FDIC/NCUA) institutional checking account. Institution defined as state or federally chartered bank or credit union.
- **U.S. Treasury Obligations** – Direct obligations of the United States Treasury whose payment is guaranteed by the United States. Direct obligations include, but are not limited to, U.S. Treasury Bills, U.S. Treasury Notes, U.S. Treasury Bonds, U.S. Treasury Inflation-Protected Securities (TIPS), and Zero Coupon Securities (STRIPS).
- **U.S Agency Obligations** – U.S. Government Agencies, Government-Sponsored Enterprises (GSE's), Corporations, or Instrumentalities of the U.S. Government. U.S. U.S. Agency Obligations include, but are not limited to, Federal National Mortgage Association ((FNMA), Federal Home Loan Mortgage Corporation (FHLMC), Federal Home Loan Bank (FHLB), and Federal Farm Credit Bureau (FFCB). Agency obligations that have been securitized in collateralized mortgage trusts are prohibited.
- **Mutual Funds (U.S. Government-Backed Only)** – Investments are limited to mutual funds consisting of 100% U.S. Government Obligations. Funds include, but are not limited to, Wells Fargo 100% Treasury (WFTXX) and Wells Fargo Advantage Treasury Plus (PIVXX).
- **Corporate Paper** – Unsecured short-term promissory notes issues by corporations, municipalities, and sovereigns for a specific maturity at a stated rate of interest. To be eligible for purchase, the rating of the note must be at least P1 by Moody's Investor Service and/or A1 by Standard & Poor's Corporation.

IV. Authorized IPHC Funds

For the purposes of managing investment risk and to optimize investment returns within acceptable risk parameters, the following funds will be created and held as separate investments, with separate regulations and rules for each pool of funds. The Executive Director will recommend the dollar amounts to be held in each fund. The specific policies for managing each of these funds are detailed in the subsequent sections of this document.

Operating Fund Pool

- General (Fund 10)
- Supplemental (Fund 20)

Restricted Fund Pool

- Leave Liability (Fund 30)
- Annuitant Medical (Fund 40)
- Reserve (Fund 50)

Endowment Fund Pool

- Scholarship (Fund 60)

V. Operating Fund Pool

Purpose

The purpose of the Operating Fund Pool accounts is to provide sufficient cash to meet the day-to-day financial obligations of the IPHC in a timely manner. Requirements for credits to and expenditures from the two funds in this pool are specified in the Financial Regulations.

Fund Descriptions and Rules

General Fund (Fund 10)

The General Fund is an appropriations fund and shall be used to support the general operations and administrative expenditures of the Commission. Prior to 2014, the General Fund was known as the "Appropriations Fund."

Supplemental Fund (Fund 20)

The Supplemental Fund is a working capital fund and shall be used to support the ~~Standardized~~Fisheries-Independent Setline Survey (FISS) and associated research.

Investment Guidelines

Objectives

The investment objectives of the Operating Fund are:

- Preservation of capital
- Liquidity
- Optimization of investment return within the constraints of the first two objectives

Allowable Investments

Operating Fund Pool funds may be invested as follows:

- Interest-bearing savings account
- Certificates of deposit;
- Money market mutual funds;
- Interest-bearing checking accounts;
- U.S. Treasury obligations;
- U.S. agency obligations;
- Mutual funds (U.S. Government-backed only).

Maturity

Investments should be scheduled in such a way to assure adequate cash flow.

- The maturities on investments for the Operating Fund Pool shall be 18 months or less.
- The weighted average for maturity shall be less than nine months.

Reporting

The Executive Director or his/her designee shall prepare the following reports for presentation on at least an annual basis to the FAC ~~&A Committee~~ including:

- Schedule of investments (issue and rate)
- Interest income year to date
- Weighted average for maturity

VI. Restricted Fund Pool

Purpose

The purpose of the Restricted Fund Pool accounts is to meet the specific expense needs for each account and to improve the return on funds held for expenditure for up to five years.

Fund Descriptions and Rules

Leave Liability Fund (Fund 30)

The purpose of the Leave Liability Fund is to provide funds for outstanding leave liabilities that may be cashed out by employees upon retirement or resignation. Funds are maintained within the account to account for projected leave liabilities within the next 24 months. This is estimated by projecting retirements and staff turnover. Interest earned is retained in the account. Requests are made at the IPHC Annual Meeting for additional funds to provide adequate funding to meet the purpose of the account.

Medical Annuitant Fund (Fund 40)

The IPHC provides paid medical premiums (private and government) for IPHC retirees. The Medical Annuitant Fund provides the funds to pay these premiums. Funds are maintained within the account to meet obligations stated in the triennial actuarial valuation. The actuarial valuation report will be conducted by a reputable third party actuarial firm and include future assets and liabilities based on economic and demographic assumptions. Expense of the valuation will be charged against the fund. Interest earned is retained in the account. Requests are made at the IPHC Annual Meeting for additional funds to replenish the account.

Reserve (Fund 50)

The Reserve Fund provides the funds to respond to unforeseen contingencies that cannot be met by the Operating Fund Pool accounts alone.

Account Guidelines

- The fund is limited to a maximum of $1.0 million USD
- Interest credited to the Reserve Fund in a fiscal year will be transferred to the Supplemental Fund at the beginning of the following fiscal year, if the balance exceeds the maximum
- The Reserve Fund shall be maintained at a minimum of $500,000 USD unless through specific action by the Commission
- No more than 50% of the Reserve Fund may be utilized within a fiscal year without voted approval of the Commission
- The ordered priorities for use of the Reserve Fund will be 1) core staff costs; 2) ongoing administrative and operations costs related to fishery monitoring and assessment; 3) research costs
- Subject to annual confirmation by the Commission, the Executive Director may withdraw funds from the Reserve Fund, up to, but not exceeding the limit of the Executive Director’s discretionary spending authority in any fiscal year

- Proposals for use of the Reserve Fund will be submitted to the Commission by the Executive Director. Such proposals must identify the circumstances that require Reserve Funds; measures or circumstances that will avoid additional requirements from the Reserve Fund; and, measures or circumstances that will result in replenishment of the Reserve Fund
- Proposals for use of the Reserve Fund will be reviewed by the FAC~~&A Committee~~ and recommendation for their approval forwarded to the Chair of the Commission. Upon recommendation of the Commission, the Commission, approve the Executive Director's proposals for use of the Reserve Fund.

Investment Guidelines

Objectives

- Preservation of capital
- Liquidity
- To optimize the investment return within the constraints above

Allowable Investments

Restricted Fund Pool funds may be invested as follows:

- Interest-bearing savings account
- Certificates of deposit;
- Money market mutual funds;
- Interest-bearing checking accounts;
- U.S. Treasury obligations;
- U.S. agency obligations;
- Mutual funds (U.S. Government-backed only).

Maturity

Investments should be scheduled in such a way to assure adequate cash flow to meet anticipated expense needs.

- The maturities on investments for the Restricted Fund Pool shall be 60 months or less.
- The weighted average for maturity shall be less than 36 months.

Reporting

The Executive Director or his/her designee shall prepare the following reports for presentation on at least an annual basis to the FAC ~~&A Committee~~ including:

- Schedule of investments (issue and rate)
- Interest income year to date
- Weighted average for maturity

VII. Endowment Fund Pool

Purpose

The purpose of the Endowment Fund Pool account(s) is to provide permanent funding for the specific fund(s) within the pool. The assets within each fund shall be managed in such a way as to facilitate the fund's stated objective. At the discretion of the Commissioners the principal may be used if necessary, but must be refunded within 12 months. Requests are made during the annual budget process if it becomes necessary for additional funds to augment or replenish the account(s).

Fund Descriptions and Rules

Scholarship Fund (Fund 60)

The Scholarship Fund provides endowment funds for the annual undergraduate scholarship awarded each year by the IPHC. The principal is maintained at a minimum level of $260,000 and is required to produce $8,000 in annual earnings on a long-term basis. Earnings are retained in the account and may be used for the fund's endowed activities.

Scholarship awards and the amount of the award are subject to the rules and actions of the Scholarship Committee.

Account Guidelines

- The principal endowment level is currently $260,000
- In the event the principal is below the endowment level, funds should be authorized by the Commission to replenish the account
- Currently the award provides an annually renewal scholarship of $~~2~~4,000 USD, payable directly to the award winner
- IPHC will award up to one new scholarship every other~~per~~ year
- Each scholarship is renewable for three additional years (can be non-consecutive years)
- Renewal is dependent on 1) sufficient academic progress (maintaining a 3.0 GPA) and 2) continued undergraduate status

Investment Guidelines

Objectives

- Preservation of capital
- Sufficient growth of capital to meet stated objective
- Control and understanding of potential risk
- To optimize the investment return within the constraints above

Allowable Investments

Endowment Fund Pool funds may be invested as follows:

- Interest-bearing savings account
- Certificates of deposit;

- Money market mutual funds;
- Interest-bearing checking accounts;
- U.S. Treasury obligations;
- U.S. agency obligations;
- Corporate paper (not to exceed 20% of the fund's assets);
- Mutual funds that invest solely in securities allowed in this section.

Maturity

Investments should be scheduled in such a way to assure adequate cash flow to meet anticipated expense needs.

- The maturities on investments for the Endowment Funds shall be 10 years or less.
- The weighted average for maturity shall be less than 5 years.

Reporting

The Executive Director or his/her designee shall prepare the following reports for presentation on at least an annual basis to the FAC ~~&A Committee~~ including:

- Schedule of investments (issue and rate)
- Interest income year to date
- Weighted average for maturity

IPHC meetings calendar (2018-20)

PREPARED BY: IPHC SECRETARIAT (12 DECEMBER 2017)

PURPOSE

To provide the Commission with an opportunity to consider the draft IPHC meetings calendar for the period 2018-20 (Appendix I).

BACKGROUND

Commission: The Commission's annual cycle of meetings is built around the management needs of the Pacific halibut fishery. The IPHC Interim Meeting (IM) follows the completion of the commercial fishing season, and is timed to allow the IPHC staff to incorporate data from that season into the stock assessment and harvest advice for the coming season. The IPHC Annual Meeting (AM) is scheduled to allow harvest and regulation decisions to be made by the Commission and implemented by the Contracting Parties in time for the opening of the next commercial fishing season.

Subsidiary bodies: The Conference Board (CB) and Processor Advisory Board (PAB) meet during the course of the AM each year. The Scientific Review Board (SRB) and Management Strategy Advisory Board (MSAB) each meet at least twice during the course of the year, in a sequence that supports both their mutual collaboration and the timing of their advice for the Commission. The Research Advisory Board (RAB) will meet next in February 2018, when its members are best able to convene and consider the IPHC's scientific program. This is a change from previous years, when it generally met in November. The Finance and Administration Committee (FAC) meet the morning before the commencement of the AM each year.

DISCUSSION

Meetings of the Commission and its subsidiary bodies are of interest to the community and the public, and the publication of their schedule as far in advance as possible promotes improved governance and collaboration.

In addition, the dates and location for the 96th Annual Meeting (AM096) in 2020 must be selected in early 2018 in order to plan for the meeting and contract for the necessary meeting facilities.

Interim Meeting: In recent years, the Interim Meeting has been scheduled after the US Thanksgiving holiday (late November) and before the December North Pacific Fishery Management Council (NPFMC) meeting. This timing works well for the IPHC Secretariat, as it allows enough time to complete the stock assessment before the Interim Meeting and for the results to be published before the NPFMC meeting, when the NPFMC approves its recommendations to the IPHC. This Interim Meeting timing also supports the customary December meeting dates of a number of other Pacific halibut stakeholder organizations, at which they prepare their positions for the IPHC Annual Meeting.

In some years the Interim Meeting has been held as early as the week of the USA Thanksgiving holiday, which the Commission has found less desirable because of the reduced time available for assessment and the difficulty of traveling during that week. This may be necessary for the 2019 Interim Meeting (IM095) because of the late date of the US holiday (28 Nov 2019) and the early date of the NPFMC meeting (tentatively scheduled for 2-10 Dec 2019).

RECOMMENDATIONS

That the Commission:

1) **NOTE** paper IPHC-2018-AM094-22, which provides the Commission with an opportunity to consider the annual IPHC meetings calendar (2018-20).
2) **ENDORSE** the IPHC meeting calendar for implementation by the IPHC Secretariat.

APPENDICES

Appendix I: DRAFT: IPHC meetings calendar (2018-20)

APPENDIX I
DRAFT: IPHC meetings calendar (2018-20)

	2018			2019			2020		
Meeting	**No.**	**Date**	**Location**	**No.**	**Date**	**Location**	**No.**	**Date**	**Location**
Annual Meeting (AM)	**94th**	**22-26 Jan**	**Portland, USA**	**95th**	**28 Jan-1 Feb**	**Victoria, Canada**	**96th**	**27-31 Jan**	**TBD, USA**
Conference Board (CB)	88th	23-24 Jan	Portland, USA	89th	29-30 Jan	Victoria, Canada	90th	28-29 Jan	TBD, USA
Processor Advisory Board (PAB)	23rd	23-24 Jan	Portland, USA	24th	29-30 Jan	Victoria, Canada	25th	28-29 Jan	TBD, USA
Finance and Administration Committee (FAC)	94th	22 Jan	Portland, USA	95th	28 Jan	Victoria, Canada	96th	27 Jan	TBD, USA
Scientific Review Board (SRB)	12th	19-21 June	Seattle, USA	14th	18-20 June	Seattle, USA	15th	23-25 June	Seattle, USA
	13th	25-27 Sept	Seattle, USA	15th	24-26 Sept	Seattle, USA	16th	22-24 Sept	Seattle, USA
Management Strategy Advisory Board (MSAB)	11th	7-10 May	Seattle or Sitka, USA	13th	6-9 May	Seattle or TBD, USA	14th	11-14 May	Seattle or TBD, USA
	12th	15-18 Oct	Seattle or TBD, USA	14th	21-24 Oct	Seattle or TBD, USA	15th	19-22 Oct	Seattle or TBD, USA
Work Meeting (WM)	--	19-20 Sept	Bellingham, USA	--	18-19 Sept	Bellingham, USA	--	16-17 Sept	Bellingham, USA
Research Advisory Board (RAB)	20th	28 Feb	Seattle, USA	21st	27 Feb	Seattle, USA	22nd	26 Feb	Seattle, USA
Interim Meeting (IM)	**94th**	**27-28 Nov**	**Seattle, USA**	**95th**	**25-26 Nov**	**Seattle, USA**	**96th**	**1-2 Dec**	**Seattle, USA**

INTERNATIONAL PACIFIC HALIBUT COMMISSION

Implementation Notes: 2018 Regulatory proposals

PREPARED BY: IPHC SECRETARIAT (26 DECEMBER 2017)

PURPOSE

To provide the Commission with the required 'Implementation Notes' for regulatory proposals received by the IPHC Secretariat for consideration at its 94th Annual Meeting, by the deadline of 23 December 2017.

BACKGROUND

On behalf of the Commission, the IPHC Secretariat has received regulatory proposals for consideration at the 94th Session of the IPHC Annual Meeting (AM094), as indicated in the Table 1. In accordance with the process established for handling regulatory proposals, the IPHC Secretariat has developed brief Implementation Notes for each proposal to aid Commissioners in their deliberations. These are provided under the discussion section of this paper and are linked throughout Table 1.

Table 1. Regulatory proposals received from Contracting Parties and stakeholders by the proposal deadline of 23 December 2017.

Regulatory proposals for 2018		
		Sector (Region)
Contracting Party (Agency) regulatory proposals		
IPHC-2018-AM094-PropB1 Rev_1	CDQ Leasing in IPHC Regulatory Area 4 (U.S.A. - NOAA-Fisheries)	Commercial (4)
IPHC-2018-AM094-PropB2	Clarify sport fishing regulations in Regulatory Areas 2C and 3A (U.S.A. - NOAA-Fisheries)	Recreational (2C, 3A)
IPHC-2018-AM094-PropB3	Clarify head-on requirement in Alaska Commercial Fisheries (U.S.A. - NOAA-Fisheries)	Commercial (AK)
Other Stakeholder regulatory proposals		
IPHC-2018-AM094-PropC1	Catch limit proposals (Sect. 11) (Various)	Commercial
IPHC-2018-AM094-PropC2	Preserving catch on private live-aboard vessels (A. Cooper)	Recreational (2C)
IPHC-2018-AM094-PropC3	For unguided sport fishing (P. Phillips)	Recreational (AK)
IPHC-2018-AM094-PropC4	Sport Fishing for Halibut - Cleaning Regulations (S. Riehemann)	Recreational (AK)
IPHC-2018-AM094-PropC5	Elimination of skin-on regulation (J. Shirk)	Recreational (AK)
IPHC-2018-AM094-PropC6	Live-aboard processing exemption (D. Robertson)	Recreational (AK)
IPHC-2018-AM094-PropC7	Eliminate the requirement for a CHP (S. Riehemann)	Recreational (2C)
IPHC-2018-AM094-PropC8	Allow shellfish pots on board (ALFA)	Commercial (AK)
IPHC-2018-AM094-PropC9	Processing halibut greater than four filets (M. Cowart)	Recreational (AK)
IPHC-2018-AM094-PropC10	Halibut length measurement method (R. Yamada)	Recreational
IPHC-2018-AM094-PropC11	Long term storage aboard pleasure vessels (L. Thompson)	Recreational (AK)
IPHC-2018-AM094-PropC12	Long term storage on cruising vessels (W. Cornell)	Recreational (AK)
IPHC-2018-AM094-PropC13	Halibut in Bering Sea pots (J. Kauffman)	Commercial (4)
IPHC-2018-AM094-PropC14	Status Quo Harvest Measures for Guided Anglers in Area 3A (R. Yamada)	Recreational (3A)
IPHC-2018-AM094-PropC15	Trawler Halibut Bycatch Tender boat program (J. Kearns)	Commercial

Discussion

Contracting Party (Agency) Regulatory Proposals

IPHC-2018-AM094-PropB1 Rev_1	Leasing IFQ to CDQ groups in IPHC Regulatory Area 4 (U.S.A. - NOAA-Fisheries)	Commercial (4)

Suggested action: The IPHC Secretariat has no objection to this proposed modification of the IPHC Fishery Regulations (2017) and thus, recommends adoption.

IPHC-2018-AM094-PropB2	Clarify sport fishing regulations in Regulatory Areas 2C and 3A (U.S.A. - NOAA-Fisheries)	Recreational (2C, 3A)

Suggested action: The IPHC Secretariat has no objection to this proposed modification of the IPHC Fishery Regulations (2017) and thus, recommends adoption.

IPHC-2018-AM094-PropB3	Clarify head-on requirement in Alaska Commercial Fisheries (U.S.A. - NOAA-Fisheries)	Commercial (AK)

Suggested action: For the head-on requirement clarifications coming from both PropA4 and PropB3, the IPHC Secretariat recommends adopting the U.S.A. (NOAA-Fisheries) PropB3 regulatory language for paragraphs (5) and (6) of IPHC Regulation Section 17.

Other Stakeholder Regulatory Proposals

IPHC-2018-AM094-PropC1	Catch limit proposals (Sect. 11) (Various)	Commercial

Suggested action: The IPHC Secretariat recommends Commissioners use the harvest decision table, as provided in paper IPHC-2018-AM094-10, as the primary tool to measure the risks of the various catch limit proposals.

IPHC-2018-AM094-PropC2	Preserving catch on private live-aboard vessels (A. Cooper)	Recreational (2C)

The proposal suggests a new paragraph for Section 28 of the regulations and includes suggested measures to track retained Pacific halibut by logging each catch with location caught, measuring each fish (length or weight), state issued license information of the angler, and photographing of each fish prior to processing.

The IPHC Secretariat has concerns regarding compliance with possession and bag limits in response to this regulatory proposal. The options of logbook or photo documentation do not satisfy these concerns.

Suggested action: As this regulation (IPHC Regulation 28(1)(d)) is important for enforcement purposes, the IPHC Secretariat recommends that the Commission does not adopt this proposal at this time. Further discussion with enforcement agencies is required.

IPHC-2018-AM094-PropC3	For unguided sport fishing (P. Phillips)	Recreational (AK)

This proposal would require logbook-style record keeping and reporting requirements for unguided recreational fisheries in Alaska.

The IPHC Secretariat supports improved recordkeeping and reporting from the non-charter recreational sector. Record keeping and reporting would need to be coordinated with the Alaska

Department of Fish and Game (ADFG), NMFS, and the North Pacific Fishery Management Council (NPFMC).

Suggested action: Indicate that the authors should forwarded their proposal to the NPFMC for further consideration.

IPHC-2018-AM094-PropC4	Sport Fishing for Halibut - Cleaning Regulations (S. Riehemann)	Recreational (AK)

The proposal suggests adding "*unless preserved*" or "*unless preservation facilities are aboard*" to paragraph (1)(d) of Section 28 of the regulations where the required condition of recreational caught Pacific halibut onboard the vessel are detailed.

The IPHC Secretariat has concerns regarding compliance with possession and bag limits in response to this regulatory proposal.

Suggested action: As this regulation (IPHC Regulation 28(1)(d)) is important for enforcement purposes, the IPHC Secretariat recommends that the Commission does not adopt this proposal at this time. Further discussion with enforcement agencies is required.

IPHC-2018-AM094-PropC5	Elimination of skin-on regulation (J. Shirk)	Recreational (AK)

The proposal suggests removing the requirement for skin on all pieces of Pacific halibut in paragraph (1)(d) of Section 28 in the regulations.

The IPHC Secretariat has concerns regarding compliance with possession and bag limits in response to this regulatory proposal. However, it is not the IPHC's intention to require the entire fillet to be with 'skin attached'. As is the case in numerous fisheries globally, a smaller size of naturally attached skin on each piece of Pacific halibut (only require enough skin to determine that the fillets are from a Pacific halibut and which side) is all that is required to determine that a fillet is from a Pacific halibut and whether it is from the ventral (light) or dorsal (dark) side. This is sufficient to enforce the applicable Pacific halibut bag and possession limits.

Suggested action: The IPHC Secretariat recommends the following revised regulatory language for IPHC Regulation Section 28(1)(d):

28. Sport Fishing for Halibut—Areas 2C, 3A, 3B, 4A, 4B, 4C, 4D, 4E

(1) In Convention waters in and off Alaska:

…

(d) No person shall possess on board a vessel, including charter vessels and pleasure craft used for fishing, halibut that have been filleted, mutilated, or otherwise disfigured in any manner, except that each halibut may be cut into no more than 2 ventral pieces, 2 dorsal pieces, and 2 cheek pieces, with a patch of skin on each ~~all~~ piece~~s~~ that is approximately two (2) inches (~5 cm) square, naturally attached.

…

IPHC-2018-AM094-PropC6	Live-aboard processing exemption (D. Robertson)	Recreational (AK)

The proposal suggests adding "*except pleasure vessels with live aboard accommodations and processing facilities, may process, preserve, maintain and transport halibut on board*" to paragraph (1)(d) of Section 28 of the regulations where the required condition of recreational caught Pacific halibut onboard the vessel are detailed.

The IPHC Secretariat has concerns regarding compliance with possession and bag limits in response to this regulatory proposal.

Suggested action: As this regulation (IPHC Regulation 28(1)(d)) is important for enforcement purposes, the IPHC Secretariat recommends that the Commission does not adopt this proposal.

IPHC-2018-AM094-PropC7	Eliminate the requirement for a CHP (S. Riehemann)	Recreational (2C)

This proposal suggests eliminating the requirement for a Charter Halibut Permits (CHP) for private, crewed vessels that are not available for charter.

CHPs for the recreational fishery in Alaska are not an IPHC Regulation requirement. Any CHP requirements would need to be coordinated with the Alaska Department of Fish and Game (ADFG), NMFS, and the NPFMC.

Suggested action: Indicate that the authors should forwarded their proposal to the NPFMC for further consideration.

IPHC-2018-AM094-PropC8	Allow shellfish pots on board (ALFA)	Commercial (AK)

The IPHC Secretariat supports this regulatory proposal as long as any Pacific halibut caught in the shellfish pots on the trip are tracked and reported.

The Commission may wish to consider whether there should be a limit on the number of shellfish pots onboard during commercial Pacific halibut trips. Suggested regulatory language is included in the proposal, but requires further coordination with Contracting Parties on the description of a shellfish pot.

Suggested action: Indicate that the authors should forwarded their proposal to the NPFMC for further consideration, and for the IPHC Secretariat and NOAA-Fisheries to coordinate over the coming year to further clarify the proposal and determine how best to implement it effectively.

IPHC-2018-AM094-PropC9	Processing halibut greater than four filets (M. Cowart)	Recreational (AK)

The proposal suggests a new paragraph for Section 28 of the regulations and includes suggested measures to track retained Pacific halibut on private live aboard vessels by logging catch record, date stamp photos prior to processing, and labeling of processed packages.

The IPHC Secretariat has concerns regarding compliance with possession and bag limits in response to this regulatory proposal. The options of logbook or photo documentation do not satisfy these concerns. This regulation (IPHC Regulation 28(1)(d)) is important for enforcement purposes.

Suggested action: The IPHC Secretariat recommends that the Commission does not adopt this proposal.

IPHC-2018-AM094-PropC10	Halibut length measurement method (R. Yamada)	Recreational

This proposal suggests revised language for Section 25(2) where fish measurement procedures are detailed. The proposal suggests replacing "*over the pectoral fin*" with "*under the fish*".

The IPHC Secretariat deems this revision unnecessary. Measurements in a straight line '*over*' and '*under*' the fish would produce the same value.

Suggested action: The IPHC Secretariat recommends that the Commission does not adopt this proposal.

IPHC-2018-AM094-PropC11	Long term storage aboard pleasure vessels (L. Thompson)	Recreational (AK)

The proposal suggests adding "*possession does not include preserved fish*" to paragraph (1)(d) of Section 28 of the regulations where the required condition of recreational caught Pacific halibut onboard the vessel are detailed.

The IPHC Secretariat has concerns regarding compliance with possession and bag limits in response to this regulatory proposal.

The proposal secondly suggests adding "*halibut*" to paragraph (1)(e) of Section 28 of the regulations where the gear for recreational caught Pacific halibut onboard the vessel are detailed.

The IPHC Secretariat has concerns regarding compliance with current gear restrictions as non-halibut gear may catch Pacific halibut. This regulation (IPHC Regulation 28(1)(d)) is important for enforcement purposes.

Suggested action: The IPHC Secretariat recommends that the Commission does not adopt this proposal.

IPHC-2018-AM094-PropC12	Long term storage on cruising vessels (W. Cornell)	Recreational (AK)

The proposal suggests adding "*processed (frozen or canned)*" to paragraph (1)(d) of Section 28 of the regulations where the required condition of recreational caught Pacific halibut onboard the vessel are detailed. The proposal includes suggested measures to track retained Pacific halibut by logging each catch with date, time, and location caught, measuring each fish (length), state issued license information of the angler, documented proof of the vessel functioning as the angler's domicile, and photographing of each fish prior to processing with date/time stamp and processed fish packages must be marked to correspond to log information and photograph.

The IPHC Secretariat has concerns regarding compliance with possession and bag limits in response to this regulatory proposal. The options of logbook or photo documentation do not satisfy these concerns. This regulation (IPHC Regulation 28(1)(d)) is important for enforcement purposes.

Suggested action: The IPHC Secretariat recommends that the Commission does not adopt this proposal.

IPHC-2018-AM094-PropC13	Halibut in Bering Sea pots (J. Kauffman)	Commercial (4)

The IPHC Secretariat supports this regulatory proposal which is similar to the use of pots in the Gulf of Alaska which started in 2017. IPHC's concern is that any Pacific halibut caught in pots on the trip are tracked and reported.

While this proposal includes suggested IPHC regulatory language, the IPHC Secretariat suggests the following simplified, revised regulatory language for IPHC Regulation Section 19(1), (2):

19. Fishing Gear

(1) No person shall fish for halibut using any gear other than hook and line gear,

(a) except that vessels licensed to catch sablefish in Area 2B using sablefish trap gear as defined in the Condition of Licence can retain halibut caught as bycatch under regulations promulgated by DFO; or

(b) except that a person may retain halibut taken with longline or single pot gear ~~in the sablefish IFQ fishery~~ if such retention is authorized by NMFS regulations published at 50 CFR Part 679.

(2) No person shall possess halibut taken with any gear other than hook and line gear,

(a) except that vessels licensed to catch sablefish in Area 2B using sablefish trap gear as defined by the Condition of Licence can retain halibut caught as bycatch under regulations promulgated by DFO; or

(b) except that a person may possess halibut taken with longline or single pot gear ~~in the sablefish IFQ fishery~~ if such possession is authorized by NMFS regulations published at 50 CFR Part 679.

…

Suggested action: The IPHC Secretariat recommends adopting the above revised regulatory language for Section 19(1), (2), and supports the suggested regulatory language provided in PropC13 for gear marking requirements in Section 19(4).

IPHC-2018-AM094-PropC14	Status Quo Harvest Measures for Guided Anglers in Area 3A (R. Yamada)	Recreational (3A)

The IPHC Secretariat defers to the NPFMC's Catch Sharing Plan (CSP) and recreational management measures recommended by the NPFMC to IPHC to stay within the CSP. The NPFMC and their advisory body, the Charter Halibut Management Committee, meet in October and December each year to discuss charter halibut management measures in Regulatory Areas 2C and 3A for the upcoming year. This regulation proposal does not need to be forwarded to the NPFMC because they have already considered measures for 2018. In addition, this proposal is within the range of options brought forward by the NPFMC for consideration by the IPHC dependent on the final adopted TCEY.

Suggested action: Indicate that the authors should forwarded their proposal to the NPFMC for further consideration.

IPHC-2018-AM094-PropC15	Trawler Halibut Bycatch Tender boat program (J. Kearns)	Commercial

The IPHC Secretariat defers to the NPFMC.

Suggested action: Indicate that the authors should forwarded their proposal to the NPFMC for further consideration.

IPHC-2018-AM094-AR01
Received: 12 Dec 2017

Pacific Fishery Management Council

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Phone 503-820-2280 | Toll free 866-806-7204 | Fax 503-820-2299 | www.pcouncil.org
Phil Anderson, Chair | Charles A. Tracy, Executive Director

December 11, 2017

Dr. David Wilson
Executive Director
International Pacific Halibut Commission
2320 West Commodore Way, Suite 300
Seattle, WA 98199-1278

Re: Council Recommendations for the 2018 Pacific Halibut Catch Sharing Plan for Area 2A and Annual Fishery Regulations

Dear Dr. Wilson:

The Pacific Fishery Management Council (Council) adopted recommended changes to the 2018 Pacific Halibut Catch Sharing Plan (CSP) for Area 2A and annual fishery regulations at their November 2017 meeting in Costa Mesa, California and we have transmitted the Council's recommendations to the National Marine Fisheries Service requesting adoption of regulations consistent with the Council's recommendation. The Council recommendations for the 2018 CSP and regulations are described below.

The Council-recommended changes for the Washington halibut fishery are detailed in the report provided by the Washington Department of Fish and Wildlife (Agenda Item E.1.a, WDFW Report 1).

For the Washington recreational halibut fishery in the South Coast, North Coast, and Puget Sound subareas the 2018 statewide season dates would be Friday, May 11; Sunday, May 13; Friday, May 25; Sunday, May 27; Thursday, June 7; Saturday, June 9; Saturday, June 16; Thursday, June 21; Saturday, June 23; Thursday, June 28; and Saturday, June 30. These three subareas would be open on these dates unless the individual quota for that subarea was reached.

In the recreational halibut fishery in the Columbia River subarea, the days of the week that the all-depth fishery is open would change from Thursday, Friday, Saturday and Sunday (four days) to Thursday, Friday, and Sunday (three days).

In addition, Washington recreational fisheries would have an annual bag limit of four Pacific halibut per year.

Another change for Washington fisheries would be a change to the incidental retention of Pacific halibut in the primary sablefish fishery north of Point Chehalis. The CSP language was revised following the status quo allocation formula, but reduced the maximum amount of incidental halibut retention from 70,000 pounds to 50,000 pounds when the Area 2A total allowable catch (TAC) is less than 1.5 million pounds. When the Area 2A TAC is 1.5 million pounds or more, the maximum allocation would be increased to 70,000 pounds.

No changes were proposed for the Oregon or California subarea recreational fisheries, nor any other commercial fisheries. Oregon and California provided reports at the November Council meeting (Agenda Item E.1.a, ODFW Report 1, Agenda Item E.1.a, Supp CDFW Report 1)

Please have your staff call upon Ms. Robin Ehlke of the Council staff if you need any further clarification or assistance in implementing the Council's proposed revisions.

Sincerely,

Charles A. Tracy
Executive Director

RDE:kma

Cc: Mr. Phil Anderson
Mr. David Crabbe
Ms. Robin Ehlke
Mr. Barry Thom

~~2017~~2018 PACIFIC HALIBUT CATCH SHARING PLAN FOR AREA 2A

(a) FRAMEWORK

This Plan constitutes a framework that shall be applied to the annual Area 2A total allowable catch (TAC) approved by the International Pacific Halibut Commission (IPHC) each January. The framework shall be implemented in both IPHC regulations and domestic regulations (implemented by NMFS) as published in the *Federal Register*.

(b) ALLOCATIONS

This Plan allocates 35 percent of the Area 2A TAC to U.S. treaty Indian tribes in the State of Washington in subarea 2A-1, and 65 percent to non-Indian fisheries in Area 2A. The allocation to non-Indian fisheries is divided into four shares, with the Washington sport fishery (north of the Columbia River) receiving 35.6 percent, the Oregon sport fishery receiving 29.7 percent, the California sport fishery receiving 4.0 percent, and the commercial fishery receiving 30.7 percent. Allocations within the non-Indian commercial and sport fisheries are described in sections (e) and (f) of this Plan. These allocations may be changed if new information becomes available that indicates a change is necessary and/or the Pacific Fishery Management Council takes action to reconsider its allocation recommendations. Such changes will be made after appropriate rulemaking is completed and published in the *Federal Register*. All allocations and subquotas are described in net weight, consistent with the IPHC's description of the TAC.

(c) SUBQUOTAS

The allocations in this Plan are distributed as subquotas to ensure that any overage or underage by any one group will not affect achievement of an allocation set aside for another group. The specific allocative measures in the treaty Indian, non-Indian commercial, and non-Indian sport fisheries in Area 2A are described in paragraphs (d) through (f) of this Plan.

(d) TREATY INDIAN FISHERIES

Thirty-five percent of the Area 2A TAC is allocated to 13 treaty Indian tribes in subarea 2A-1, which includes: all waters off the coast of Washington that are north of the Quinault River, WA (47°21.00' N. lat.) and east of 125°44.00' W. long; all waters off the coast of Washington that are between the Quinault River, WA (47°21.00' N. lat.) and Point Chehalis, WA (46°53.30′ N. lat.), and east of 125°08.50′ W. long.; and all inland marine waters of Washington. The treaty Indian allocation is to provide for a tribal commercial fishery and a ceremonial and subsistence fishery. These two fisheries are managed separately; any overages in the commercial fishery do not affect the ceremonial and subsistence fishery. The commercial fishery is managed to achieve an established subquota, while the ceremonial and subsistence fishery is managed for a year-round season. The tribes will estimate the ceremonial and subsistence harvest expectations in January of each year, and the remainder of the allocation will be for the tribal commercial fishery.

(1) The tribal ceremonial and subsistence fishery begins on January 1 and continues through December 31. No size or bag limits will apply to the ceremonial and subsistence fishery, except that when the tribal commercial fishery is closed, treaty Indians may take and

retain not more than two halibut per day per person for subsistence purposes. Ceremonial fisheries shall be managed by tribal regulations promulgated inseason to meet the needs of specific ceremonial events. Halibut taken for ceremonial and subsistence purposes may not be offered for sale or sold.

(2) The tribal commercial fishery season dates will be set within the season dates determined by the IPHC and implemented in IPHC regulations. The tribal commercial fishery will close when the subquota is taken. Any halibut sold by treaty Indians during the commercial fishing season must comply with IPHC regulations on size limits for the non-Indian fishery.

(e) NON-INDIAN COMMERCIAL FISHERIES

The non-Indian commercial fishery is allocated 30.7 percent of the non-Indian share of the Area 2A TAC for a directed halibut fishery and an incidental catch fishery during the salmon troll fishery. The non-Indian commercial allocation is approximately 19.9 percent of the Area 2A TAC. Incidental catch of halibut in the primary directed sablefish fishery north of Point Chehalis, WA will be authorized if the Washington sport allocation exceeds 224,110 ~~lb~~pounds (lbs) (101.7 metric tons (mt~~)~~)) as described in section (e)(3) of this Plan. The structuring and management of these three fisheries is as follows.

(1) Incidental halibut catch in the salmon troll fishery.

Fifteen percent of the non-Indian commercial fishery allocation is allocated to the salmon troll fishery in Area 2A as an incidental catch during salmon fisheries. The quota for this incidental catch fishery is approximately 2.9 percent of the Area 2A TAC. The primary management objective for this fishery is to harvest the troll quota as an incidental catch during the April-June salmon troll fishery. The secondary management objective is to harvest the remaining troll quota as an incidental catch during the remainder of the salmon troll fishery.

(i) The Council will recommend landing restrictions at its spring public meeting each year to control the amount of halibut caught incidentally in the troll fishery. The landing restrictions will be based on the number of incidental harvest license applications submitted to the IPHC, halibut catch rates, the amount of allocation, and other pertinent factors, and may include catch or landing ratios, landing limits, or other means to control the rate of halibut harvest. NMFS will publish the landing restrictions annually in the *Federal Register*, along with the salmon management measures.

(ii) Inseason adjustments to the incidental halibut catch fishery.

(A) NMFS may make inseason adjustments to the landing restrictions, if requested by the Council Chairman, as necessary to assure that the incidental harvest rate is appropriate for salmon and halibut availability, does not encourage target fishing on halibut, and does not increase the likelihood of exceeding the quota for this fishery. In determining whether to make such inseason adjustments, NMFS will consult with the applicable state representative(s), a representative of the Council's Salmon Advisory Sub-Panel, and Council staff.

(B) Notice and effectiveness of inseason adjustments will be made by NMFS in accordance with paragraph (f)(5) of this Plan.

(iii) If the overall quota for the non-Indian, incidental commercial troll fishery has not been harvested by salmon trollers during the April-June fishery, additional landings of halibut caught incidentally during salmon troll fisheries will be allowed in July and will continue until the amount of halibut that was initially available as quota for the troll fishery is taken or until the end of the season date for commercial halibut fishing determined by the IPHC and implemented in IPHC regulation. Landing restrictions implemented for the April-June salmon troll fishery will apply for as long as this fishery is open. Notice of the July opening of this fishery will be announced on the NMFS hotline (206) 526-6667 or (800) 662-9825. Halibut retention in the salmon troll fishery will be allowed after June only if the opening has been announced on the NMFS hotline.

(iv) A salmon troller may participate in this fishery or in the directed commercial fishery targeting halibut, but not in both.

(v) Under the Pacific Coast groundfish regulations at 50 CFR 660.330, fishing with salmon troll gear is prohibited within the Salmon Troll Yelloweye Rockfish Conservation Area (YRCA). The Salmon Troll YRCA is an area off the northern Washington coast and is defined by straight lines connecting latitude and longitude coordinates. Coordinates for the Salmon Troll YRCA are specified in groundfish regulations at 50 CFR 660.70(c) and in salmon regulations at 50 CFR 660.405(c).

(2) Directed fishery targeting halibut.

Eighty-five percent of the non-Indian commercial fishery allocation is allocated to the directed fishery targeting halibut (e.g., longline fishery) in southern Washington, Oregon, and California. The allocation for this directed catch fishery is approximately 17.0 percent of the Area 2A TAC. This fishery is confined to the area south of Subarea 2A-1 (south of Point Chehalis, WA; 46°53.30' N. lat.). This fishery may also be managed with closed areas designed to protect overfished groundfish species. Any such closed areas will be described annually in federal halibut regulations published in the *Federal Register* and the coordinates will be specifically defined at 50 CFR 660.71 through 660.74. The commercial fishery opening date(s), duration, and vessel trip limits, as necessary to ensure that the quota for the non-Indian commercial fisheries is not exceeded, will be determined by the IPHC and implemented in IPHC regulations. If the IPHC determines that poundage remaining in the quota for the non-Indian commercial fisheries is insufficient to allow an additional day of directed halibut fishing, the remaining halibut will be made available for incidental catch of halibut in the salmon troll fisheries (independent of the incidental harvest allocation).

(3) Incidental catch in the sablefish fishery north of Point Chehalis.

~~If~~Dependent on the Area 2A TAC~~ is greater than 900,000 lb (408.2 mt),~~, the primary directed sablefish fishery north of Point Chehalis will be allocated the Washington sport allocation that is in excess of 214,110 lb (97.1 mt), provided a minimum of 10,000 lb (4.5 mt) is available (i.e., the Washington sport allocation is 224,110 lb (101.7 mt) or greater). If the amount above 214,110 lb (97.1 mt) is less than 10,000 lb (4.5 mt), then the excess will be allocated to the Washington sport subareas according to section (f) of this Plan. The amount of halibut allocated to the sablefish fishery will be shared as follows: up to ~~70~~50,000 lb of halibut to the primary sablefish fishery north of Pt. Chehalis, unless the Area 2A TAC is 1,500,000 pounds or more, then the maximum allocation is 70,000 pounds. Any remaining allocation will be distributed to the Washington sport fishery among the four subareas according to the sharing described in the Plan, Section (f)(1).

The Council will recommend landing restrictions at its spring public meeting each year to control the amount of halibut caught incidentally in this fishery. The landing restrictions will be based on the amount of the allocation and other pertinent factors, and may include catch or landing ratios, landing limits, or other means to control the rate of halibut landings. NMFS will publish the landing restrictions annually in the *Federal Register*.

Under Pacific Coast groundfish regulations at 50 CFR 660.230, fishing with limited entry fixed gear is prohibited within the North Coast Commercial Yelloweye Rockfish Conservation Area (YRCA) and the Non-Trawl Rockfish Conservation Area (RCA). The North Coast Commercial Yelloweye Rockfish Conservation Area YRCA is an area off the northern Washington coast, overlapping the northern part of North Coast Recreational YRCA. The Non-Trawl RCA is an area off the Washington coast. These closed areas are defined by straight lines connecting latitude and longitude coordinates. Coordinates for the North Coast Commercial YRCA are specified in groundfish regulations at 50 CFR 660.70(b). Coordinates for the Non-Trawl RCA are specified in groundfish regulations at 50 CFR 660.73.

(4) Commercial license restrictions/declarations.

Commercial fishers must choose either (1) to operate in the directed commercial fishery in Area 2A and/or retain halibut caught incidentally in the primary directed sablefish fishery north of Point Chehalis, WA or (2) to retain halibut caught incidentally during the salmon troll fishery. Unless otherwise required by IPHC regulations, commercial fishers must obtain an individual vessel license for each commercial fishery: (1) to operate in the directed commercial fishery in Area 2A; or (2) to retain halibut caught incidentally in the primary sablefish fishery north of Point Chehalis, WA; or (3) to retain halibut caught incidentally during the salmon troll fishery. Commercial fishers wishing to operate in both the directed commercial fishery in Area 2A and/or retain halibut caught incidentally in the primary directed sablefish fishery north of Point Chehalis, WA may not obtain a vessel license to retain halibut caught incidentally during the salmon troll season. Commercial fishers operating in the directed halibut fishery must send their vessel license application to the IPHC postmarked no later than April 30, or the first weekday in May, if April 30 falls on a weekend, in order to obtain a vessel license to fish for halibut in Area

2A. Unless otherwise required by IPHC regulations, commercial fishers operating in the primary sablefish fishery north of Point Chehalis, WA who seek to retain incidentally caught halibut must send their vessel license application to the IPHC postmarked no later than March 15, or the first weekday following March 15, if March 15 falls on a weekend, in order to obtain a vessel license to retain incidentally caught halibut in Area 2A. Unless otherwise required by IPHC regulations, commercial fishers operating in the salmon troll fishery who seek to retain incidentally caught halibut must send their vessel license application to the IPHC postmarked no later than March 15, or the first weekday following March 15, if March 15 falls on a weekend, in order to obtain a vessel license to retain incidentally caught halibut in Area 2A. Fishing vessels licensed by IPHC to fish commercially in Area 2A are prohibited from operating in the sport fisheries in Area 2A.

(f) SPORT FISHERIES

The non-Indian sport fisheries (including incidental sablefish) are allocated approximately 69~~.3~~ percent of the non-Indian share, which is approximately 45~~.0~~ percent of the Area 2A TAC. The allocation is further divided as subquotas among seven geographic subareas.

(1) Subarea management. The sport fishery is divided into seven sport fishery subareas, each having separate allocations and management measures as follows.

(i) Washington inside waters (Puget Sound) subarea.

This sport fishery subarea is allocated 23.5 percent of the first 130,845 lb (59.4 mt) allocated to the Washington sport fishery, and 32 percent of the Washington sport allocation between 130,845 lb (59.4 mt) and 224,110 lb (101.7 mt) (except as provided in section (e)(3) of this Plan). This subarea is defined as all U.S. waters east of the mouth of the Sekiu River, as defined by a line extending from 48°17.30' N. lat., 124°23.70' W. long. north to 48°24.10' N. lat., 124°23.70' W. long., including Puget Sound. Season dates will be developed by the end of November each year for the following year. Seasons will open in early May and ~~will~~may be open up to two days per week ~~including~~which may include one weekday and one weekend day. Season structure ~~will~~may include periodic closures to assess the remaining quota for the subarea. If sufficient quota remains, additional openings may be implemented. The fishery will continue until the quota is projected to be taken, or September 30, whichever is earlier. The daily bag limit is one fish per person, with no size limit.

(ii) Washington north coast subarea.

This sport fishery subarea is allocated 62.2 percent of the first 130,845 lb (59.4 mt) allocated to the Washington sport fishery, and 32 percent of the Washington sport allocation between 130,845 lb (59.4 mt) and 224,110 lb (101.7 mt) (except as provided in section (e)(3) of this Plan). This subarea is defined as all U.S. waters west of the mouth of the Sekiu River, as defined above in paragraph (f)(1)(i), and north of the Queets River (47°31.70' N. lat.). Season dates will be developed by the end of November each year for the following year. Seasons will open in early May and ~~will~~may be open up to two days per week ~~including~~which may include one weekday and one weekend day. Season structure ~~will~~may include periodic closures to assess the remaining quota for the subarea. If sufficient quota remains, additional openings may be implemented.

No sport fishing for halibut is allowed after September 30. If the fishery is closed prior to September 30, and there is insufficient quota remaining to reopen for another fishing day, then any remaining quota may be transferred inseason to another Washington coastal subarea by NMFS via an update to the recreational halibut hotline. The daily bag limit in all fisheries is one halibut per person with no size limit.

Recreational fishing for groundfish and halibut is prohibited within the North Coast Recreational Yelloweye Rockfish Conservation Area (YRCA). The North Coast Recreational YRCA is a C-shaped area off the northern Washington coast and is defined by straight lines connecting latitude and longitude coordinates. Coordinates for the North Coast Recreational YRCA are specified in groundfish regulations at 50 CFR 660.70(a) and will be described annually in federal halibut regulations published in the *Federal Register*.

(iii) Washington south coast subarea.

This sport fishery is allocated 12.3 percent of the first 130,845 lb (59.4 mt) allocated to the Washington sport fishery, and 32 percent of the Washington sport allocation between 130,845 lb (59.4 mt) and 224,110 lb (101.7 mt) (except as provided in section (e)(3) of this Plan. This subarea is defined as waters south of the Queets River (47°31.70' N. lat.) and north of Leadbetter Point (46°38.17' N. lat.). The south coast subarea quota will be allocated as follows: 10 percent or 2,000 pounds, whichever is less, will be set aside for the nearshore fishery with the remaining amount allocated to the primary fishery. During days open to the primary fishery and seaward of the 30-fm line lingcod may be taken, retained and possessed, when allowed by groundfish regulations. Season dates for the primary fishery will be developed by the end of November each year for the following year. The primary seasons will open in early May and ~~will~~may be open up to two days per week ~~including~~which may include one weekday and one weekend day. ~~The primary season~~Season structure ~~will~~may include periodic closures to assess the remaining quota for the subarea. If sufficient quota remains, additional openings may be implemented. If there is insufficient quota remaining to reopen the primary fishery for another fishing day, the remaining primary fishery quota will be added to the nearshore quota. The nearshore fishery takes place, in the area from 47°31.70’ N. lat. south to 46°58.00’ N. lat. and east of a boundary line approximating the 30 fathom depth contour as defined by the following coordinates:

47°31.70′ N. lat., 124°37.03′ W. long.;
47°25.67′ N. lat., 124°34.79′ W. long.;
47°12.82′ N. lat., 124°29.12′ W. long.; and
46°58.00′ N. lat., 124°24.24′ W. long.

The nearshore fishery will open the first Saturday subsequent to the closure of the primary fishery and will be open seven days per week until the remaining quota is projected to be taken. If the fishery is closed prior to September 30, and there is insufficient quota remaining to reopen the nearshore areas for another fishing day, then any remaining quota may be transferred inseason to another Washington coastal subarea by NMFS via an update to the recreational halibut hotline.

The daily bag limit is one halibut per person, with no size limit.

Recreational fishing for groundfish and halibut is prohibited within two YRCA's off Washington's southern coast. The South Coast Recreational YRCA and the Westport Offshore YRCA are defined by straight lines connecting latitude and longitude coordinates. Coordinates for these Recreational YRCAs are specified in groundfish regulations at 50 CFR 660.70 (d) and (e) and will be described annually in federal halibut regulations published in the *Federal Register*.

(iv) Columbia River subarea.

This sport fishery subarea is allocated 2.0 percent of the first 130,845 lb (59.4 mt) allocated to the Washington sport fishery, and 4.0 percent of the Washington sport allocation between 130,845 lb (59.4 mt) and 224,110 lb (101.7 mt) (except as provided in section (e)(3) of this Plan). This subarea is also allocated 2.3 percent of the Oregon sport allocation. This subarea is defined as waters south of Leadbetter Point, WA (46°38.17' N. lat.) and north of Cape Falcon, OR (45°46.00' N. lat.). The Columbia River subarea seasons are as follows:

(A) A nearshore fishery is allocated 500 pounds of the Columbia River subarea allocation, to allow incidental halibut retention on groundfish trips in the area shoreward of the boundary line approximating the 30 fathom (55 m) depth contour extending from Leadbetter Point, WA (46°38.17' N. lat., 124°15.88' W. long.) to the Washington-Oregon border (46°16.00' N. lat., 124°15.88' W. long.) and from there, connecting to the boundary line approximating the 40 fathom (73 m) depth contour in Oregon. Coordinates will be specifically defined at 50 CFR 660.71 through 660.74. The nearshore fishery will be open Monday through Wednesday following the opening of the all-depth fishery, until the nearshore allocation is taken or September 30, whichever is earlier. Taking, retaining, possessing or landing halibut on groundfish trips is only allowed in the nearshore area on days not open to all-depth Pacific halibut fisheries. The daily bag limit is one halibut per person, with no size limit.

(B) The remaining Columbia River subarea allocation will be allocated for an all-depth fishery beginning in May. The all-depth fishery will open on the first Thursday in May or May 1 if it is a Friday~~, Saturday~~ or Sunday, ~~4~~three days per week, Thursday ~~through~~, Friday and Sunday until the subarea allocation is taken, or until September 30, whichever is earlier. Subsequent to the closure, if there is insufficient quota remaining in the Columbia River subarea for another fishing day, then any remaining quota may be transferred inseason to another Washington and/or Oregon subarea by NMFS via an update to the recreational halibut hotline. Any remaining quota would be transferred to each state in proportion to its contribution. The daily bag limit is one halibut per person, with no size limit. No groundfish may be taken and retained, possessed or landed when halibut are on board the vessel with the following exceptions. When allowed by groundfish regulations sablefish, Pacific cod, flatfish species may be retained, and lingcod caught north of the Washington-Oregon border (46°16.00’ N. lat.) may be retained during the month of May.

(v) Oregon central coast subarea.

This subarea extends from Cape Falcon (45°46.00' N. lat.) to Humbug Mountain, Oregon (42°40.50' N. lat.) and is allocated 93.79 percent of the Oregon sport allocation. If the overall 2A TAC is 700,000 pounds (317.5 mt) or greater, the structuring objectives for this subarea are to provide two periods of fishing opportunity in Spring and in Summer in productive deeper water areas along the coast, and provide a period of fishing opportunity in the summer for nearshore waters. If the overall 2A TAC is less than 700,000 pounds (317.5 mt), the structuring objectives for this subarea are to provide a period of fishing opportunity beginning in Spring in productive deeper water areas along the coast, and provide a period of fishing opportunity in nearshore waters. Any poundage remaining unharvested in the Spring all-depth subquota will be added to either the Summer all-depth sub-quota or the nearshore subquota based on need, determined via joint consultation between IPHC, NMFS, PFMC, and ODFW. If the 2A TAC exceeds 700,000 pounds, any poundage that is not needed to extend the inside 40-fathom (73 m) fishery through October 31 will be added to the Summer all-depth season if it can be used, and any poundage remaining unharvested from the Summer all-depth fishery will be added to the inside 40-fathom (73 m) fishery subquota, if it can be used. If inseason it is determined via joint consultation between IPHC, NMFS, PFMC, and ODFW, that the combined all-depth and inside 40-fathom (73 m) fisheries will not harvest the entire quota to the subarea, quota may be transferred inseason to another subarea south of Leadbetter Point, WA by NMFS via an update to the recreational halibut hotline. The daily bag limit is one halibut per person, unless otherwise specified, with no size limit. During days open to all-depth halibut fishing when the groundfish fishery is restricted by depth, no groundfish may be taken and retained, possessed or landed, except sablefish, Pacific cod and flatfish species when allowed by groundfish regulations, if halibut are on board the vessel. During days open to all-depth halibut fishing when the groundfish fishery is open to all depths, any groundfish species permitted under the groundfish regulations may be retained, possessed or landed if halibut are on aboard the vessel. During days open to nearshore halibut fishing, flatfish species may be taken and retained seaward of the seasonal groundfish depths restrictions, if halibut are on board the vessel.

Recreational fishing for groundfish and halibut is prohibited within the Stonewall Bank YRCA. The Stonewall Bank YRCA is an area off central Oregon, near Stonewall Bank, and is defined by straight lines connecting latitude and longitude coordinates. Coordinates for the Stonewall Bank YRCA are specified in groundfish regulations at 50 CFR 660.70 (f) and will be described annually in federal halibut regulations published in the *Federal Register*.

ODFW will sponsor a public input process shortly after the IPHC annual meeting to develop recommendations to NMFS on the open dates for each season each year. The three seasons for this subarea are as follows.

(A) The first season (nearshore fishery) opens June 1, 7 days per week, only in waters inside the 40-fathom (73 m) curve. The fishery continues until the subquota is taken, or until October 31, whichever is earlier and is allocated 12 percent of the subarea quota if the 2A TAC is above 700,000 pounds (317.5 mt) or greater or 25 percent of the subarea quota if the 2A TAC is less than 700,000 pounds (317.5 mt). Any overage in the all-depth fisheries would not affect achievement of allocation set aside for the inside 40-fathom (73 m) curve fishery.

(B) The second season (Spring fishery) is an all-depth fishery with two potential openings and is allocated 63 percent of the subarea quota if the TAC is 700,000 pounds (317.5 mt) or greater, or 75 percent of the subarea quota if the 2A TAC is less than 700,000 pounds (317.5 mt). Fixed season dates will be established preseason for the first Spring opening and will not be modified inseason except if the combined Oregon all-depth Spring and Summer season total quotas are estimated to be achieved. Recent year catch rates will be used as a guideline for estimating the catch rate for the Spring fishery each year. The number of fixed season days established will be based on the projected catch per day with the intent of not exceeding the subarea subquota for this season. The first opening will be structured for 2 days per week (Friday and Saturday) if the season is for 4 or fewer fishing days. The fishery will be structured for 3 days per week (Thursday through Saturday) if the season is for 5 or more fishing days. The fixed season dates will occur in consecutive weeks starting the second Thursday in May (if the season is 5 or more fishing days) or second Friday in May (if the season is 4 or fewer fishing days), with possible exceptions to avoid adverse tidal conditions. If, following the "fixed" dates, quota for this season remains unharvested, a second opening will be held. If it is determined appropriate through joint consultation between IPHC, NMFS, PFMC, and ODFW, fishing may be allowed on one or more additional days. Notice of the opening(s) will be announced by NMFS via an update to the recreational halibut hotline. The fishery will be open every other week on Thursday through Saturday except that week(s) may be skipped to avoid adverse tidal conditions. The potential open Thursdays through Saturdays will be identified preseason. The fishery will continue until there is insufficient quota for an additional day of fishing or July 31, whichever is earlier if the 2A TAC is 700,000 pounds (317.5 mt) or greater. If the 2A TAC is less than 700,000 pounds (317.5 mt) the fishery will continue until there is insufficient quota for an additional day of fishing or October 31, whichever is earlier.

(C) The last season (summer fishery) is an all-depth fishery that begins on the first Friday in August and is allocated 25 percent of the subarea quota if the 2A TAC is 700,000 pounds (317.5 mt) or greater. If the 2A TAC is less than 700,000 pounds (317.5 mt) then 0 percent of the subarea quota will be allocated to this season. The fishery will be structured to be open every other week on Friday and Saturday except that week(s) may be skipped to avoid adverse tidal conditions. The fishery will continue until there is insufficient quota remaining to reopen for another fishing day or October 31, whichever is earlier. The potential open Fridays and

Saturdays will be identified preseason. If after the first scheduled open period, the remaining Cape Falcon to Humbug Mountain entire season quota (combined all-depth and inside 40-fathom (73 m) quotas) is 60,000 lb (27.2 mt) or more, the fishery will re-open on every Friday and Saturday (versus every other Friday and Saturday), if determined to be appropriate through joint consultation between IPHC, NMFS, PFMC, and ODFW. The inseason action will be announced by NMFS via an update to the recreational halibut hotline. If after the Labor Day weekend~~,~~ the remaining Cape Falcon to Humbug Mountain entire season quota (combined all-depth and inside 40-fathom (73 m) quotas) is 30,000 lb (13.6 mt) or more and the fishery is not already open every Friday and Saturday, the fishery will re-open on every Friday and Saturday (versus every other Friday and Saturday), if determined to be appropriate through joint consultation between IPHC, NMFS, PFMC, and ODFW. After the Labor Day weekend, the IPHC, NMFS, PFMC, and ODFW will consult to determine whether increasing the Oregon Central Coast bag limit to two fish is warranted with the intent that the quota for the subarea is taken by September 30. If the quota is not taken by September 30, the season will remain open, maintaining the bag limit in effect at that time, through October 31 or quota attainment, whichever is earlier. The inseason action will be announced by NMFS via an update to the recreational halibut hotline.

(vi) Southern Oregon Subarea

This sport fishery is allocated 3.91 percent of the Oregon sport allocation. This area is defined as the area south of Humbug Mountain, OR (42° 40.50' N. lat.) to the Oregon/California Border (42° 00.00' N. lat.). This fishery will open May 1, seven days per week until the subquota is taken or October 31, whichever is earlier. The daily bag limit is one halibut per person with no size limit. No groundfish may be taken and retained, possessed or landed, except sablefish, Pacific cod, and flatfish species, in areas closed to groundfish, if halibut are on board the vessel.

(vii) California subarea

This sport fishery subarea is allocated 4.0 percent of the non-Indian allocation. This area is defined as the area south of the Oregon/California Border (42° 00.00' N. lat.), including all California waters. The fishery will be structured to provide recreational fishing opportunity seven days per week, from May 1 until the quota is projected to be taken, or until October 31, whichever is earlier. Additional closed periods during this season, such as closed weeks or months and including a later opening date, may be established preseason by NMFS based on the subarea quota and projected catch. Based on the subarea quota, and considering stakeholder input, the California Department of Fish and Wildlife will provide recommendations to NMFS each year as soon as possible following the determination of the Area 2A TAC on the opening date and other closure dates, such as closed weeks or months, that would apply during the fishing season that year. Closure of the fishery or other inseason adjustments will be made by NMFS via an update to the recreational halibut hotline. The daily bag limit is one halibut per person, with no size limit.

(2) Port of landing management. All sport fishing in Area 2A will be managed on a "port of landing" basis, whereby any halibut landed into a port will count toward the quota for the subarea in which that port is located, and the regulations governing the subarea of landing apply, regardless of the specific area of catch.

(3) Possession limits. The sport possession limit on land in Washington is two daily bag limits, regardless of condition, but only one daily bag limit may be possessed on the vessel. The sport possession limit on land in Oregon is three daily bag limits, regardless of condition, but only one daily bag limit may be possessed on the vessel. The sport possession limit on land in California and on the vessel is one daily bag limit, regardless of condition.

(4) Ban on sport vessels in the commercial fishery. Vessels operating in the sport fishery for halibut in Area 2A are prohibited from operating in the commercial halibut fishery in Area 2A. Sport fishers and charterboat operators must determine, prior to May 1 of each year, whether they will operate in the commercial halibut fisheries in Area 2A which requires a commercial fishing license from the IPHC. Sport fishing for halibut in Area 2A is prohibited from a vessel licensed to fish commercially for halibut in Area 2A.

(5) Flexible inseason management provisions.

(i) The Regional Administrator, NMFS West Coast Region, after consultation with the Chairman of the Pacific Fishery Management Council, the IPHC Executive Director, and the Fisheries Director(s) of the affected state(s), or their designees, is authorized to modify regulations during the season after making the following determinations.

(A) The action is necessary to allow allocation objectives to be met.

(B) The action will not result in exceeding the catch limit for the area.

(C) If any of the sport fishery subareas north of Cape Falcon, OR are not projected to utilize their respective quotas by September 30, NMFS may take inseason action to transfer any projected unused quota to another Washington sport subarea.

(D) If any of the sport fishery subareas south of Leadbetter Point, WA are not projected to utilize their respective quotas by their season ending dates, NMFS may take inseason action to transfer any projected unused quota to another Oregon sport subarea.

(E) Notwithstanding (f)(5)(i)(A), if the total estimated yelloweye rockfish bycatch mortality from recreational halibut trips in all Oregon subareas is projected to exceed 22 percent of the annual Oregon recreational yelloweye rockfish harvest guideline, NMFS may take inseason action to reduce yelloweye rockfish bycatch mortality in the halibut fishery while allowing allocation objectives to be met to the extent possible.

(ii) Flexible inseason management provisions include, but are not limited to, the following:

(A) Modification of sport fishing periods;

(B) Modification of sport fishing bag limits;

(C) Modification of sport fishing size limits;

(D) Modification of sport fishing days per calendar week;

(E) Modification of subarea quotas; and

(F) Modification of Stonewall Bank YRCA restrictions off Oregon.

(iii) Notice procedures.

(A) Inseason actions taken by NMFS will be published in the *Federal Register*.

(B) Actual notice of inseason management actions will be provided by a telephone hotline administered by the West Coast Region, NMFS, at 206-526-6667 or 800-662-9825. Since provisions of these regulations may be altered by inseason actions, sport fishermen should monitor the telephone hotline for current information for the area in which they are fishing.

(iv) Effective dates.

(A) Inseason actions will be effective on the date specified in the *Federal Register* notice or at the time that the action is filed for public inspection with the Office of the Federal Register, whichever is later.

(B) If time allows, NMFS will invite public comment prior to the effective date of any inseason action filed with the *Federal Register*. If the West Coast Administrator determines, for good cause, that an inseason action must be filed without affording a prior opportunity for public comment, public comments will be received for a period of 15 days after of the action in the *Federal Register*.

(C) Inseason actions will remain in effect until the stated expiration date or until rescinded, modified, or superseded. However, no inseason action has any effect beyond the end of the calendar year in which it is issued.

(v) Availability of data. The West Coast Administrator will compile, in aggregate form, all data and other information relevant to the action being taken and will make them available for public review during normal office hours at the West Coast Regional Office, NMFS, Sustainable Fisheries Division, 7600 Sand Point Way NE, Seattle, WA.

(6) Sport fishery closure provisions.

The IPHC shall determine and announce closing dates to the public for any subarea in which a subquota is estimated to have been taken. Closures are determined after consultation with Regional Administrator, NMFS West Coast Region, Chairman of the Pacific Fishery Management Council, the IPHC Executive Director, and the Fisheries Director(s) of the affected state(s), or their designees. When the IPHC has determined that a subquota has been taken, and has announced a date on which the season will close, no person shall sport fish for halibut in that area after that date for the rest of the year, unless a reopening of that area for sport halibut fishing is scheduled by NMFS as an inseason action, or announced by the IPHC.

(g) PROCEDURES FOR IMPLEMENTATION

Each year, NMFS will publish a proposed rule with any regulatory modifications necessary to implement the Plan for the following year, with a request for public comments. The comment period will extend until after the IPHC annual meeting, so that the public will have the opportunity to consider the final Area 2A TAC before submitting comments. After the Area 2A TAC is known, and after NMFS reviews public comments, NMFS will implement final rules governing the sport fisheries. The final ratio of halibut to Chinook to be allowed as incidental catch in the salmon troll fishery will be published with the annual salmon management measures.
Sources:

82 FR 18581 (April 20, 2017)
81 FR 18789 (April 1, 2016)
80 FR 17344 (April 1, 2015)
79 FR 18827 (April 4, 2014)
78 FR 16423 (March 15,2013)
77 FR 16740 (March 22, 2012)
76 FR 14300 (March 16, 2011)
75 FR 13024 (March 18, 2010)
74 FR 11681 (March 19, 2009)
73 FR 12280 (March 7, 2008)
72 FR 11792 (March 14, 2007)
71 FR 10850 (March 3, 2006)
70 FR 20304 (April 19, 2005
69 FR 24524 (May 4, 2004)
68 FR 10989 (March 7, 2003)
67 FR 12885 (March 20, 2002)
66 FR 15801 (March 21, 2001)
65 FR 14909 (March 20, 2000)
64 FR 13519 (March 19, 1999)
63 FR 13000 (March 17, 1998)
62 FR 12759 (March 18, 1997)
61 FR 11337 (March 20, 1996)
60 FR 14651 (March 20, 1995)
59 FR 22522 (May 2, 1994)
58 FR 17791 (April 6, 1993)

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NMFS Report

REPORT ON THE 2017 PACIFIC HALIBUT FISHERIES IN AREA 2A

The 2017 Area 2A Pacific halibut (halibut) total allowable catch (TAC) of 1,330,000 pounds (lbs.), set by the International Pacific Halibut Commission (IPHC), was allocated according to the 2017 Catch Sharing Plan (CSP) for Area 2A as follows:

Treaty Tribes	465,500 (35%)
Non-Tribal Total	864,500 (65%)
Non-Tribal Commercial	265,402
Washington Sport	307,762
Oregon Sport	256,757
California Sport	34,580

Weights in this report are net weight (gutted, head-off, and without ice and slime), except IPHC fishing period limits. The structure of each fishery and the resulting harvests are described below. Refer to Table 2 at the end of this report for a summary of catches by the tribal, commercial, and recreational fisheries.

TOTAL TRIBAL AND NON-TRIBAL FISHERIES

Best estimates of halibut catch for Area 2A indicate harvest of 818,976 pounds of the non-tribal total quota and 432,483 pounds of the tribal quota, with a total preliminary harvest estimate of 1,251,459 pounds, or 94.09%, of the 1,330,000 lbs. TAC. A summary of all Area 2A quotas and best-available harvest estimates for 2017 is attached in Table 2 on the last page of this document.

NON-TRIBAL COMMERCIAL FISHERIES

A quota of 265,402 pounds (30.7% of the non-tribal share) was allocated to two fishery components:

1) a directed longline fishery targeting on halibut south of Point Chehalis, WA; and
2) an incidental catch fishery during the salmon troll fisheries off Washington, Oregon, and California.

An additional 70,000 pounds were allocated to an incidental catch fishery in the sablefish primary fishery for vessels using longline gear north of Point Chehalis, WA. This allowance for the sablefish primary fishery is taken from the Washington sport allocation and is only available in years when the Washington TAC is above 214,110 pounds, as long as the amount is at least 10,000 pounds.

Incidental halibut catch in the salmon troll fishery

A quota of 39,810 pounds of Pacific halibut (15% of the non-tribal commercial fishery allocation) was allocated to the non-tribal commercial salmon troll fishery in Area 2A as incidental catch during salmon troll fisheries.

- Halibut retention was permitted in the salmon troll fisheries beginning May 1, with the following ratio: one halibut (minimum 32 inches) per two Chinook salmon landed by a salmon troller, except that one halibut could be landed without meeting the ratio requirement, and no more than 35 halibut could be landed per trip.
- On July 1, the ratio changed to one halibut per four Chinook, except that one halibut could be landed without meeting the ratio requirement, and no more than 10 halibut could be landed per trip.
- The allocation of halibut in the salmon troll fishery was estimated to have been taken and the fishery closed August 3, with an estimated catch of 38,621 pounds.

Fishing with salmon troll gear is prohibited within the Salmon Troll Yelloweye Rockfish Conservation Area (YRCA) off the northern Washington Coast. Additionally, the "C-shaped" North Coast Recreational YRCA off Washington is designated as an area to be avoided (a voluntary closure) by salmon trollers.

Directed fishery targeting halibut

A quota of 225,591 pounds (85% of the non-tribal commercial fishery allocation) was allocated to the directed longline fishery targeting on halibut in southern Washington, Oregon, and California. The fishery was confined to the area south of Subarea 2A-1 (south of Point Chehalis, WA; 46°53.30' N. lat.). In addition, there are closed areas along the coast defined by depth contours. Between the U.S./Canada border and 40°10' N. lat. the western boundary is defined by a line approximating the 100 fm depth contour. The eastern boundary is defined as follows: Between the U.S./Canada border and 46°16' N. lat., the boundary is the shoreline. Between 46°16' N. lat. and 40°10' N. lat. the boundary is the 30 fm depth contour. One-day fishing periods of 10 hours in duration were scheduled every other week by the IPHC starting June 28, 2017. In 2017, the fishery was open for 3 fishing periods on June 28, July 12, and July 26. A 32 inch minimum size limit with the head on was in effect for all openings. Vessel landing limits per fishing period based on vessel length were imposed by IPHC during all openings as shown in Table 1. Vessels choosing to operate in this fishery could not land halibut as incidental catch in the salmon troll fishery, nor operate in the recreational fishery.

Table 1. 2017 fishing period limits (dressed weight, head-on with ice and slime, in pounds per vessel) by vessel size.

Vessel Class/Size (ft)		June 28 and July 12	July 26
0-25	A	860	670
26-30	B	1,075	835
31-35	C	1,715	1,335
36-40	D	4,735	3,680
41-45	E	5,090	3,960
46-50	F	6,095	4,740
51-55	G	6,800	5,290
56+	h	10,225	7,955

- The June 28, July 12 and July 26 directed commercial open periods resulted in a catch of approximately 229,707 pounds. IPHC announced closure of the directed fishery on August 4, 2017.

Incidental halibut catch in the sablefish primary longline fishery north of Point Chehalis, WA
A quota of 70,000 pounds was allocated to the primary sablefish fishery in Area 2A as incidental catch north of Point Chehalis, WA. This incidental fishery is only available to vessels with a groundfish limited entry permit endorsed for longline gear with a sablefish tier limit and with an IPHC license. Beginning April 1, the incidental landing limit was 110 pounds (dressed weight) of halibut per 1,000 pounds (dressed weight) of sablefish and up to 2 additional halibut in excess of the landing limit ratio. Effective May 11, the landing limit was changed to 140 pounds (64 kg) dressed weight of halibut for every 1,000 pounds (454 kg) dressed weight of sablefish landed and up to 2 additional halibut in excess of the 140 pounds per 1,000 pounds ratio per landing.
The fishery was confined to an area seaward of a boundary line approximating the 100-fm depth contour. Fishing was also prohibited in the North Coast Commercial YRCA, an area off the northern Washington coast. In addition, the "C-shaped" North Coast Recreational YRCA off Washington is designated as an area to be avoided (a voluntary closure) by commercial longline sablefish fishermen.

- This fishery is projected to have landed 35,866 pounds.

SPORT FISHERIES (NON-TRIBAL)
529,098 pounds were allocated between sport fisheries in Washington (35.6% of non-tribal share, minus 70,000 pounds allocated to the incidental catch in the sablefish primary fishery), Oregon (29.7% of the non-tribal share), and California (4.0% of the non-tribal share). The allocations were further subdivided as quotas among six geographic subareas as described below. Unless otherwise noted the daily bag limit in all subareas was one halibut of any size, per person, per day.

Washington Inside Waters Subarea (Puget Sound and Strait of Juan de Fuca)
This area was allocated 64,962 pounds (23.5% of the first 130,845 lbs allocated to the Washington sport fishery, and 32% of the Washington sport allocation between 130,845 and 224,110 pounds). The fishing season in Puget Sound was open May 4, 6, 11, 21, 25, and June 1, 4, 10, and 17.

- The estimated total catch in this area is 60,123 pounds, which is 4,839 pounds under the quota.

Northern Washington Coastal Waters Subarea (landings in Neah Bay and La Push)
The coastal area off Cape Flattery to Queets River was allocated 115,599 pounds (62.2% of the first 130,845 pounds allocated to the Washington sport fishery, and 32% of the Washington sport allocation between 130,945 and 224,110 pounds). The fishery was open for nine days (May 4, 6, 11, 21, 25, June 1, 4, 10, and 17), and closed on June 17 without enough quota remaining to reopen the fishery. The "C-shaped" North Coast Recreational YRCA, southwest of Cape Flattery, was closed to sport halibut fishing.

- The estimated total catch for this area is 100,410 pounds, which is 15,189 pounds under the quota.

Washington South Coast Subarea (landings in Westport)

The area from the Queets River to Leadbetter Point was allocated 50,307 pounds (12.3% of the first 130,845 pounds allocated to the Washington sport fishery and 32% of the Washington sport allocation between 130,845 and 224,110 pounds). This subarea operates with an all-depth fishery and a nearshore fishery. When open, the nearshore fishery occurs in waters between the Queets River and 47°25.00' N. lat. south to 46°58.00' N. lat., and east of 124°30.00' W. long. The south coast subarea quota was allocated as follows: 2,000 pounds to the nearshore fishery and the remaining 48,307 pounds to the primary fishery. The all-depth fishery was open five days on May 4, 6, 11, 21, and June 17. The nearshore fishery remained closed due to overages from the all-depth fishery.

- The all-depth fishery estimated catch is 61,061 pounds which is 10,754 pounds over the quota.

Columbia River Subarea (Leadbetter Point to Cape Falcon)

This sport fishery subarea was allocated 12,799 pounds, consisting of 2.0% of the first 130,845 pounds allocated to the Washington sport fishery, and 4.0% of the Washington sport allocation between 130,845 and 224,110 pounds, and 2.3% of the Oregon sport allocation. The fishery operates with an all-depth and nearshore fishery. The nearshore fishery is allocated 500 pounds to accommodate incidental halibut retention during groundfish fishing when the all-depth halibut fishery in this area is closed.

- The all-depth fishery was open May 4-7, 11-14, 18-21, and 25. It reopened on June 17 for one day. The nearshore fishery opened May 8.
- The all-depth fishery estimated catch is 13,830 pounds which is 1,531 pounds over the subarea quota.
- The nearshore fishery estimated catch was 184 pounds, through June 23. The overage from the all-depth fishery was greater than what remained on the total Columbia River Subarea allocation, therefore the nearshore fishery closed to prevent further overage of the subarea allocation.

Oregon Central Coast Subarea (Cape Falcon to Humbug Mountain)

This sport fishery subarea was allocated 240,812 pounds (93.79% of the Oregon sport allocation).

Three seasons occurred in this subarea:

1. a restricted depth nearshore (inside 40-fathom) fishery, open June 1-July 30, reopened September 3-October 31, 7 days a week;
2. a fixed Spring season in all depths that was open on May 11-13, 18-20, June 1-3, 8-10, 15-17, June 29- July 1;
3. a Summer season in all depths that was open August 4-5, August 18-19, September 1-2, and September 15-16.

Harvest in this subarea in these seasons is summarized in the bullets below.

- The inside 40-fathom fishery has an estimated catch of 34,865 pounds, which is 766 pounds under the quota of revised quota of 35,631 pounds.
- The Spring all-depth fishery resulted in an estimated catch of 145,635 pounds, which is 6,077 pounds under the spring allocation.
- Quota left from the Spring all-depth fishery (6,077 pounds) was transferred to the Summer all-depth fishery.
- The Summer all-depth fishery resulted in an estimated catch of 63,546 pounds, which is 2,735 pounds under the revised allocation of 66,280 pounds.
- The remaining 2,735 pounds was transferred to the Central Coast nearshore fishery.

Southern Oregon (Humbug Mountain to the OR/CA Border)
This sport fishery was allocated 10,039 pounds (3.9% of the Oregon sport fishery allocation minus the Oregon contribution to the Columbia River subarea). This area has a pre-set season of 7 days per week from May 1 to October 31.

- On August 28, 4,000 pounds from this subarea was transferred to the Central Coast nearshore subarea, resulting in an adjusted allocation of 6,039 pounds.
- This fishery has an estimated catch of 2,811 pounds, which is 3,228 pounds under the adjusted quota.

California (Off the California Coast)
This sport fishery was allocated 34,580 pounds (4.0% of the non-tribal share). The fishery was open May 1- June 15, July 1- 15, August 1-15 and September 1-10. The fishery was closed on September 10 at 11:59 pm because catch projections estimated the quota had been taken and there was not sufficient quota for the fishery to remain open. An error was found in California catch estimation programming language that had resulted in the over-reporting of catch, causing the fishery to close earlier than was necessary.

- This fishery resulted in an estimated catch of 30,541 pounds, which is 4,039 pounds under the quota.

TRIBAL FISHERIES
465,500 pounds (35% of the Area 2A TAC) was allocated to tribal fisheries. The tribes estimated that 29,600 pounds would be used for ceremonial and subsistence (C&S) fisheries and the remaining 435,900 pounds were allocated to the commercial fishery.

- The unrestricted fishery was open March 20 (11 hours) and April 15-16 (39 hours). The unrestricted fishery landed 264,005 pounds in 306 landings.
- The restricted fishery was open May 1-2 (35 hours), with a 500 pound/vessel/day limit. The restricted fishery landed 41,607 pounds in 172 landings.
- The late fishery was open May 19-20 and 22-23 (34 hr.) with a 2,500 pound/vessel/day limit, and June 18-19 and July 21-22 (34 hrs.) with a 1,000 pound/vessel/day limit. The late fisheries totaled 126,870 pounds in 186 landings.
- The total landings for all tribal fisheries is 432,482 pounds, which is 3,418 pounds under the tribal commercial allocation. The C&S fishery will continue through December 31 and estimates of catch will be reported by the tribes in January 2018.

Table 2. Summary of all Area 2A quotas and 2017 harvest estimates.

2017 Area 2A TAC and Catch (in pounds)			2017 Quota	Inseason Revised Quota	Catch to Date		% Quota taken
Tribal			465,500		432,482		92.91
Tribal	C&S		29,600				
Tribal	Commercial		435,900		432,482	*	99.22
Non-Tribal			864,500		818,976		94.73
Commercial			265,402				
Commercial	Directed		225,591		229,707	*	101.82
Commercial	Incid. Salmon Troll		39,810		38,621	*	97.01
WA Sport			307,762		257,460		83.66
WA Sport	Incid. Sable		70,000		35,866	*	51.24
WA Sport	Puget Sound		64,962		60,123	*	92.55
WA Sport	North Coast		115,599		100,410	*	86.86
WA Sport	South Coast	Primary	50,307		61,061	*	121.40
WA Sport	South Coast	Nearshore	-		-	*	-
WA/OR	Columbia River	All-Depth	12,299		13,830	*	112.45
WA/OR	Columbia River	Nearshore	500		184	*	36.80
OR Sport			256,757		246,857		96.14
OR Sport	Central OR Coast	Spring all-depth	151,712		145,635	*	95.99
OR Sport	Central OR Coast	Summer all-depth	60,203	66,280	63,546	*	95.88
OR Sport	Central OR Coast	Nearshore	28,897	35,631	34,865	*	97.85
OR Sport	Southern OR		10,039	6,039	2,811	*	46.55
CA Sport			34,580		30,541	*	88.32
Total			1,330,000		1,249,682		93.96
* Fishery closed for the season							

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U. S. COAST GUARD ENFORCEMENT REPORT

(IPHC Areas 2A, 2C, 3A, 3B, 4A, 4B, 4C, 4D and 4E)

TO THE

INTERNATIONAL PACIFIC HALIBUT COMMISSION

January 2018

Prepared By:
Eleventh U.S. Coast Guard District (dre)
Thirteenth U.S. Coast Guard District (dre)
Seventeenth U.S. Coast Guard District (dre)

I. Coast Guard Resources in Pacific Northwest and Alaska

The U.S. Coast Guard (USCG) has three districts overseeing U.S. waters of the western coastal states, including Alaska. The Eleventh District (D11) area of responsibility includes the southern portion of IPHC Area 2A and all the waters off the coast of California out to 200 nautical miles. The Thirteenth District (D13) area of responsibility includes the northern portion of IPHC Area 2A and all waters off the coasts of Washington and Oregon out to 200 nautical miles, as well as Washington internal waters. The Seventeenth District (D17) area of responsibility includes all waters off Alaska out to 200 nautical miles, and encompasses the IPHC Areas 2C, 3A, 3B, 4A, 4B, 4C, 4D, and 4E. Resources used for fisheries enforcement include cutters, aircraft, and boats from coastal stations.

Cutters:

- The 378-foot High Endurance Cutter USCGC DOUGLAS MUNRO and 282-foot Medium Endurance Cutter USCGC ALEX HALEY home-ported in Kodiak, AK regularly patrol the Bering Sea in addition to periodic patrols of North Pacific waters.
- 418-foot National Security Cutters and 378-foot High Endurance Cutters from California, Washington, and Hawaii are periodically assigned to patrol D13 and D17 waters or to monitor fisheries activity during transits to other operating areas.
- Six 225-foot buoy tenders conduct periodic law enforcement and are home-ported in San Francisco, Astoria, Sitka, Cordova, Kodiak, and Homer.
- Three 210-foot Medium Endurance Cutters are also occasionally assigned to dedicated patrols in D11’s and D13's waters or to monitor fisheries activity. These cutters are home-ported in Astoria, OR and Port Angeles, WA.
- Eight 110-foot patrol boats conduct routine law enforcement and are home-ported in San Diego, Port Angeles, Coos Bay, Petersburg, Juneau, Valdez, Seward, and Homer.
- Seven 87-foot Coastal Patrol Boats located in Puget Sound and Strait of Juan de Fuca ports with an additional thirteen 87-foot Coastal Patrol Boats providing coverage along the California coast.
- Two 154-foot Fast Response Cutters, USCGC JOHN MCCORMICK and USCGC BAILEY BARCO were commissioned earlier in 2017 and conduct routine law enforcement throughout eastern Alaska. Both are home-ported in Ketchikan, AK.

Aircraft:

- Fixed wing and rotary wing aircraft are based in air stations in Kodiak, Sitka, Port Angeles, Astoria, North Bend, Humboldt Bay, Sacramento, San Francisco, Point Mugu, and San Diego.

Stations:

- D11 has nine coastal boat stations, two boat stations in California internal waters, and one boat station located in Lake Tahoe.
- D13 has eleven coastal boat stations in Washington and Oregon, as well as three stations in Washington internal waters and one on the Willamette River (Portland).
- Two additional seasonal stations are operated in Central and Southern Oregon during summer months with higher boating activity.
- D17 has three coastal boat stations in Ketchikan, Juneau, and Valdez.

The primary at-sea fisheries enforcement assets are our cutters, ranging in size from the 87-foot patrol boats up to the largest cutters. Patrol boats are more limited in sea keeping abilities, and conduct the majority of enforcement inside of 50 nautical miles from shore. In D11 and D13, the 87-foot patrol boats have increased their fisheries enforcement presence over the past few years. This role is fulfilled by 154-foot Fast Response Cutters and 110-foot patrol boats in Alaskan waters which provide regular law enforcement presence in the commercial, charter, subsistence, and recreational fishing fleets. However, patrol boats are limited in their offshore operational effectiveness by weather. Fast Response Cutters have increased operating parameters and will eventually completely replace the 110-foot patrol boat fleet.

Beyond 50 nautical miles, we rely upon our larger cutters to enforce all federal fisheries regulations, with National Security Cutters and High Endurance Cutters from throughout the west coast assigned to patrol Alaskan waters. The 210-foot Medium Endurance Cutters are occasionally assigned to enforcement patrols within D13 waters and conduct fisheries enforcement while transiting through D11 waters.

The boat stations primarily focus on recreational, subsistence, and charter halibut activity in their regions, although this does not preclude them from boarding commercial vessels sighted in the course of normal duties.

Fisheries law enforcement flights are conducted daily from air stations in Kodiak, Sitka, Port Angeles, Astoria, North Bend, Humboldt, San Francisco, Point Mugu, and San Diego using a variety of assets from fixed wing HC-130 to MH60 and MH65 helicopters. Additionally, fixed-wing aircraft from Sacramento, California may conduct surveillance flights along the entire west coast and throughout the Eastern Pacific. During 2016, Air Station Sacramento completed the transition from HC-130 aircraft to a new fixed-wing platform, the HC-27J, which will continue to conduct medium range flight patrols.

All units involved in fisheries enforcement receive training from the Coast Guard's North Pacific Regional Fisheries Training Center in Kodiak, Alaska or the Coast Guard’s Pacific Regional Fisheries Training Center in Alameda, California prior to patrolling a specific region. NOAA Office of Law Enforcement (OLE) agents and state fisheries enforcement officers routinely participate in the training, as well as riding on cutters and aircraft during fisheries enforcement patrols. The success of USCG fisheries enforcement operations is enhanced by collaboration with our enforcement partners from NOAA OLE and the states of California, Washington, Oregon, and Alaska.

II. Commercial Halibut Enforcement

In 2017, the USCG distributed its enforcement assets throughout the IPHC Areas, with boarding amounts listed in Table 1. The USCG enforcement focus is to protect the resource in accordance with the fishery management plan, to ensure equal economic opportunity for all participants, and to enhance safety at sea.

Table 1. 2016 & 2017 Geographic Distribution of Boardings on Vessels Targeting Halibut

IPHC Area	2016 Boardings	2017 Boardings
2A	37	68
2C	256	330
3A	178	195
3B	2	2
4A	17	11
4B	8	4
4C	1	0
4D	3	1
4E	0	1

In Area 2A, three ten-hour non-tribal commercial halibut derbies took place during the 2017 season - June 28th, July 12th, and July 26th. The USCG placed a high priority on monitoring activity with dedicated cutter and aircraft patrols during the derbies, as well as during the associated pre-season closures. Table 2 gives an overview of the assets dedicated to monitoring the derbies.

USCG enforcement efforts during the commercial halibut derbies focused on IPHC regulations, such as: (1) ensuring vessels fishing during the pre-season closures did not participate in the derbies without first undergoing a state hold inspection, (2) ensuring vessels were properly permitted to participate and ensuring their permits were onboard during the derbies, (3) inspecting catch for compliance with size restrictions and overall catch limits, (4) ensuring fishing gear was in compliance, and (5) ensuring vessels were not fishing after the derby closure if they had halibut on board. Finally, the USCG focused on ensuring vessels complied with federal commercial fishing vessel safety regulations.

In addition to IPHC regulations, west coast Non-Trawl Rockfish Conservation Areas (RCAs) have been closed to the use of fixed-gear to retain groundfish, including Pacific Halibut, since 2002. Vessel Monitoring System (VMS) carriage requirements have been in place to monitor the RCAs since 2003 and the carriage requirements were expanded significantly in 2008 to encompass open access groundfish vessels, which includes many of the participants in west coast commercial halibut derbies. The Non-Trawl RCA is a high enforcement priority during commercial halibut derbies. No RCA violations associated with commercial halibut derby activity have been detected since 2013.

The USCG continued the policy of timing at-sea boardings to avoid impeding fishing operations during the ten-hour derbies. Boardings are typically conducted after derby hours unless specific safety or fisheries-related violations are observed. Table 2 summarizes efforts during the 2017 commercial halibut derbies and associated 72-hour pre-season closures in IPHC Area 2A.

Table 2. 2017 Commercial Halibut Derby Enforcement Resource Allocation

Enforcement Resource Allocation	June 28th	July 12th	July 26th
Large Cutter Days	0	0	0
Patrol Boat Hours	113	29	65
Small Boat Hours	3	11	4
Aircraft Hours	22	6	7

In Areas 2C through 4E, the commercial fishery is rationalized with the 2017 season lasting from March 11th to November 7th. D17 law enforcement assets routinely patrolled the fishing grounds, often conducting joint boardings with or in collaboration with NOAA OLE. Our partnership with NOAA OLE and Alaska Wildlife Troopers is integral to successfully allocating law enforcement assets in the areas of the highest fishing activity, ensuring consistent presence on the fishing grounds and at offload sites.

Joint operations with NOAA OLE were conducted throughout the season from the Bering Sea to Southeast Alaska. Joint, pulse operations with NOAA and state fisheries enforcement personnel were conducted during commercial derbies off Oregon and Southern Washington in June and July, including NOAA Enforcement Officers embarking on CG cutters during the June 28th derby. Joint operations included at-sea boardings, aircraft patrols, and dockside inspections. The joint agency efforts are a regular and important aspect of law enforcement coordination as they enable the broadest contact rate with the fishing fleets in order to compel compliance with federal regulations while also providing the most accurate and complete picture of fishing activity on the fishing grounds and at catch offload sites.

Routine patrols are essential to maintain awareness of halibut fishing activity. The long duration of the commercial season relieves the pressure to fish during inclement weather that would risk safety at sea. However, this also gives participants the opportunity to spread their effort throughout the season as well as their permitted area. The lack of a universal requirement for fishing vessels targeting halibut to be equipped with VMS on board means there is not a centralized means to assess fishing activity in Areas 2C through 4E. Time intensive patrols by surface and aviation assets are the primary means to identify where vessels are fishing for halibut as well as the number of vessels out at sea for a specific period of time. The need for patrols is amplified when market forces and/or fair weather conditions cause an increase in fishing activity.

Participants in the commercial halibut fishery only make up a portion of the hook and line vessels on the fishing grounds and the USCG strives to apply enforcement focus on all halibut fishery participants and sectors. During patrols and boardings of the hook and line vessels, USCG enforcement efforts focus on (1) adherence to permit requirements for area and individual quota, (2) safe release of halibut bycatch by other commercial vessels, (3) consistent use of seabird avoidance gear, (4) indicators of high-grading catch, (5) retention of rockfish and Pacific cod, (6) complete offload of catch, and (7) timely compliance with all recordkeeping requirements.

III. Recreational Halibut Enforcement

The Area 2A recreational near-shore halibut season occurred in various areas off Washington and Oregon between May and October 2017, with staggered opening and closing dates. The primary USCG emphasis for the sport halibut fishery is monitoring openers, due to safety concerns, similar to the derby-style fisheries concerns noted in the commercial section above. Specific cutter, small boat station, and aircraft patrols were scheduled during the openers, as recreational vessels will transit 30-40 miles offshore to participate in the fishery. The USCG focus is to address our concerns that these vessels may be ill equipped and inadequately prepared for offshore operation. Fortunately, no significant search and rescue cases occurred during the 2017 openers.

Throughout the recreational halibut season, units also monitored four Yelloweye Rockfish Conservation Areas (YRCAs) that are closed to sport fishing for halibut and groundfish at all times. This area consists of a C-shaped YRCA off NW Washington, the South Coast and Westport YRCAs off SW Washington, and the Stonewall Bank YRCA off Central Oregon. The threat of illegal fishing in these areas is especially prevalent during the recreational halibut openers. No YRCA incursion violations have been documented since the 2012 season.

Recreational activity occurs in Areas 2C, 3A, and 3B in the form of individual and charter fishing. The season lasts from 01 February to 31 December but is most prevalent from May through September. USCG assets increase fisheries patrols during this time to focus on popular fishing grounds in Southeast Alaska, Prince William Sound, Cook Inlet, and the Gulf of Alaska. The majority of boardings accomplished by D17 assets in 2017 were completed on the recreational and charter vessels.

During boardings, emphasis is placed on compliance with licensing and charter operation requirements as well as requirements which determine the size and number of halibut allowed to be caught. Overall enforcement presence in the sport fishing fleet detects a high rate of compliance with IPHC regulations.

IV. Violations and Enforcement Summary

Overall, USCG assets boarded a total of 612 vessels and detected 11 IPHC violations. Violations were documented and referred to NOAA OLE or Alaska Wildlife Troopers (for violation detected on recreational vessel) for final action. Table 3 compares at-sea boardings and violations between 2017 and 2018.

Table 3. 2016 & 2017 Boarding and Violation Summaries by Industry Sector

2016 Boardings/Violations		2017 Boardings/Violations	
Total At-Sea Boardings	502	Total At-Sea Boardings	612
Commercial	94	Commercial	129
Charter	55	Charter	97
Recreational/Subsistence	353	Recreational/Subsistence	386
Fisheries Violations	10	Fisheries Violations	11
Commercial	6	Commercial	8
Charter	2	Charter	1
Recreational/Subsistence	2	Recreational/Subsistence	2
Fisheries Compliance Rates	98.0%	Fisheries Compliance Rates	98.2%
Commercial	93.6%	Commercial	93.8%
Charter	96.4%	Charter	99.0%
Recreational/Subsistence	99.5%	Recreational/Subsistence	99.5%

In Area 2A, three suspected IPHC violations were documented during the June 28th derby, all of which were potential catch overages due to discrepancies associated with the classification of the vessels' permits, which is based on vessel length and dictates landing limits. Information was forwarded to NOAA OLE for investigation. No IPHC violations were documented during the July 12th or July 26th derbies.

In Area 2C, one commercial vessel was cited for failing to properly maintain its fishing logbook in a timely manner (joint USCG / NOAA OLE boarding).

In Area 3A, one commercial vessel was cited for failing to maintain its fishing logbook in a timely manner. One charter vessel was cited for not properly endorsing clientele catch in its fishing logbook (joint USCG / NOAA OLE boarding). One recreational vessel was documented as having retained one halibut without a state issued sport fishing license (referred to Alaska Wildlife Troopers in real time). One recreational vessel was cited for mutilating halibut at sea, preventing determination of the number of halibut caught (joint USCG / NOAA OLE boarding).

In Area 4A, two commercial vessels were cited for failing to have onboard for inspection a legible copy of the IFQ permits being fished by the vessels' hired masters.

In Area 4D, one commercial vessel was cited for failing to use careful release methods for undersized halibut.

The violations described above by their IPHC Area are listed below in Table 4 by violation type. This summary of IPHC and federal violations compares 2016 and 2017 violations detected by USCG units.

Table 4. 2016 & 2017 Description of Fisheries Violations in All Sectors

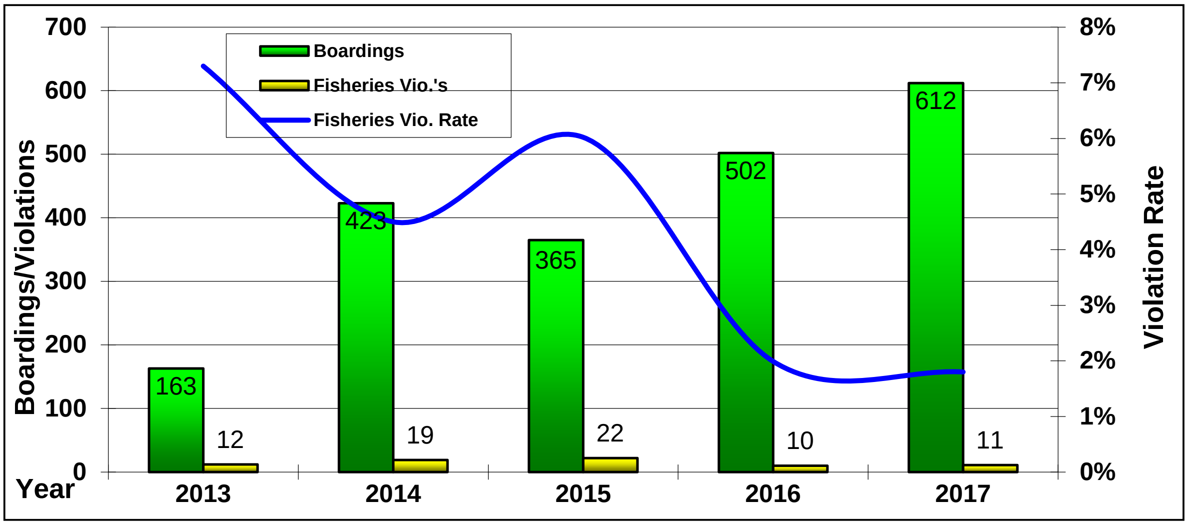
2016	2017
Retention of undersized halibut…………………1	Failure to use careful release methods.…………1
Destruction of evidence……………………..….1	Mutilation of catch……………………………...1
Mutilation of catch……………………………...1	Failure to maintain IFQ logbook………………..2
Fishing without valid license……………………2	Failure to maintain charter logbook…………… 1
Anchoring within a no entry zone………………1	Copy of IFQ permit not ready for inspection.….2
Failure to maintain IFQ logbook………………..1	Sport fishing without permit…………..………..1
Failure to maintain charter logbook…………… 2	Catch overage…………………………………...3
Discarding Pcod/Rockfish………………………1	

The USCG remains concerned about the safety of derby-style fisheries. The USCG has provided specific comments in this regard to the Pacific Fishery Management Council (PFMC). These concerns are mitigated to some extent through taking weather forecasts into account during scheduling decisions; however, this does not eliminate the safety risks due to unpredicted adverse weather conditions. Fortunately, no significant search and rescue cases occurred during the 2017 derbies. The USCG is encouraged by discussions started by the PFMC during 2017 regarding the potential to pursue alternatives to derbies in the commercial Pacific halibut fishery, as well as mitigation of concerns associated with short-duration, derby-style openers in the recreational Pacific halibut fishery. The USCG will continue to work with the PFMC to support these initiatives.

In addition to the IPHC violations summarized in Tables 3 and 4, vessel safety issues encountered by our law enforcement assets across all halibut sectors included insufficient lifesaving equipment, improper navigation equipment, and missing documentation. The USCG continues to pursue increased at-sea boarding opportunities to promote compliance with both safety and fisheries regulations.

The USCG continues to maximize joint enforcement efforts and information sharing with federal and state fisheries enforcement partners to optimize operations. Similar to recent seasons, USCG field commands held pre-season meetings with federal and state partners to coordinate efforts. The USCG focused allocation of patrol assets during the early season derbies when more participation was anticipated. The USCG assisted Washington State and the Pacific Northwest Treaty Tribes with monitoring activity in the tribal, commercial, ceremonial, and subsistence halibut fisheries, both offshore and within Puget Sound waters.

Figure 1. 2013-2017 Boardings and Fisheries Violations



The halibut fisheries violation rate averaged 3.6% over the last five years. The USCG continues to pursue a steady focus on compliance across IFQ, derby, charter, subsistence, and recreational fisheries by maximizing boarding opportunities and detecting violations where they occur.

V. Enforcement Plans for 2018

The USCG will continue joint pulse operations with NOAA and state enforcement partners to focus enforcement efforts across the commercial, charter, subsistence, and sport sectors of the halibut fishery.

To respond to the increased number of commercial and recreational halibut vessels fishing in Northern California, D11 plans to conduct joint targeted enforcement operations during the 2018 commercial halibut derbies with California Department of Fish and Wildlife and NOAA.

The USCG will continue to focus fisheries enforcement and safety efforts on commercial derbies in Area 2A, with specific emphasis on early derbies when the highest level of activity is expected. USCG enforcement resources will also monitor IPHC regulations associated with Pacific halibut bycatch in other fisheries throughout the year. Due to safety concerns, the primary USCG emphasis for the 2A sport halibut fishery is monitoring all-depth openers, which have staggered opening and closing dates. Specific cutter, boat station, and aircraft patrols will be scheduled during the all-depth openers to address concerns that these vessels may be ill-equipped and inadequately prepared for offshore operation.

The USCG will continue to enforce new regulatory requirements which became effective in 2015 and 2016; mandatory dockside Commercial Fishing Vessel Safety Examinations (CFVSE) for all vessels which operate beyond three nautical miles from shore, and the carriage of AIS units for vessels over 65 feet in length. Commercial Fishing Vessel Safety inspectors continued to educate the industry about both requirements and have facilitated dockside exams to bring vessels into compliance. Vessels which operate beyond three nautical miles without a CFVSE or which fail to meet applicable AIS carriage requirements may receive a notice of violation if the deficiency is observed during an at-sea boarding.

The commercial and recreational halibut fisheries in Alaskan waters continue to draw high national and international interest. D17 will continue to actively patrol throughout the season and emphasize joint operations with our federal and state partners, NOAA OLE and the Alaska Wildlife Troopers.

By sustaining effort to patrol all areas where halibut fisheries occur, in either derbies or seasonal fishing, the USCG will strive to continue to promote a level playing field for all participants and enhance safety at sea. Our goal is consistent and targeted enforcement presence applied fairly across all commercial, charter, subsistence, and recreational fleets.

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Received: 2 January 2018

National Marine Fisheries Service
Office of Law Enforcement

West Coast Enforcement Division Report to
The International Pacific Halibut Commission

January 2017 ~ December 2017

NOAA Fisheries Office of Law Enforcement
West Coast Division
7600 Sand Point Way NE
Seattle, WA 98115

To Report Fisheries Violations:
Call our National Hotline at 1-800-853-1964

NOAA FISHERIES

Office of Law Enforcement

West Coast Division Report to International Pacific Halibut Commission

Calendar Year 2017

January 1, 2017 – December 31, 2017

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West Coast Enforcement Division

2017 HALIBUT ENFORCEMENT EFFORTS

West Coast Enforcement Division Overview

The West Coast Enforcement Division (WCD) provides marine resource enforcement and compliance assistance for the West Coast, primarily California, Oregon and Washington, but to also include Colorado, Idaho, Montana, North Dakota, South Dakota, Utah and Wyoming. Our staff includes special agents and enforcement officers stationed in California, Oregon and Washington. Our territory includes 1,500 miles of Canadian Border; 1,293 miles of rigorous Pacific Ocean coastline and 7,863 miles of tidal shoreline; five National Marine Sanctuaries, to include 290 Marine Conservation Areas; Puget Sound; 21 major international seaports; 18 international airports; 222,471 square nautical miles of Pacific Ocean; and 339,375 square miles of land encompassing numerous rivers and tributaries feeding into the Pacific Ocean. Our primary missions include compliance assistance and enforcing domestic fishing regulations under the Magnuson-Stevens Fishery Conservation and Management Act; protecting federally-listed marine species and critical habitats under the Endangered Species Act; ensuring species protection and preservation under the Marine Mammal Protection Act; monitoring imports and exports of marine products at international ports (air and sea), border crossings, and during commercial inspections under the Lacey Act; and protecting essential fish habitats.

Our responsibilities are carried out by a sworn staff comprised of special agents and enforcement officers, and an operations support staff compromised of program managers, enforcement technicians, systems administrators, and administration specialists. Additionally, we work closely and conduct joint operations with other federal partners; the U.S. Coast Guard (USCG), the Environmental Protection Agency (EPA), the United States Fish and Wildlife Service (USFWS), the United States Attorney's (USA) offices, and others, and our state partners; Oregon State Police Fish and Wildlife Division (OSP), the Washington Department of Fish and Wildlife, Enforcement Program (WDFW), and California Department of Fish and Wildlife (CDFW). Our state partners work under a Cooperative Enforcement Program. OLE's Enforcement Officer is the bedrock for our uniformed presence and the frontline in the enforcement and management of Pacific halibut for Washington, Oregon and California.

For CY 2017, the Office of Law Enforcement in the West Coast Division had numerous personnel changes. The Assistant Director for WCD OLE retired at the end of December 2016. The position was advertised and an offer has been made to a candidate, with a projected start date of January 2018. One special agent transferred from OEL/HQ to Newport, OR. A hiring announcement in the near future will advertise for five special agent positions to be filled in Long Beach, CA (x2); Monterey, CA; Santa Rosa, CA and Seattle, WA. Five new enforcement officers were hired and are located in Seattle, Bellingham and Westport, WA; Newport, OR and San Diego, CA. WCD OLE is currently in the process of hiring four additional enforcement officer positions for Long Beach, Monterey, and Santa Rosa, CA, and one in Astoria, OR.

The Office of Law Enforcement restructured the administrative program staff to better facilitate agency needs by creating two support groups. The Administrative Officer will lead a team of Mission Support personnel, including a secretary, three administrative assistants (Seattle, WA; Portland, OR and Long Beach, CA), two information technology analysts, and a program analyst for the West Coast Cooperative Enforcement Program. The VMS Program Manager has been assigned as a Program Manager for Investigative Support. That team consists of four VMS investigative assistants (Seattle, WA) and three operational investigative assistants (Seattle, WA; Astoria, OR and Long Beach, CA). Three administrative positions are vacant and under review for series and/or location changes to ensure effective staffing levels in all locations and within the Mission Support and Investigative Support teams.

Office of Law Enforcement - Cooperative Enforcement Program (CEP)

Under the Federally funded NOAA Cooperative Enforcement Program, OLE has ongoing formal Cooperative Enforcement Agreements (CEA) and Joint Enforcement Agreements (JEA) with all three West Coast States: California Department of Fish and Wildlife (CDFW) – Law Enforcement Division, Oregon State Police (OSP) – Fish and Wildlife Division, and Washington Department of Fish and Wildlife (WDFW) – Police. These agreements extend federal authority for state agencies to enforce specific federal laws and regulations as defined in specific agreed upon federal priorities within each agreement, including the enforcement of the Northern Pacific Halibut Act.

In addition to providing reimbursement for direct federal fisheries enforcement work performed by state officers, wardens, and troopers in support of federal fisheries enforcement priorities, the agreements also provide funding for state administrative overhead and direct purchases of large assets (i.e., boats, vehicles, etc.) as well as small or portable assets (i.e., radios, plotters, computers, thermal imaging, cameras, etc.) and services (maintenance of equipment and vessels). The West Coast Cooperative Enforcement Program received $2.71M for the 2016 agreements – the last of these agreements concluded August 30th, 2017; and $2.24M towards the new 2017 agreements – this first of which commenced August 16th, 2017.

Within the framework of each agreement, under targeted enforcement there are defined marine law enforcement, compliance assistance, and living resource management responsibilities under assorted specific federal traditional priorities that each agency is tasked with responsibility for – these typically include land-based services and at-sea services, and may include air services if available within the agency and if determined necessary. With the 2017 agreements have a blend of traditional (25%) and targeted (or execution) priorities (75%). The traditional priorities operate the same as under prior agreements where each agency has federal priorities that share a pool of defined hours for each of the services (sea, land, and air). All West Coast states have Northern Pacific Halibut enforcement and management as one of their executable priorities. Executable priorities are defined and very specific, they have a set amount funding, services, and timeframes, with very specific goals.

These agreements foster a cooperative environment; producing a viable collaborative approach to federal and state living marine resources enforcement and management. There is consistent ongoing cooperative efforts between Washington Department of Fish & Wildlife (WDFW) – Police, Oregon State Police – Fish and Wildlife Division (OSP), California Department of Fish and Game – Law Enforcement Division (CDFW), National Oceanic and Atmospheric Administration, Office of Law Enforcement (OLE), and the United States Coast Guard (USCG) for the enforcement, preservation, and management of living marine resources. The USCG is an excellent federal partner, providing premier at-sea and air resources and willingly supporting state partner and federal operations. WDFW Officers, CDFW Wardens, and OSP Troopers ensure comprehensive protection and compliance through the monitoring of directed and incidental commercial, recreational, and tribal fisheries. This is accomplished by conducting vessel boardings, monitoring off-loads, inspections of processors, wholesalers, dealers, markets, air and sea ports, and cold storage facilities, and through follow-up, surveillance, investigations, and collaborative operations inclusive of Halibut catch limits, quotas, size limits, and documentation inspection. The significant contributions of our West Coast Cooperative Enforcement Program Partners (CDFW, OSP, WDFW), and the USCG, formulate the foundation of coastal living marine resource protection and compliance.

California Department of Fish & Wildlife – Law Enforcement Division

CDFW responsibilities for Halibut enforcement for land-based activities includes conducting dockside patrols, off-load monitoring, licenses, incidental catch, compliance, verification checks, and collaborative enforcement efforts. CDFW at-sea responsibilities include patrolling the Pacific Ocean, conducting operations, collaborative enforcement, and inspecting at-sea vessels and personnel for licenses, federal permits, logbooks, marine permits and registration, and fish on board, with emphasis in the Exclusive Economic Zone. Most of their agency activities towards Halibut is regionalized to the North Pacific Ocean Coast.

Their agency is limited in their data management abilities as their agency has no centralized records management system and aggregating specifics in reporting data is challenging. Having said this, John Clithero, Program Analyst, has provided a summary of their agency's involvement in Pacific Halibut enforcement and management:

CDFW Enforcement:

For CY2017, CDFW committed fourteen commissioned staff towards Halibut enforcement activities, for a total of 251 operational hours. Their at-sea activities encompassed: 125 at-sea hours (79 at-sea near-shore vessel personnel hours and 46 at-sea near-shore vessel hours,). Their dockside activities encompassed 112 hours. CFDW approximate funding applied towards Halibut enforcement and management was $24,911.56 ($16,293.16 at-sea operations and $8,618.40 for land-based operations). Wardens made 289 contacts – with full compliance and no enforcement actions taken.

CDFW Enforcement Highlights:

During CY 2017, CDFW land-based and at-sea halibut patrols covered the major ports in Mendocino, Humboldt and Del Norte Counties (Pt. Arena, Albion, Noyo Harbor, Shelter Cove, Eureka, Trinidad, and Crescent City), and approximately 15 sport boat launch ramps. CDFW patrolled, contacted, and regularly checked eight party boats targeting halibut between Shelter Cove and Crescent City. Numerous dockside and at-sea contacts were made where halibut were present. Offshore halibut patrols were made in combination with salmon and rockfish patrols. The halibut catch rate was reported to be low in the Shelter Cove area in Northern California by Wildlife Officers working in that area. No enforcement actions were taken based on observed compliance with all applicable regulations.

CDFW Enforcement Comments:

Continual complaints from the public were received by CDFW Wildlife Officers working in the field relating that the recreational halibut regulations are too confusing.

Oregon State Police – Fish & Wildlife Division

OSP responsibilities for Halibut enforcement for land-based activities includes conducting dockside patrols, off-load monitoring, licenses, incidental catch, compliance, verification checks, and collaborative enforcement efforts. OSP at-sea responsibilities include patrolling the Pacific Ocean, conducting operations, collaborative enforcement, and inspecting at-sea vessels and personnel for licenses, federal permits, logbooks, marine permits and registration, and fish on board, with emphasis in the Exclusive Economic Zone.

OSP Enforcement:

For CY2017 OSP committed seventeen commissioned staff towards Halibut enforcement activities, for a total of 632 operational hours. Their at-sea activities encompassed: 475 at-sea hours (231 at-sea near-shore vessel personnel hours, 115.50 at-sea near-shore vessel hours, 86 at-sea long-range vessel personnel hours, and 43 at-sea long-range vessel hours). Their dockside activities encompassed 156.50 hours. OSP approximate funding applied towards Halibut enforcement and management was $40,526.30 ($31,605.80 at-sea operations and $8,920.50 for land-based operations). OSP Troopers contacted 979 anglers with 112 not being in compliance (for an 89% compliance rate), with one federal referral case.

OSP Enforcement Highlights:

In May, Senior Trooper O'Connor along with Troopers Olson and Reeder conducted a boat patrol for the All-Depth Halibut season out of Garibaldi. A charter boat was contacted with 16 people on board including the captain and deckhand. At the time of the contact, there were 14 halibut on board. Upon inspection of the harvest tags, it was determined that one of the anglers did not have a harvest tag. Six anglers, including the deckhand, had purchased "prepaid daily angling licenses" from the charter company and had failed to properly validate their license for their halibut because they had written the location/species code but not the month/day. Some of these licenses were missing the "valid for" date and one of them was missing the name, date of birth, signature and the "valid for" date. The captain was contacted and he stated that each angler purchases a license from the charter company when they arrive in the morning if they did not already have one. The captain stated the anglers leave the licenses blank until they get to the fishing grounds, this way they can get their money refunded to them in the event there are mechanical or weather problems. The captain had a supply of licenses that he admitted to selling from the boat while underway. A citation was issued to the deckhand for Failure to Properly Validate Angling Harvest Tag and another citation was issued to one of the anglers for No Angling Harvest Tag. One halibut was seized and donated to the County jail. Warnings were given to five of the customers for Failure to Properly Validate Angling Harvest Tag.

Troopers Van Meter and Hansen conducted offshore boat patrols out of Newport for the All-Depth Halibut season during May. Over the course of two days, the Troopers contacted 132 anglers and approximately 52 boats. One angler was contacted who was fishing for halibut but did not have his harvest tag with him. The Troopers did a check to determine if he had in fact purchased a tag and found that he did. It was also determined this angler had a warrant for his arrest. The angler was taken into custody without incident and put onboard the OSP patrol vessel. The angler was transported by boat to the USCG Station Yaquina Bay where he was then transported to the Lincoln County Jail by Senior Trooper Kehr and Trooper Adkins.

One angler was contacted at South Beach Marina with a halibut that was not recorded on a harvest card. The angler claimed he had fallen asleep and forgot to tag the fish. The angler was cited for Fail to Immediately Validate Harvest Card.

In June, Senior Trooper Herman and Recruit Likens conducted a boat patrol on the ocean at Astoria Canyon during the one day North of Falcon recreational halibut season. The troopers checked multiple halibut anglers. Four citations were issued for Fail to Validate Harvest Card, including one boat with three halibut on board, none of which were tagged. Five warnings were also issued for Fail to Properly Validate Harvest Card, and one for Unlawful Possession of Lingcod. One lingcod was seized.

In June, Senior Trooper Cutsforth and Senior Trooper Farrar conducted a boat patrol on the Siuslaw River and Pacific Ocean during the last All-Depth Halibut season. During the patrol, they contacted numerous boats and sport anglers near Heceta Banks and one commercial fisherman who was fishing for Salmon near the commercial Salmon cut off at the Siuslaw River South Jetty. No violations were observed and the catch rate was slow. The Troopers also checked the Cape Perpetua Marine Reserve for any unlawful activity, with none being detected.

Trooper Roberts performed an evening surveillance at the port of Bandon checking halibut anglers. Six different anglers were contacted that had retained halibut. All of the anglers had tagged their catch but had not fully validated the length of their catch on their combined angling harvest cards. All of the subjects stated that they did not have measuring devices onboard their vessels. The six subjects were warned for Fail to Properly Validate Combined Angling Harvest Card.

In June, Senior Trooper Farrar checked commercial halibut fisherman and their vessels during the 2017 Commercial Halibut Derby, and after the closure between Florence and Coos Bay. Several boats were contacted at the various ports and no violations were observed.

While observing commercial halibut offloads in Port Orford, Senior Trooper Keeler became suspicious of a vessel that appeared to not match the length on its halibut permit. According to the state vessel license, the vessel is 33 feet in length. According to the Coast Guard, the vessel is 35.9 feet and according to the halibut permit the vessel is between 36 and 40 feet. The vessel landed well over the limit of halibut for vessels under 36 feet. Information was gathered and forwarded to NOAA Office of Law Enforcement for follow-up.

In July, Sergeant Thompson and Senior Trooper Van Meter checked the Newport commercial halibut fleet as they returned to port after the first halibut derby for 2017. The catch rate was low. One boat was contacted who had a crew member who did not have his 2017 individual commercial fishing license and the boat didn't have enough crew licenses to cover the extra crew member. The crew member was cited for No 2017 Individual Commercial Fishing License.

During August, Senior Trooper Van Meter partnered with Lincoln County Marine Patrol Deputies for an offshore halibut patrol for the first weekend of the summer All-Depth season.

Fishing pressure was high due to excellent ocean conditions. Numerous boats were checked and the following angling offenses were found:

A boat with three halibut anglers was contacted, with one of the anglers stating as the Trooper made initial contact, that they had just caught a fourth fish that they were going to give to their friends in another boat. The Trooper boarded the vessel and found a cooler full of halibut on the back deck. One of the anglers said that the fish on top had just been caught and was so slimy and flopping around that it flopped around the deck, into the boat cabin and then flopped right into the cooler. The angler claimed the fish had just been caught and happened right as the Trooper's boat was pulling up. The angler said the fish was still alive and "I should just release it". The Trooper stared at the lifeless halibut in the cooler for several minutes and determined it wasn't going to swim away. The Trooper seized the fish from the cooler and noticed there were four additional halibut still in the cooler. When asked about the extra fish, the angler said he had no idea how that fish got there and must have miscounted. The Trooper seized that fish as well. The three anglers were cited for Fail to Validate Harvest Card for the fish they were allowed to keep. One angler was also cited for Exceeding Daily Limit of Halibut. Both seized halibut were later donated to the Lincoln County Food Share.

Senior Trooper Van Meter and Trooper Adkins conducted an offshore boat patrol out of Newport for an All-Depth Halibut sport fishery during September. Two boats were contacted fishing within the Stonewall Banks Yelloweye Rockfish Closure Area. One of the boats possessed a halibut that the Troopers determined had been caught inside of the closure area by locating coordinates from the boats GPS plotter. Both boats were cited for Angling Closed Area; Stonewall Banks YRCA. The halibut was seized and the angler that caught it was cited for Unlawful Possession of Halibut; Closed Area. Two other citations were issued for Failure to Immediately Validate Harvest Card.

Washington Department of Fish & Wildlife – Police

WDFW responsibilities for Halibut enforcement for land-based activities includes commercial off-load monitoring, compliance, and verification checks, and recreational emphasis and inspections of key coastal ports, to ensure compliance of limits, size, and gear restrictions. WDFW at-sea enforcement includes patrolling, conducting operations, and vessel inspections, illegal trafficking in sport caught halibut, unreported/undocumented catch, and selective gear restrictions, with emphasis in the Exclusive Economic Zone.

WDFW Patrol Officers conducted halibut related compliance inspections on the water, at the dock, and in the market place along the Washington Coast, Strait of Juan de Fuca, and Puget

Sound. Officers patrolled during the open commercial and recreational seasons and during closures to provide protection throughout the entire year.

WDFW Enforcement:

WDFW committed 16 commissioned staff toward halibut enforcement, for a total of 763 hours. Their at-sea activities encompassed: 555 at-sea hours (370 at-sea personnel hours and 185 at-sea long-range vessel hours). Their dockside activities encompassed 208 hours. WDFW approximate funding applied toward halibut enforcement and management was $56,420.10 ($44,502.95 at-sea operations and $11,917.15 for land-based operations). WDFW Officers accomplished 2,095 recreational contacts and 109 commercial contacts, issued 201 warnings and 46 citations.

WDFW Overview:

Halibut can be found throughout Puget Sound and offshore waters. This resource is shared among four user groups in Washington State: recreational, directed non-Indian commercial, non-Indian incidental, and Tribal fishermen. Washington Department of Fish and Wildlife (WDFW) police developed a patrol plan for 2017 that provides comprehensive protection throughout the entire year.

As halibut seasons and habitats overlap with other fisheries, directed halibut patrols often reveal federal and state violations related to other species. Conversely, halibut violations were also found during patrols intended to maintain compliance in other fisheries. Common halibut violations include mutilation of fish so that size or species could not be determined, failure to account for catch, fishing for and possession of rockfish or halibut in closed areas, closed-season fishing, exceeding limits, failing to submit catch for inspection (hidden fish), and fishing without a license.

WDFW Strategic Planning:

The Patrol Plan’s focus areas include:

Elevating enforcement presence at-sea and shore side during halibut-directed fisheries or when halibut can be legally retained incidental to other fisheries;

Ensuring compliance with halibut hot spots that are closed to fishing during open halibut seasons (intended for yellow eye and canary rockfish protection);

Providing a presence on the halibut grounds during season closures, to include during non-halibut fisheries in locations where halibut could be intercepted;

Monitoring commercial off-loads;

Inspecting wholesale and retail sellers to ensure lawful origin of halibut in commerce;

Ensuring the safety of all persons engaging in commercial and recreational fisheries; and

Conducting joint patrols with partner agencies such as Tribal, United States Coast Guard and local sheriffs’ offices in order to expand patrol coverage.

WDFW Enforcement Highlights:

Recreational Season:

Three detachments conducted saturation patrols in Marine Areas 1, 2, 3, 4 and 5 prior to and during the recreational and commercial coastal halibut openers. WDFW police committed four patrol boats and deployed officers on United States Coast Guard (USCG) and Clallam County Sheriff’s vessels to expand the at-sea presence. In addition to WDFW officers detecting recreational and commercial fishing violations, USCG boarding teams terminated several vessels voyages due to a lack of required safety equipment. Some highlights include:

A number of halibut-directed patrols resulted in high compliance with halibut rules, however, groundfish-related violations by halibut anglers were still observed. For example, one vessel kept a dozen rockfish (five different species) that were illegal to possess in addition to three undersized lingcod. At least one person in the group understood how much trouble they were in upon seeing the patrol vessel approach and started to throw fish overboard. Since rockfish with distended swim bladders fail to sink, they were easily retrieved and the fishermen were cited accordingly.

Officers Davidson, Branscomb, Summit and Sergeant Rosenberger, with assistance from USCG, emphasized presence in the La Push area. The first open fishing day yielded violations which included one boat fishing halibut in a closed area and in possession of two closed-season Canary Rockfish. With the assistance of the USCG helicopter, WDFW Police were able to contact a vessel fishing for halibut in the Yellow Eye Conservation Area, which is closed to halibut fishing.

Officer Summit assists an angler at his request:

In the Strait of Juan de Fuca, Sergeant Rosenberger teamed up with the Clallam County Sheriff to patrol waters between Sekiu and Neah Bay. Three men aboard a boat were contacted and told the Sergeant that they did not have any fish on board and that it was a slow fishing day. As the deputies conducted a vessel safety inspection, Sergeant Rosenberger could hear a fish flopping within a fish well and saw drops of blood on the deck. Sergeant Rosenberger told the men that he knew there was a fish aboard and requested that they provide it for inspection. They men again denied having a fish, just as the fish started to thrash. The Sergeant asked to see the inside of a fish well the suspect was standing on and discovered a halibut, which was very much alive. The suspect told the Sergeant that he had not recorded the fish on his catch record card, and that is why he had not told the truth. The Sergeant informed the man that he had taken what is a lesser violation and made it into a gross misdemeanor offense by lying. He was cited accordingly. Over-limits for bottomfish and retaining rockfish in closed areas were also addressed through additional angler inspections.

WDFW Police went undercover and observed an over-limit of four halibut retained on board a vessel for hire. Small halibut, both alive and dead were hi-graded in favor of larger fish. When confronted, the captain(s) and crew had a hard time telling the truth for quite some time, but finally admitted to the violations. Ultimately a search warrant was served on the charter boat company office as officers had cause to believe that hi-grading and exceeding limits was routine. After interviewing numerous witnesses on prior fishing trips, additional violation counts have been added to the original case.

Local charter suspected of 'high-grading' prized halibut

Natalie St. John •
Published on July 18, 2017 3:51PM

Incidental Halibut Fishery:

Commercial salmon troll areas overlap halibut grounds. Trollers may legally retain halibut incidental to the salmon fishery, however limits apply. Commercial trollers are routinely inspected to ensure compliance. No violations were found.

Fish Company Inspections:

Wholesale fish dealers and processors are inspected throughout the season to ensure proper catch accounting and enforce possession limits. One commercial vessel was discovered to have delivered two hundred and eighteen pounds of halibut in excess of the limit. The overage was seized and state citations were issued to the captain. Officers also conducted vessel patrols during each of the open-directed commercial halibut fisheries. No violations were found.

Office of Law Enforcement – West Coast Division Investigations & Patrols

Investigations

Enforcement Officers monitored an offload of Pacific halibut subsequent to the IPHC Area 2A halibut opener. A commercial fishing vessel was found to be 224 pounds over quota limits. The owner/operator agreed to forfeit the halibut. He was offered a summary settlement in the amount of $1,176.00. The offer was accepted.

Enforcement Officers monitored an offload of pacific halibut subsequent to the IPHC Area 2A Halibut opener. A commercial fishing vessel was found to be 317 pounds over quota limits. The owner/operator agreed to forfeit the halibut. He was offered a summary settlement in the amount of $1,664.25. The offer was accepted.

A supervisory enforcement officer and special agent assisted Washington Department of Fish and Wildlife (WDFW) serve a search warrant on a charter fishing company in Ilwaco, WA. Evidence was collected in support of the WDFW investigation into suspected high-grading and waste of halibut during charter fishing trips. Investigation continues.

Enforcement officers conducted multiple dockside boardings during the commercial halibut fishery in the area of Coos Bay, OR and Ilwaco, WA. Several violations were observed, including improperly marked gear, failure to maintain fish receiving tickets, and failure to maintain vessel log.

Patrols

Enforcement Officers in Astoria and Charleston, Oregon and Ilwaco, Washington boarded 17 commercial fishing vessels participating in the IPHC Area 2A halibut opener on June 28, 2017. The vessels were inspected to ensure compliance with IPHC regulations including complete offload, catch shares, size limits, and proper logbook and permits.

A supervisory enforcement officer conducted a shoreside patrol of Garibaldi, OR in conjunction with the IPHC Area 2A, 10-hour commercial halibut fishery. He conducted a meeting with the local Coast Guard station personnel, visited processing facilities, performed inspections of recreational vessels landing halibut and monitoring of commercial vessel activity.

A supervisory enforcement officer and enforcement officers conducted patrols in Washington and Oregon in support of a 10-hour commercial halibut opener. Patrols were coordinated with U.S. Coast Guard and JEA partners to monitor for early/late fishing, careful release of undersized halibut, and compliance with landing requirements.

Vessel Monitoring Staff:

VMS enforcement technicians monitored vessel positions before and during the halibut openings and no incidents were found.

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Washington Department of FISH and WILDLIFE

Summary of Washington Pacific Halibut Fisheries Management in 2017

December 2017

Washington Department of Fish and Wildlife
600 Capital Way North
Olympia, WA 98501

WASHINGTON DEPARTMENT OF FISH AND WILDLIFE
SUMMARY OF PACIFIC HALIBUT FISHERIES MANAGEMENT IN 2017

This report summarizes the Washington Department of Fish and Wildlife's (WDFW) management and enforcement activities for Pacific halibut fisheries in 2017. It includes a synopsis of Washington's recreational catch and incidental halibut catch in the sablefish fishery north of Point Chehalis. A summary of WDFW's enforcement efforts relative to patrolling recreational and commercial halibut fisheries during 2017 is attached.

Washington's Recreational Halibut Fisheries in 2017

Washington's halibut fisheries are managed under the Pacific Fishery Management Council's Pacific Halibut Catch Sharing Plan (CSP) for Area 2A. The CSP specifies how the Area 2A total allowable catch (TAC), as defined by IPHC, is allocated or "shared" among various state commercial and recreational sectors. For Washington, WDFW manages its recreational fisheries by subarea. These subareas are:

1. Puget Sound (inside waters east of the Sekiu River, including Puget Sound)
    - Eastern Region (inner Sound waters east of Low Point)
    - Western Region (Strait waters west of Low Point)
2. North Coast (waters in the Strait of Juan de Fuca west of the Sekiu River and Pacific Ocean waters south to the Queets River)
3. South Coast (Pacific Ocean waters south of the Queets River to Leadbetter Point)
4. Columbia River (Pacific Ocean waters south of Leadbetter Point to Cape Falcon, Oregon)

A summary of Washington's recreational halibut season dates for 2017 is described in Table 1.

Table 1. Washington recreational halibut seasons, catch, and average weight by subarea

Subarea	Quota (lbs)	Catch (lbs)	Avg Wt (lbs)	Season Dates
Puget Sound	64,962	60,123	23.77	East and West: May 4, 6, 11, 21, 25, June 1, 4, 10, 17
North Coast	115,599	100,410	17.73	May 4, 6, 11, 21, 25, June 1, 4, 10, 17
South Coast	50,307	61,061	16.20	Primary: May 4, 6, 11, 21 and June 17 Nearshore: N/A
Columbia River 1/	12,799	12,970	17.97	All Depth: May 4-25, Thu-Sun and Sat June 17 Nearshore: May 8-June 11, Mon-Wed
Total 2/	243,667	234,564		

1/ Columbia River harvest is Washington catch only.
2/ Total Catch includes only Washington landings for the Columbia River subarea

Halibut are measured at the dock and the lengths of the samples are then converted to weight. Length data is collected throughout the season and applied to the number of halibut caught to project the total catch in pounds. Starting in 2017, both the coastal and Puget Sound region were managed with catch estimates that are produced on a weekly basis and areas are closed when they are projected to attain their respective subarea quota.

Statewide Season Structure – North Coast, South Coast and Puget Sound

The 2017 CSP was revised to establish a statewide season with concurrent season dates for the north coast, south coast and Puget Sound subareas. The Washington recreational halibut fishery has become increasingly popular in with more fishing effort directed at a relatively stable quota. The result has been recreational halibut seasons that last from three to five days in the north coast and south coast subareas. Seasons in the Puget Sound region have gone from several months to as few as 8 days in 2016. In response, WDFW has worked extensively to improve inseason sampling methods, consider stakeholder input, and construct seasons that provide meaningful recreational fishing opportunity and maximize the season length. In recent years, WDFW has worked with stakeholders in these subareas to create overlap in the season dates across these subareas. The overlap is intended to keep catch within the subarea quota and spread out the season by limiting the overall number of fishing days. The implementation of a new sampling approach for the Puget Sound region that allows for inseason quota tracking in 2017 provided the flexibility necessary to establish concurrent season dates in all of these subareas.

North Coast Subarea

The North Coast subarea has traditionally been structured to be open on Thursdays and Saturdays. Under the statewide season structure, the fishery was open Thursday, May 4th, Saturday, May 6th and Thursday, May 11th then switched to a Thursday, Sunday structure on Sunday, May 21 following a management break implemented to evaluate catch relative to the subarea quota. Catch per unit of effort (CPUE) in this subarea was much lower in 2017 than what is typically seen. In addition, fishing effort dropped off as the season extended into late May and June and resulted in a season that was open for 9 days. This subarea was open for one final day on Saturday, June 17th with cumulative catch reaching 100,410 pounds which was 5,683 pounds under the 2017 subarea allocation.

South Coast Subarea

The South Coast subarea has traditionally been structured to open on the first Sunday in May and continue two days per week (Sunday and Tuesday) with a management closure to monitor quota attainment and provide advance notice of another fishing day or a potential closure. Under the statewide season structure this area followed the same season structure as the North Coast subarea with the season following a two day per week structure starting with Thursdays and Saturdays and then switching to a Thursday, Sunday weekend/weekday structure after the first three days. The approach for the North Coast and South Coast subareas reflected a significant compromise between stakeholders from both subareas that wanted to retain their traditional weekend days while still moving toward consistent season days. Saturdays are important to stakeholders from the North Coast subarea while Sundays are important to stakeholders from the South Coast subarea. The South Coast continued to reserve two thousand pounds or 10 percent of the subarea allocation, which was two thousand pounds in 2017, to allow for a nearshore fishery. The 2017 CSP was revised to open the nearshore fishery on the first Saturday following the closure of the primary all depth fishery. However, after five days of all depth fishing, the catch in this area was 61,061 pounds, 10,754 pounds over the subarea allocation which included the 2,000 pounds reserved for the nearshore fishery.

Puget Sound Subarea
As mentioned above, changes were made to the sampling approach for the Puget Sound region that allowed for an inseason quota management approach for this subarea. In addition to enabling WDFW mangers to track inseason catch and close the fishery upon projected quota attainment, the new sampling structure provided the flexibility to manage this subarea under the same statewide season approach as the North Coast and South Coast subareas. This subarea opened on Thursday, May 4th under the same season structure and dates as in place for the North Coast and South Coast subareas. Similar to the North Coast subarea, overall fishing success and CPUE was down in this subarea compared to recent seasons. For example, total catch in 2016 under a total of eight fixed season dates was 102,699 pounds, 45,306 pounds over the 2016 subarea allocation. WDFW is pleased to report that the 2017 recreational halibut catch in the Puget Sound subarea remained within its allocation for the first time in several years. The fishery was open for a total of 9 days concluding on Saturday, June 17th when the cumulative catch reached 60,123 pounds leaving 4,839 pounds of quota remaining.

Columbia River Subarea
The Columbia River subarea is structured to open in all depths the first Thursday in May and continues four days per week, Thursday through Sunday until the set aside for the all-depth fishery is achieved. Five hundred pounds of the Columbia River allocation is set aside to allow halibut retention in the nearshore area when bottomfish are on board during days when the all-depth fishery is closed (Monday-Wednesday).

In 2017, the all-depth fishery opened on May 4 and continued four days per week, Thursday through Sunday through May 25th with a final fishing day on Saturday, June 17th. A total of 12,786 pounds of halibut were landed in the Washington portion of the Columbia River subarea during the all depth fishery. Landings in the nearshore fishery totaled 184 pounds through June 11th for total Washington landings in the Columbia River subarea totaling 12,970 pounds.

2017 Washington Recreational Catch Summary
While there is opportunity for further refinement, we view the statewide season approach and new inseason monitoring for the Puget Sound region as meaningful improvements managing recreational halibut fisheries in Washington.

Canadian Halibut Landed into Neah Bay

As part of WDFW's port sampling efforts for recreational halibut fisheries, we also sample halibut caught in Canadian waters and landed into Neah Bay from March through October. The number of Canadian halibut landed into Neah Bay continues to decrease, with the 2017 total at 245 fish. Table 2 summarizes the Canadian halibut catch landed into Neah Bay for 2013-2017.

There could be additional halibut caught in Canada and landed into Washington ports other than Neah Bay that are not currently being accounted for. For example, WDFW's Puget Sound port sampling program does not collect recreational halibut catch data for Canadian halibut that may be landed into other ports adjacent to Canada such as Sekiu, Port Angeles or Bellingham.

Table 2. Canadian halibut landings into Neah Bay, Washington, 2013-2017.

Year	# Boats	# Anglers	# Halibut
2017	169	419	245
2016	230	608	304
2015	254	648	434
2014	295	797	629
2013	390	1,107	690

Incidental Halibut Catch in the 2017 Sablefish Fishery North of Point Chehalis, WA

The 2A Halibut CSP provides for incidental landings of halibut in the primary longline sablefish fishery north of Pt. Chehalis, Washington, in years when the Area 2A TAC is greater than 900,000 lbs. The primary sablefish fishery north of Point Chehalis will be allocated the Washington sport allocation that is in excess of 214,110 lb, provided a minimum of 10,000 pounds is available. The amount of halibut allowed in the directed sablefish fishery is capped at 70,000 lbs; any remaining allocation is transferred back to the Washington recreational fishery and divided among the subareas according to the methodology described in the CSP. The 2017 area 2A TAC was 1,330,000 pounds and the initial Washington sport allocation was 307,762 allowing for 70,000 pounds of halibut available for incidental retention in the longline sablefish fishery. The Pacific Fishery Management Council adopted a 110 pounds of halibut per 1,000 pounds of sablefish limit per landing with up to two additional halibut in excess of the 110 pounds per 1,000 pounds landing ratio allowed per landing (both dressed weight, halibut with head-on) beginning on April 1, 2017. Effective May 11, the landing limit was changed to 140 pounds (64 kg) dressed weight of halibut for every 1,000 pounds (454 kg) dressed weight of sablefish landed and up to 2 additional halibut in excess of the 140 pounds per 1,000-pound ratio per landing. The sablefish fishery extends from April 1 through October 31 with associated halibut landings allowed beginning April 1.

In 2017, fifteen vessels made a total of 67 landings containing halibut in the tier-limit sablefish fishery north of Pt. Chehalis. The total catch of dressed, head-on halibut in the directed sablefish fishery north of Pt. Chehalis at the conclusion of the fishery was 35,866 pounds which is 52 percent of the established quota. Incidental halibut retention in the sablefish fishery was open through October 31. The incidental halibut landings in the sablefish fishery north of Point Chehalis from 2013-2017 are summarized in Table 3.

Table 3. Incidental Halibut in the Sablefish Fishery North of Pt. Chehalis

Year	Vessels	Landings	Quota	Catch	% of Quota
2017	15	67	70,000	35,866	51.8
2016	16	64	49,686	39,376	79.2
2015	8	37	10,348	9,797	94.7
2014	12	42	14,274	12,224	85.6
2013	14	53	21,173	14,151	66.8

Summary

WDFW will continue to monitor and sample our recreational and commercial fisheries, including the amount of halibut caught in Canadian waters and landed into Neah Bay; continue to improve sampling and catch estimation methods for the Puget Sound region to keep catch within allocations; maintain our enforcement efforts during the halibut recreational fisheries; and monitor the efforts to document halibut bycatch in the West Coast commercial fisheries and recommend appropriate action through the Pacific Fishery Management Council.

Washington Department of Fish and Wildlife Police

2017
Halibut Report

"TO PROTECT OUR NATURAL RESOURCES AND THE PUBLIC WE SERVE"

WDFW Police

2017 Halibut Report

OVERVIEW

Halibut can be found throughout Puget Sound and offshore waters. This resource is shared among four user groups in Washington State: recreational, directed non-Indian commercial, non-Indian incidental, and Tribal fishermen. Washington Department of Fish and Wildlife (WDFW) police developed a patrol plan for 2017 that provides comprehensive protection throughout the entire year.

As halibut seasons and habitats overlap with other fisheries, directed halibut patrols often reveal federal and state violations related to other species. Conversely, halibut violations were also found during patrols intended to maintain compliance in other fisheries. Common halibut violations included mutilation of fish so that size or species could not be determined, failure to account for catch, fishing for and possession of rockfish or halibut in closed areas, closed-season fishing, exceeding limits, failing to submit catch for inspection (hidden fish), and fishing without a license.

Strategic Planning

The Patrol Plan's focus areas include:

1. Elevating enforcement presence at sea and shore-side during halibut-directed fisheries or when halibut can be legally retained incidental to other fisheries;
2. Ensuring compliance with halibut hot spots that are closed to fishing during open halibut seasons (intended for yellow eye and canary rockfish protection);
3. Providing a presence on the halibut grounds during season closures, to include during non-halibut fisheries in locations where halibut could be intercepted;
4. Monitoring commercial off-loads;
5. Inspecting wholesale and retail sellers to ensure lawful origin of halibut in commerce;
6. Ensuring the safety of all persons engaged in commercial and recreational fisheries; and
7. Conducting joint patrols with partner agencies such as Tribal, United States Coast Guard, and local sheriffs' offices in order to expand patrol coverage.

Officers measuring halibut off the Washington coast.

2017 Emphasis Patrols:

16 Participating WDFW Officers

Total Hours: 578

- 370 Hours at Sea on Long-Range Vessels (185 Vessel Hours)

- 208 Hours of Land-Based Patrols

Total Contacts: 2,095

- 109 Commercial Contacts

- 1,995 Recreational Contacts

- Warnings Issued: 201
- Citations Issued: 46

Patrol Highlights

Recreational Season:

Three detachments conducted saturation patrols in Marine Areas 1, 2, 3, 4 and 5 prior to and during the recreational and commercial coastal halibut openers. WDFW police committed four patrol boats and deployed officers on United States Coast Guard (USCG) and Clallam County Sheriff's vessels to expand the at-sea presence. In addition to WDFW officers detecting recreational and commercial fishing violations, USCG boarding teams terminated several vessels voyages due to a lack of required safety equipment. Some highlights . include:

A number of halibut-directed patrols resulted in high compliance with halibut rules, however, groundfish-related violations by halibut anglers were still observed. For example, one vessel kept a dozen rockfish (five different species) that were illegal to possess in addition to three undersized lingcod. At least one person in the group understood how much trouble they were in upon seeing the patrol vessel approach and started to throw fish overboard. Since rockfish with distended swim bladders fail to sink, they were easily retrieved and the fishermen were cited accordingly.

Officers Davidson, Branscomb, Summit and SGT Rosenberger, with assistance from USCG, emphasized presence in the La Push area. The first open fishing day yielded violations which included one boat fishing halibut in a closed area and in possession of two closed-season Canary Rockfish. With the assistance of the USCG helicopter, WDFW Police were able to contact a vessel fishing for halibut in the Yellow Eye Conservation Area, which is closed to halibut.

In the Strait of Juan de Fuca, Sgt. Rosenberger teamed up with the Clallam County Sheriff to patrol waters between Sekiu and Neah Bay. Three men aboard a boat were contacted and told the Sgt. that they did not have any fish on board and that it was a slow fishing day. As the deputies conducted a vessel safety inspection, Sgt. Rosenberger could hear a fish flopping within a fish well and saw drops of blood on the deck.

Sgt. Rosenberger told the men that he knew there was a fish aboard and requested that they provide it for inspection. The men again denied having a fish, just as the fish started to thrash. The Sgt. asked to see the inside of a fish well the suspect was standing on and discovered a halibut, which was very much alive. The suspect told the Sgt. that he had not recorded the fish on his catch record card, and that is why he had not told the truth. The Sgt. informed the man that he had taken what is a lesser violation and made it into a gross misdemeanor offense by lying. He was cited accordingly. Over-limits for bottomfish and retaining rockfish in closed areas were also addressed through additional angler inspections.

Patrol Highlights

Officer Summit assists anglers at their request

Commercial Fishery:

WDFW Police went undercover and observed an over-limit of four halibut retained on board a vessel for hire. Small halibut, both alive and dead were high-graded in favor of larger fish. When confronted, the captain(s) and crew had a hard time telling the truth for quite some time, but finally admitted to the violations. Ultimately a search warrant was served on the charter boat company office as they had cause to believe that high-grading and exceeding limits was routine. After interviewing numerous witnesses on prior fishing trips, additional violations were added to the original case.

Incidental Fisheries

Commercial salmon troll areas overlap halibut grounds. Trollers may legally retain halibut incidental to the salmon fishery, however limits apply. Commercial trollers are routinely inspected to ensure compliance. No violations were found.

Commercial Focus

Fish Company Inspections:

Wholesale fish dealers and processors are inspected throughout the season to ensure proper catch accounting and enforce possession limits. One commercial vessel was discovered to have delivered two hundred and eighteen pounds of halibut in excess of the limit. The overage was seized and state citations were issued to the captain. Officers also conducted vessel patrols during each of the open-directed commercial halibut fisheries. No violations were found.

CHINOOK OBSERVER

Local charter suspected of 'high-grading' prized halibut

Natalie St. John
Published on July 18, 2017 3:51PM

IPHC-2018-AM094-AR06 Rev_1
Received: 23 December 2017, &
4 January 2018

Oregon Department of Fish and Wildlife

Report on the 2017 Oregon Recreational and Commercial Pacific Halibut Fisheries

and

Economic Impacts of 2018 Default Harvest Control Rule

Oregon Department of Fish and Wildlife
Marine Resources Program

December 2017

2017 Oregon Recreational Fisheries

Allocation

Beginning in 2014, the Oregon recreational Pacific halibut fishery has received 20.0 percent of the Area 2A Total Allowable Catch (TAC), or catch limit as indicated in the Pacific Fishery Management Council (PFMC) "Pacific Halibut Catch Sharing Plan" (CSP). Previously, the Oregon and California recreational fisheries had been combined and received 20.6 percent of the Area 2A TAC. Beginning 2016, 2.3 percent of the Oregon recreational allocation was allocated to the Columbia River subarea (Leadbetter Point, Washington to Cape Falcon, Oregon; Figure 1). The Central Oregon Coast Subarea (Cape Falcon to Humbug Mountain) was allocated 93.79 percent and the Southern Oregon Subarea (Humbug Mountain to the OR/CA Border) received 3.91 percent of the Oregon recreational allocation.

Recreational Catch Monitoring

Catch estimates were derived using data obtained from the Oregon Recreational Boat Survey (ORBS). Catches, by port and boat type (charter or private), were calculated by applying trip level data obtained from dockside sampling (mean anglers per boat, mean fish weight, mean fish per angler, proportion of trips targeting Pacific halibut, proportion of non-targeted trips with incidental catch of Pacific halibut) to total effort counts (boats). Samplers were instructed to measure the lengths of all Pacific halibut from every other boat sampled, for both the private and charter fleets. This information was used to estimate total weight of fish landed. In 2017, statewide, 3,809 Pacific halibut were sampled, which was 32.4 percent of the estimated 11,754 Pacific halibut landed into Oregon (Table 1).

Groundfish Retention

For 2017, retention of all groundfish except other flatfish species (new in 2015), sablefish and Pacific cod were once again prohibited in the Columbia River and Oregon Central Coast all-depth fisheries if Pacific halibut were aboard the vessel. This provision is to reduce incidental take of yelloweye rockfish, federally classified as an overfished species. Sablefish and Pacific cod were allowed to be retained as they are rarely targeted; rather, take in the directed halibut fishery is often incidental. Groundfish retention was allowed in the nearshore halibut fishery (in areas open for groundfish fishing) when the all-depth fishery was closed and in the Southern Oregon subarea because the majority of halibut fishing occurs inside of 40 fathoms, where yelloweye rockfish are less abundant and have higher survival after release.

Since 2005, the high relief area of Stonewall Bank, located approximately 15 miles off Newport, has been closed to halibut fishing (Figure 1). The intent of this provision is also to reduce the incidental take of yelloweye rockfish.

Discussion

Columbia River Subarea (Leadbetter Point, Washington to Cape Falcon, Oregon)

In 2017, the Columbia River fishery was scheduled to have two openings, an all-depth season beginning the 1st Thursday of May, continuing 4 days per week (Thurs-Sun) until the quota was attained or September 30, and a nearshore fishery opening the Monday after the first all-depth opening, continuing 3 days per week (Mon-Wed) until the quota was attained or September 30. On May 25, 2017 the all-depth season closed with a total of 11,371 pounds caught, which was 928 pounds under the 12,299 pound allocation. In mid-June, the Washington Department of Fish and Wildlife (WDFW) determined that there was enough allocation remaining to open all Washington subareas, including the Columbia River Subarea, with the 928 pounds remaining, for one more day of all-depth fishing. ODFW agreed to reopen the Columbia River Subarea on June 17, 2017 for one additional day. Effort and landings on that additional open day were higher than anticipated, with 2,459 pounds landed, bringing total landings to 13,830 pounds, 1,531 pounds over the allocation. The overage in the all-depth season was greater than what was set aside for the nearshore season. Therefore, the nearshore season closed on June 23. There had been minimal effort and 184 pounds landed in the nearshore fishery at that time. An estimated 1,044 pounds (7.5 percent of the total subarea catch) were landed into Oregon ports, all from the all-depth season (Table 1). The total Oregon contribution to the subarea catch limit was 5,905 pounds, 2.3 percent of the Oregon recreational allocation.

Oregon Central Coast Subarea (Cape Falcon to Humbug Mountain)

The fishery in this subarea has two components: a shallow nearshore fishery and a directed all-depth fishery (spring and summer seasons).

Nearshore fishery (inside 40 fathoms)

Beginning in 2010, anglers began targeting halibut inside 40 fathoms rather than just catching incidentally on bottomfish or other trips, resulting in earlier than anticipated closures. To extend the season, in 2013 the nearshore fishery was changed from seven days per week to three days per week (Thursday, Friday, and Saturday). However, the nearshore season closed within one calendar day of when it had in 2012, even with the three day per week openings. Many anglers were unhappy with the three day per week openings, and requested going back to seven day per week, but opening later in the year. The intention was to allow halibut opportunities later into the summer months. Therefore, beginning in 2014, the nearshore fishery opened on July 1, seven days per week and remained open through October 31, or until allocation attainment. Due to leaving some allocation unharvested in 2014, anglers requested that the fishery opening date be moved to June 1, beginning in 2016.

In 2017, the initial allocation to the central coast nearshore fishery was 28,897 pounds. Through July 30, there were 27,967 pounds landed, leaving only 930 pounds remaining. The nearshore fishery was then closed beginning on July 31. The week prior to the Labor Day holiday weekend, ODFW consulted with the National Marine Fisheries Services (NMFS) and International Pacific Halibut Commission (IPHC) on the status of Oregon recreational fisheries. It was determined at that time that the Southern Oregon Subarea was unlikely to take the entire allocation prior to the regulator closure of October 31, therefore 4,000 pounds was transferred to the Central Oregon Coast Subarea nearshore fishery, allowing it to reopen on August 28. On September 22, the 2,734 pounds remaining from the summer all-depth season were moved to the nearshore fishery to keep it open through the regulatory closure of October 31. Total catch was 34,865 pounds, which was 766 pounds (2 percent) under the adjusted allocation of 35,631 pounds.

All-depth fishery

The directed all-depth fishery, split into spring (May-July) and summer (August-October) seasons, is allocated 88 percent of the Oregon Central Coast subarea catch limit. In 2017, 71.6 percent of that amount (151,712 pounds) was allocated to the spring fishery and the remainder to the summer fishery (60,203 pounds).

The 2017 spring season was managed in two periods, each with fishing allowed Thursday, Friday and Saturday. The first period was managed under the fixed-day approach in use since 1995: a number of fixed dates are set preseason so anglers can plan their fishing in advance, with the intent to not exceed the spring catch limit. Any remaining poundage is available for a second open period in the spring; these "make-up" dates are also set preseason. The first period (fixed-day season) was open for 15 days on May 11-13; May 18-20; June 1-3; June 8-10; and June 15-17. During the five fixed openings, there were two that had low effort and landings due to weather and ocean conditions, the other three had good weather allowing for high effort. After the fixed dates, enough quota remained for three back-up days of fishing. The total catch from the spring season was 145,634 pounds (Table 1), or 96 percent of the spring all-depth catch limit. The remaining 6,078 pounds was shifted to the summer all-depth fishery.

The 2017 summer fishery was set preseason to open every other Friday and Saturday from August 4 through October 31. The opening weekend, had good weather which allowed for more effort and landings than seen in the last two summers' opening weekend. Weather conditions were not as favorable the following two openings. After the fourth opening, ODFW consulted with IPHC and NMFS and determined that not enough quota remained for any additional all-depth days. Therefore, the remaining 2,734 pounds were transferred to the nearshore fishery. The total catch in the summer fishery was 63,547 pounds (Table 1), under the revised summer fishery catch limit of 66,281 pounds by 2,734 pounds (4 percent).

Combined Nearshore and All-Depth Fisheries

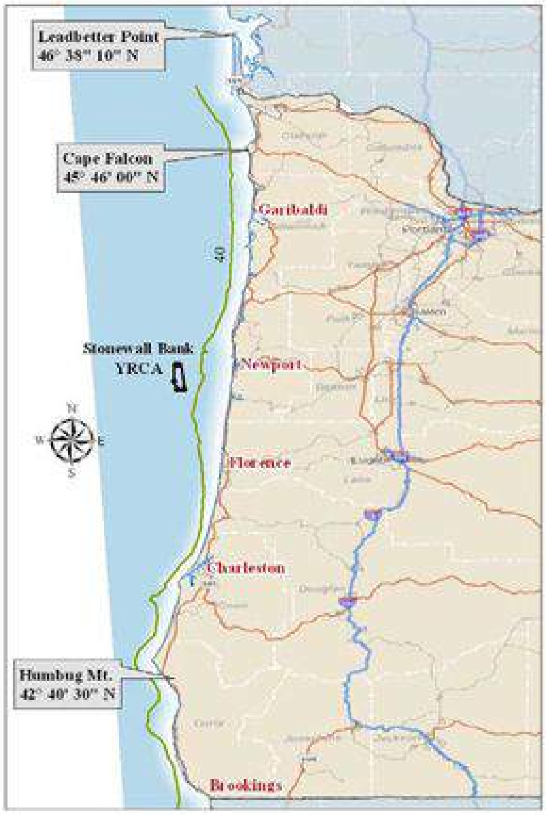
The combined catch from the nearshore and all-depth fisheries was 244,046 pounds, or 101 percent of the 240,812 pound initial total allocation (99.6 percent of the adjusted 244,812 pound allocation) for the Oregon Central Coast subarea.

Southern Oregon Subarea

Until 2011, Pacific halibut were rarely targeted off Oregon in the former South of Humbug subarea as this area is located in what was thought to be the southern edge of the species' range. Beginning in 2014, a new Southern Oregon Subarea was created from Humbug Mountain to the Oregon/California Border. The Southern Oregon subarea received 3.91 percent of the Oregon recreational allocation (10,039 pounds). During 2017, as in 2015 and 2016, early season had little success compared to 2010-2013 primarily due to unfavorable current and weather conditions. Effort and catch picked up some in late July when other opportunities began to decrease and the weather and ocean became more favorable. There was minimal effort or catch from this subarea after Labor Day weekend, again primarily due to weather conditions. In late August, this subarea was not anticipated to require its entire allocation, and 4,000 pounds were transferred to the Central Oregon Coast Subarea nearshore season. The intent was to keep both fisheries open through the regulatory closure of October 31, which was achieved. The catch estimate for the Southern Oregon subarea was 2,811 pounds, under the adjusted allocation of 6,039 pounds by 3,228 pounds, 53 percent.

Summary

The combined catch of Pacific halibut in the 2017 Oregon recreational fisheries is estimated at 247,900 pounds. The catch was comprised of an estimated 11,754 fish averaging 21.1 pounds net weight (Table 1). An estimated 20,400 halibut targeted angler trips contributed $2.5 million, via spending on trip- and fishing-related expenses such as hotels, lodging, tackle, and other items.



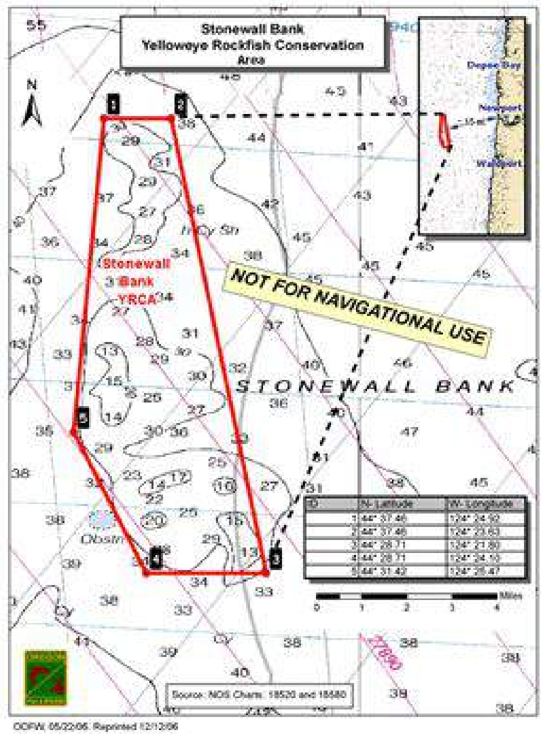


Figure 1. Maps with Oregon Pacific halibut recreational regulation locations, including Stonewall Bank Yelloweye Rockfish Conservation Area

Table 1. 2017 Oregon Pacific halibut recreational fishery catch data.

Subarea	Season	No. of Halibut Sampled	Average Weight (net lbs.)	No. of Halibut Harvested	Total Pounds (Net Weight)
Columbia River	All-Depth	38	14.1	74	1,044
	Nearshore	0	N/A	0	0
Central Oregon Coast	Spring All-Depth	2,126	20.4	7,132	145,634
	Summer All-Depth	1,070	22.1	2,876	63,547
	Nearshore	510	22.4	1,557	34,865
Southern Oregon Subarea		65	24.4	115	2,811
Total		**3,809**	**21.1**	**11,754**	**247,900**

2017 Oregon Commercial Fishery

A brief review of Oregon's commercial Pacific halibut fishery in recent years with a focus on 2017 is below[1]. A more detailed report prepared in 2014 on the economics of Oregon's recreational and commercial fisheries is available at:
www.dfw.state.or.us/MRP/finfish/halibut/docs/management/EconomicHalibutReport2014.pdf

Participation

The Oregon commercial halibut fishery provides a small amount of harvest revenue to a relatively large number of participants. A few vessels are dependent on the fishery for a majority of their annual revenue. The explanation for the large number of participants includes the low gear-up costs for participation, and open access licensing. In addition to directed fishery participation, there are many participants in the incidental halibut salmon troll fishery. Oregon-registered vessels with an IPHC license for commercial halibut in Area 2A are shown in Table 2. Approximately 50 percent of those vessels that had directed commercial licenses made deliveries of Pacific halibut in 2017; as did approximately 34 percent of those with incidental troll salmon licenses. While the average per-vessel harvest revenue is somewhat minor in recent years for the directed halibut fishery ($1,000 to $10,000), there may be some participation motivated by wanting to continue a landings history if this currently open-access, derby style fishery were to become an individual fishing quota fishery in the future. Additionally, with some limited opportunities in other fisheries, such as salmon, some vessels may be expanding their annual portfolio of fisheries they participate in to keep the vessel fishing and earning income.

Table 2. Number of Oregon-registered vessels with an IPHC license for commercial halibut fisheries in Area 2A, 2012-2017

Oregon Registered Vessels	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
Directed Commercial	115	88	99	92	109	135
Incidental Sablefish (N of Pt. Chehalis)	1	0	2	0	1	1
Directed and Incidental Sablefish	4	8	5	5	1	3
Incidental Troll Salmon	173	192	239	230	193	116

Harvesting and Processing

During the directed fishery, there were 229,000 round weight pounds landed into Oregon at an ex-vessel value of $1.39 million in 2017 (Table 3). During the incidental to salmon troll fishery, there were 4,000 pounds round weight landed into Oregon, for an ex-vessel value of $0.027 million in 2017. Halibut ex-vessel prices averaged $6.05 per round weight pound in 2017. There were a total of 118 unique vessels that had shoreside halibut landings in Oregon in 2017. Of the 105 vessels, 39 vessels landed halibut with troll gear (i.e., the incidental salmon fishery), and 66 landed halibut with longline or hook and line gears (i.e., the directed fishery). There were also 13 vessels

[1] Full report: http://www.dfw.state.or.us/MRP/finfish/halibut/docs/management/EconomicHalibutReport2016.pdf

that landed halibut in the shoreside Pacific whiting fishery[1] in 2016. There were 144 deliveries in the directed fishery, 85 deliveries in the incidental salmon troll fishery, and 28 deliveries in the shoreside whiting fishery in 2017 (Table 3). Forty-five percent of the vessels in the directed fishery had less than $10,000 in ex-vessel revenue in 2017, while only 15 percent had over $50,000 in ex-vessel revenue. The average ex-vessel revenue in 2017 was $21,000, while the median was approximately $11,000.

Table 3. Summary of commercial Pacific halibut fisheries information.

Sector	# of Vessels	# deliveries	Pounds Landed	Avg. Ex-vessel price per pound	Total Ex-Vessel Price
Incidental with Salmon	39	85	3,985	$6.83	$27,213.00
Directed fishery	66	144	229,158	$6.05	$1,386,231.00
Shoreside whiting	13	28	648	$0.00	$0.00
Total	**118**	**257**	**233,791**	**$6.06**	**$1,413,444.00**

Fifteen processors or buyers purchased over $10,000 of landed halibut each in 2017, and this comprised over 98 percent of all halibut landings in Oregon. The top three processors or buyers purchased about 71 percent of all Oregon halibut landings.[2]

Economic Impacts of 2018 Catch Alternatives

To inform the biological and economic trade-offs associated with the Area 2A catch alternatives for 2018, ODFW compared the difference in total economic impacts between: (1) the 2017 status quo catch limit (Fishery Constant Exploitation Yield, FCEY) of 1.33 million pounds, and (2) the 2018 FCEY of 0.47 million pounds that results from application of the reference spawning potential ratio (SPR) and the IPHC's interim management procedure[3]. A 2018 FCEY of 0.47 million pounds would be a 65% reduction (-0.86 million pounds) from 2017, and would be projected to decrease the total value of the West Coast halibut fishery by USD $5.4 million in personal income and 108 jobs (Table 4).

These economic impact projections are based on the predicted reductions of ex-vessel revenue for each West Coast commercial fishery (i.e., tribal and non-tribal by state) and predicted reductions in recreational private and charter trips for each state, which are then expanded to total economic impacts (income and jobs) via the use of the respective "multipliers" from the IO-PAC model (Leonard and Watson 2011) that is used by the National Marine Fisheries Service to evaluate economic impacts for West Coast fisheries. Source data are the PacFIN database for commercial revenues (excluding research/survey sales) and the RecFIN database for recreational angler trips.

[1] The Pacific whiting fishery is a maximized retention fishery. Harvesters are not paid for the landings and processors typically distribute the fish to food banks or destroy them

[2] Processor receipts of halibut include research, discard, trawl, and catch from outside the EEZ.

[3] Preliminary Pacific halibut catch tables for 2018. IPHC-2017-IM093-09. I. Stewart, 27 November 2017.

It is important to note that these would be the theoretical maximum economic reductions, as they are based on an assumption there is no substitution from the lost halibut activity to other activities that could provide economic benefits. In other words, the true economic effects of reduced halibut catch limits would likely be less than the theoretical maximum reductions provided here since commercial fishermen could switch in part to other revenue sources (e.g., other fisheries or non-fishery jobs), and recreational anglers could spend some of the money they would have normally spent on a halibut trip on other fisheries or non-fishery activities. Since these substitution effects cannot be accurately predicted without complex social research, the theoretical maximums are provided for reference, with a strong caveat that the actual economic impacts would likely be less.

Table 4. Theoretical maximum economic impact to the U.S. West Coast in terms of income and jobs resulting from a reduction in the Pacific halibut Area 2A FCEY from 1.33 million pounds (2017 status quo) to 0.47 million pounds (2018 reference SPR/default management procedure).

	Economic input			**Personal income (wages)**			**Jobs (full + part time)**		
Sector	**2017**	**2018**	**Decrease**	**2017**	**2018**	**Decrease**	**2017**	**2018**	**Decrease**
Commercial [a/]	3,176,584	1,207,102	-1,969,482	$5,217,955	$,1,982,823	-$3,235,132	98	37	-60
Sport [b/]	35,873	13,632	-22,241	$3,418,697	$1,299,050	-$2,119,647	77	29	-48
Total	---	---	---	$8,636,652	$3,281,873	-$5,354,779	174	66	-108

[a/] Commercial (tribal and non-tribal combined): U.S. dollars in ex-vessel revenue
[b/] Sport (privately owned vessels and for-hire chartered/guided): number of angler trips

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OREGON STATE POLICE

FISH AND WILDLIFE DIVISION

HALIBUT ENFORCEMENT SUMMARY

2017

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OSP Enforcement Statistics

2017 Enforcement Activity Data

Anglers Contacted	Total Persons Not in Compliance	Percentage of Contacts in Compliance	Federal Referrals
979	112	89%	1

2017 Statistics: Hours Worked

Number of Troopers Involved in Season	Number of NS Personnel Hours Worked	Number of NS Vessel Hours Worked	Number of LR Personnel Hours Worked	Number of LR Vessel Hours Worked	Total At Sea - Personnel and Vessel Hours	Number of Dockside Hours Worked	Total OSP Hours Worked Towards Halibut
17	231	115.50	86	43	475.50	156.50	473.50

Enforcement Narratives

In May, Senior Trooper O'Connor along with Troopers Olson and Reeder conducted a boat patrol for the All-Depth Halibut season out of Garibaldi. A charter boat was contacted with sixteen people on board including the captain and deckhand. At the time of the contact, there were fourteen halibut on board. Upon inspection of the harvest tags, it was determined that one of the anglers did not have a harvest tag. Six anglers, including the deckhand, had purchased "prepaid daily angling licenses" from the charter company and had failed to properly validate their license for their halibut because they had written the *location/species* code but not the *month/day*. Some of these licenses were missing the *"valid for"* date and one of them was missing the *name, date of birth, signature* and the "*valid for"* date. The captain was contacted and he stated that each angler purchases a license from the charter company when they arrive in the morning, if they did not already have one. The captain stated the anglers leave the licenses blank until they get to the fishing grounds, this way they can get their money refunded to them in the event there are mechanical or weather problems. The captain had a supply of licenses that he admitted to selling from the boat, while underway. A citation was issued to the deckhand for **Failure to Properly Validate Angling Harvest Tag** and another citation was issued to one of the anglers for **No Angling Harvest Tag** and one halibut was seized and donated to the County Jail. Warnings were given to five of the customers for Failure to Properly Validate Angling Harvest Tag.

Troopers Van Meter and Hansen conducted offshore boat patrols out of Newport for the All Depth Halibut season during May. Over the course of two days, the Troopers contacted one hundred and thirty two anglers and approximately fifty two boats:

▪ One angler was contacted who was fishing for halibut but did not have his harvest tag with him. The Troopers did a check to determine if he had in fact purchased a tag and found that he did. It was also determined this angler had a warrant for his arrest. The angler was taken into custody without incident and put onboard the OSP patrol vessel. The angler was transported by boat to the USCG Station Yaquina Bay where he was then transported to the Lincoln County Jail by Senior Trooper Kehr and Trooper Adkins.

▪ One angler was contacted at South Beach Marina with a halibut that was not recorded on a harvest card. The angler claimed he had fallen asleep and forgot to tag the fish. The angler was cited for **Fail to Immediately Validate Harvest Card**.

In June, Senior Trooper Herman and Recruit Likens conducted a boat patrol on the ocean at Astoria Canyon during the one day North of Falcon recreational halibut season. The troopers checked multiple halibut anglers. Four citations were issued for **Fail to Validate Harvest Card**, including one boat with 3 halibut on board, none of which were tagged. Five warnings were also issued for Fail to Properly Validate Harvest Card, and one for Unlawful Possession of Lingcod. One lingcod was seized.

Enforcement Narratives

In June, Senior Trooper Cutsforth and Senior Trooper Farrar conducted a boat patrol on the Siuslaw River and Pacific Ocean during the last all depth Halibut season. During the patrol, they contacted numerous boats and sport anglers near Heceta Banks and one commercial fisherman who was fishing for Salmon near the commercial Salmon cut off at the Siuslaw River South Jetty. No violations were observed and the catch rate was slow. The Troopers also checked the Cape Perpetua Marine Reserve for any unlawful activity, with none being detected.

Trooper Roberts performed an evening surveillance at the port of Bandon checking Halibut anglers. Six different anglers were contacted that had retained halibut. All of the anglers had tagged their catch but had not fully validated the length of their catch on their combined angling harvest cards. All of the subjects stated that they did not have measuring devices onboard their vessels. The six subjects were warned for Fail to Properly Validate Combined Angling Harvest Card.

In June, Senior Trooper Farrar checked Commercial Halibut Fisherman and their vessels during the 2017 Commercial Halibut Derby, and after the closure between Florence and Coos Bay. Several boats were contacted at the various Ports and no violations were observed.

While observing commercial halibut offloads in Port Orford, Senior Trooper Keeler became suspicious of a vessel that appeared to not match the length on its halibut permit. According to the state vessel license, the vessel is 33 feet in length. According to the Coast Guard, the vessel is 35.9 feet and according to the halibut permit the vessel is between 36 and 40 feet. The vessel landed well over the limit of halibut for vessels under 36 feet. Information was gathered and forwarded to NOAA law enforcement for follow-up.

In July, Sergeant Thompson and Senior Trooper Van Meter checked the Newport commercial halibut fleet as they returned to port after the first halibut derby for 2017. The catch rate was low. One boat was contacted who had a crew member who did not have his 2017 individual commercial fishing license and the boat didn't have enough crew licenses to cover the extra crew member. The crew member was cited for **No 2017 Individual Commercial Fishing License**.

Enforcement Narratives

During August, Senior Trooper Van Meter partnered with Lincoln County Marine Patrol Deputies for an offshore halibut patrol for the first weekend of the summer All Depth season. Fishing pressure was high due to excellent ocean conditions. Numerous boats were checked and the following angling offenses were found:

> A boat with 3 halibut anglers was contacted, with one of the anglers stating as the Trooper made initial contact, that they had just caught a fourth fish that they were going to give to their friends in another boat. The Trooper boarded the vessel and found a cooler full of halibut on the back deck. One of the anglers said that the fish on top had just been caught and was so slimy and flopping around that it flopped around the deck, into the boat cabin and then flopped right into the cooler. The angler claimed the fish had just been caught and happened right as the Trooper's boat was pulling up. The angler said the fish was still alive and I should just release it. The Trooper stared at the lifeless halibut in the cooler for several minutes and determined it wasn't going to swim away. The Trooper seized the fish from the cooler and noticed there were 4 additional halibut still in the cooler. When asked about the extra fish, the angler said he had no idea how that fish got there and must have miscounted. The Trooper seized that fish as well. The 3 anglers were cited for **Fail to Validate Harvest Card** for the fish they were allowed to keep. One angler was also cited for **Exceeding Daily Limit** of Halibut. Both seized halibut were later donated to the Lincoln County Food Share.

Senior Trooper Van Meter and Trooper Adkins conducted an offshore boat patrol out of Newport for an all-depth Halibut sport fishery during September. Two boats were contacted fishing within the Stonewall Banks Yelloweye Rockfish Closure Area. One of the boats possessed a halibut that the Troopers determined had been caught inside of the closure area by locating coordinates from the boats GPS plotter. Both boats were cited for **Angling Closed Area; Stonewall Banks YRCA**. The halibut was seized and the angler that caught it was cited for **Unlawful Possession of Halibut; Closed Area**. Two other citations were issued for **Failure to Immediately Validate Harvest Card**.

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California Department of Fish and Wildlife Report to the International Pacific Halibut Commission on 2017 California Fisheries

California Department of Fish and Wildlife
Marine Region
January 2018

Contents

Executive Summary

This report provides a summary of the performance of the 2017 Pacific halibut recreational and directed commercial fisheries off California.

The recreational season was scheduled to be open from May 1-June 15, July 1-15, August 1-15, and September 1-October 31 as long as there was unharvested quota available. However, following discussions with the International Pacific Halibut Commission (IPHC), Pacific Fishery Management Council (PFMC) and National Marine Fisheries Service (NMFS), an inseason fishery closure was implemented on September 11, based on projected early attainment of the 2017 California quota.

Final 2017 recreational catch estimates totaled 30,541 net pounds—or 88 percent of the quota. The average net weight per fish was approximately 19 net pounds.

A total of five vessels made landings across three opening days in the directed commercial fishery; the preliminary landings were 3,872 dressed pounds – significantly higher than prior recent years.

Background

The California coastline plays a unique part in Pacific halibut management as it is located at the southern extent of the population range and has historically been a minor, and irregular, contributor to harvest removals compared to other management areas. However, recently, a robust recreational fishery in northern California has developed and has prompted science, management and policy discussions about the portion of the stock off California. California Department of Fish and Wildlife (CDFW) is optimistic that Pacific halibut can continue to be a viable and sustainable resource for the local and regional economies of the north coast.

Recreational Fishery

California Recreational Allocation and Regulations

The IPHC set the Area 2A Total Allowable Catch at 1,330,000 net pounds at their annual meeting on January 27, 2017, which resulted in a 2017 California recreational Pacific halibut quota of 34,580 net pounds per the PFMC's Catch Sharing Plan (CSP).

Regulations for California's 2017 fishery provided for a season that would be open May 1-June 15; July 1-15; August 1-15; and from September 1- October 31; or until the quota was projected to be attained, whichever was earlier. However, partially due to significant effort and catch in August, the fishery closed early through an inseason action effective September 11 for the remainder of the year. During 2017, the fishery was open for a total of 86 days. The daily bag and possession limit was one fish and there was no size limit.

Corrections to Final Annual Estimates

CDFW's California Recreational Fisheries Survey (CRFS) staff regularly review their catch estimation programs to verify and cross-check outputs for accuracy. In the fall of 2017, an examination of programming language revealed the conversion from round to net weight for Pacific halibut was inadvertently excluded from the catch estimate calculation. Therefore, CDFW had been reporting round weight rather than net weight for management use in 2015-2017. Prior to 2015, the round to net weight conversions were calculated by hand outside of the programs used to generate catch estimates.

This error resulted in over-reporting of catch and closure of fisheries earlier than was necessary. Revised estimates based on net weight are provided below in Table 1. Consistent with west coast and IPHC protocols, all future CDFW reporting will occur in net weight.

Table 1. Revised recreational Pacific halibut catch estimates for California from 2015-2017. Corrected net weight estimates are provided below. Data for 2017 are preliminary and incomplete.

	2015		**2016**		**2017**	
	Round Weight	**Net Weight**	**Round Weight**	**Net Weight**	**Round Weight**	**Net Weight**
May	378	284	2,322	1,746	2,181	1,640
June	1,783	1,341	5,658	4,254	9,230	6,940
July	13,768	10,352	5,558	4,179	6,094	4,582
August	8,977	6,750	11,025	8,290	19,172	14,415
September	-	-	6,331	4,760	3,942	2,964
October	-	-	-	-	-	-
Total	*24,906*	*18,727*	*30,894*	*23,229*	*40,619*	*30,541*

2017 Inseason Catch Tracking

Monthly estimates produced by CDFW's CRFS program serve as California's best estimate of catch. However, production of these estimates involves a time lag of about six weeks after the month's end. Therefore, CDFW uses weekly projections to approximate catch for any months for which CRFS estimates are not yet available – allowing for timely estimation of cumulative catch during the season. As the CRFS estimates for a given month become available, those monthly estimates replace the total monthly projection values for that month.

In light of the discovery that reported catch estimates for 2015 through 2017 were not in net weight, CDFW updated both the total monthly projections and catch estimates for 2017 (Table 2). CDFW's 2017 preliminary season catch estimate is 30,541 net pounds, or 88 percent of the 34,580 net pound quota.

Table 2. Corrected 2017 Pacific halibut catch estimates in California by month. CDFW projection values are provided in ~~strikeout~~ to illustrate the process of replacing the projections with CRFS estimates when those estimates became available. Data are from CRFS and are preliminary and subject to change.

	Net Pounds Accrued	
Month	**CDFW Projection**	**CRFS Estimate**
May	~~2,674~~	1,640
June	~~4,525~~	6,940
July	~~3,805~~	4,582
August	~~11,003~~	14,415
September	~~2,982~~	2,964
October	0 (CLOSED)	
Total	**30,541**	

During the 2017 catch tracking process, CDFW noted that the resulting estimates in many months differed significantly from the weekly projection totals being used to manage inseason, as reflected in Table 2. In addition to the net weight – round weight issue (previously discussed), there may be an issue with low sample sizes in the Party/Charter (PC) mode in District 5 (covering Cape Mendocino to Point Arena), which resulted in unrealistic estimates in some months.

CDFW will undertake a review of PC sampling levels and estimation procedures in 2018 for Pacific halibut to determine if additional steps can be taken to reduce discrepancies between weekly catch projections and monthly CRFS catch estimates.

CDFW also plans to revisit the Private/Rental (PR) Private Access or Night (PAN) mode estimates that were identified in 2012 as being too uncertain for use in estimating the state's recreational Pacific halibut catch in these areas/modes. The PR-PAN component was expected to be a minor contribution to the Pacific halibut catch; and information available from CRFS in the most recent years should allow for review of this assumption.

Reporting and Coordination with NMFS, IPHC and the PFMC

The weekly projection and cumulative total projected catch were provided by CDFW staff to NMFS, the IPHC, and PFMC for discussion to evaluate the catch status to date. CDFW also posted weekly updates to its Pacific halibut webpage[1] and Pacific halibut inseason catch tracking "thermometer" to inform the public of projected catch to date throughout the season (Figure 1).

[1] https://www.wildlife.ca.gov/Conservation/Marine/Pacific-Halibut#28555772-2015-in-season-tracking

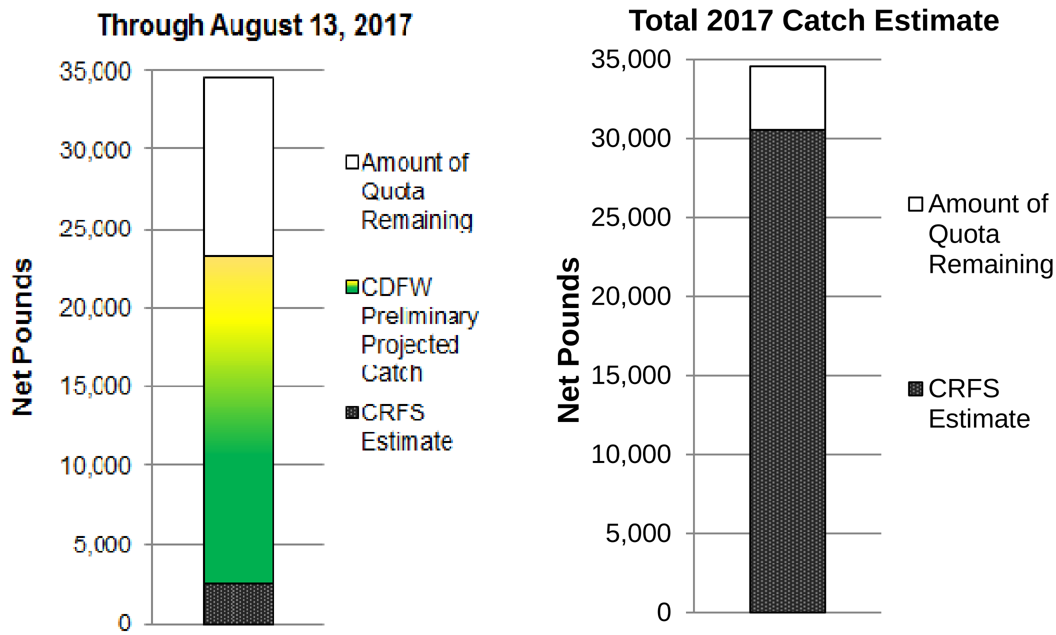


Figure 1. Examples of the CDFW online Pacific halibut inseason catch tracking "thermometer" that were posted online during 2017. The figure on the left shows catch projections (colored gradient) combined with monthly estimates (grey) that were available after August 13, 2017. The figure on the right shows the same graphic at the end of the season with only the monthly estimates, which replaced all projections. The “thermometer” was updated weekly during the open season, with a final update when the preliminary 2017 season total became available.

Location of Sampled Pacific Halibut

A total of 243 Pacific halibut were examined by CRFS samplers throughout the 2017 season. Similar to previous years, the greatest number of Pacific halibut observed by samplers (87 fish), were encountered in Trinidad followed by Eureka and Crescent City (**Error! Reference source not found.**2). The majority of sampled fish (and estimated catch) occurred in August.

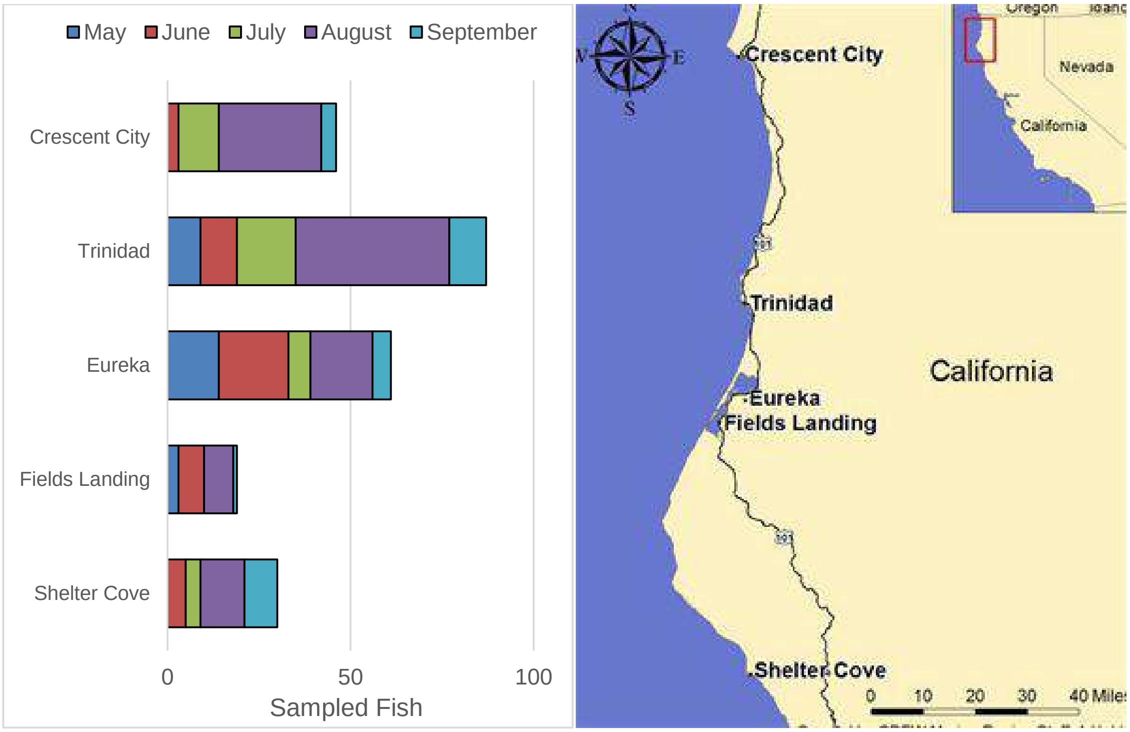


Figure 2. Northern California port areas where Pacific halibut are most frequently encountered and number of sampler examined Pacific halibut by month and port area during 2017.

Fishery Closure

Provisions in the CSP allow for flexible inseason management of the recreational Pacific halibut fisheries in Area 2A. These provisions include modifications to sport fishing periods, or the length of the season via inseason changes. Notice of any inseason action is provided to the public by NMFS on their halibut hotline.

Catch projections through September 3 showed more than 90 percent of the quota had already been taken. Good weather forecasts and the resulting potential for high catch rates prompted CDFW to hold conference calls with NMFS, the IPHC, and PFMC on September 6 and 8. Based on then-current fishery trends and predicted weather conditions, CDFW, NMFS, PFMC and IPHC determined that a fishery closure effective Monday, September 11, was necessary to avoid exceeding the quota.[2]

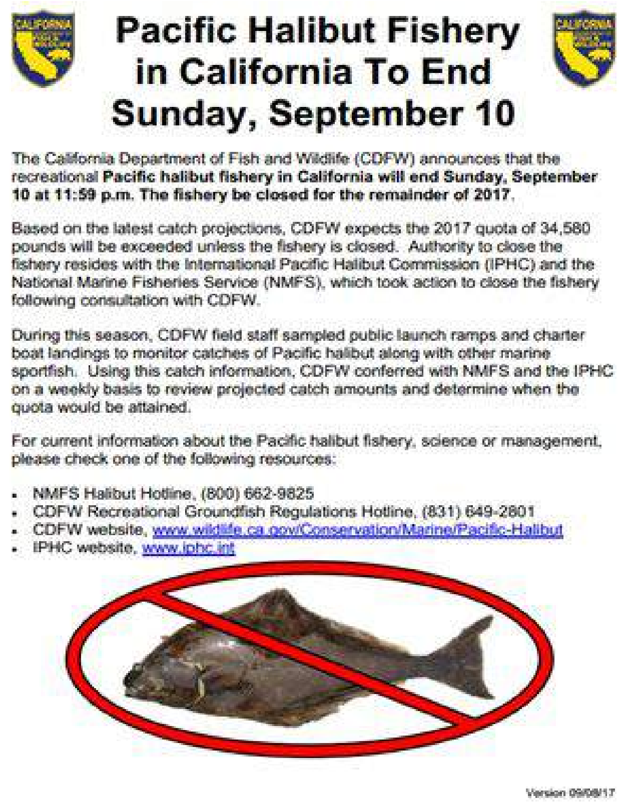
CDFW provided notice of the early closure to its constituents through a variety of methods: a news release[3], the details of which were carried in several local north coast news publications; information on its Pacific halibut webpage[4]; CDFW groundfish

[2] The correction to catch estimates occurred in November 2017, after the fishery closure had occurred. As a result, the corrected catch estimates were not available for use in in-season management during 2017.

[3] https://cdfgnews.wordpress.com/2017/09/08/recreational-pacific-halibut-fishery-to-end-sunday-sept-10/

[4] https://www.wildlife.ca.gov/Conservation/Marine/Pacific-Halibut

regulations hotline; and a flyer (Figure 3) posted at local harbors, launch ramps (Figure 4), and tackle shops which was also handed out to the public by CRFS samplers. NMFS updated its Pacific halibut hotline with the closure information, and the IPHC posted a news release about the closure to its website.



Pacific Halibut Fishery in California To End Sunday, September 10

The California Department of Fish and Wildlife (CDFW) announces that the recreational **Pacific halibut fishery in California will end Sunday, September 10 at 11:59 p.m. The fishery be closed for the remainder of 2017.**

Based on the latest catch projections, CDFW expects the 2017 quota of 34,580 pounds will be exceeded unless the fishery is closed. Authority to close the fishery resides with the International Pacific Halibut Commission (IPHC) and the National Marine Fisheries Service (NMFS), which took action to close the fishery following consultation with CDFW.

During this season, CDFW field staff sampled public launch ramps and charter boat landings to monitor catches of Pacific halibut along with other marine sportfish. Using this catch information, CDFW conferred with NMFS and the IPHC on a weekly basis to review projected catch amounts and determine when the quota would be attained.

For current information about the Pacific halibut fishery, science or management, please check one of the following resources:

- NMFS Halibut Hotline, (800) 662-9825
- CDFW Recreational Groundfish Regulations Hotline, (831) 649-2801
- CDFW website, www.wildlife.ca.gov/Conservation/Marine/Pacific-Halibut
- IPHC website, www.iphc.int

Version 09/08/17

Figure 3. CDFW flyer announcing the September 10, 2017 end of the recreational Pacific halibut fishery in California. The flyer was posted at launch ramps and marinas, and provided to tackle shops and the public to notify them of the early season closure.

Figure 4. Fishery closure flyer posted at the public launch ramp in Eureka, CA. CDFW photo.

Estimating Discard Mortality

In recent years, the IPHC requested that State agencies provide an annual estimate, if possible, of discard mortality in their recreational fisheries. The current sampling protocol of CDFW's CRFS program includes observation and estimation of the total number of both retained and discarded fish, and documentation of the weight of retained fish when possible. Discarded fish that are returned dead are also documented. However, unlike retained fish, no information on the size of discarded fish is collected.

Using CFRS data from 2004 to 2017, CDFW estimated the weight of fish discarded alive and those discarded dead, assuming that the average weight of a discarded fish is the same as a retained fish in each year. In 2017, no fish were estimated as discarded dead (Table 3). Meanwhile, 87 fish were estimated to have been released alive.

A mortality rate of seven percent was applied to fish reported as discarded either dead or alive. This mortality rate was established by the PFMC's Groundfish Management Team as a presumed rate of discard mortality for flatfish[5]. Application of this rate to

[5] PFMC (Pacific Fishery Management Council) and NMFS (National Marine Fisheries Service). 2009. Proposed Acceptable Biological Catch and Optimum Yield Specifications and Management Measures for the 2009-2010 Pacific

discarded fish is also consistent with methods used to estimate discard mortality by the Oregon Department of Fish and Wildlife and Washington Department of Fish and Wildlife. **CDFW's resulting preliminary discard estimate in its 2017 recreational fisheries is 117 net pounds.**

Table 3. Estimated number of fish and weight of recreationally caught Pacific halibut discards, and estimated total discard mortality (net pounds) in California from 2004-2017. Data from 2017 are preliminary and subject to change. Data are from CRFS.

Year	**Discarded Alive**			**Discarded Dead**		**Total Discard Mortality (net pounds)**
	Estimated Number of Fish	Estimated Net Pounds	Estimated Discard Mortality (7 percent of net pounds)	Estimated Number of Fish	Estimated Discard Mortality (7 percent of net pounds)	
2004	62	1,061	74	*	*	74
2005	37	905	63	5	31	94
2006	205	3,558	249	0	0	249
2007	27	319	22	0	0	22
2008	133	1,559	109	4	4	113
2009	226	3,040	213	0	0	213
2010	63	865	61	0	0	61
2011	24	293	21	0	0	21
2012	157	2,315	162	0	0	162
2013	120	2,095	147	0	0	147
2014	197	2,938	206	0	0	206
2015	117	2,470	173	0	0	173
2016	151	2,743	192	0	0	192
2017	87	1,678	117	0	0	117
Average	115	1,846	126	1	7	**130**

***** No estimates of discarded dead fish available.

2017 Noteables

While Pacific halibut are most commonly found north of Point Arena, they can occasionally be found south of that location. On August 2, 2017 an angler aboard a charter vessel fishing off of the Farallon Islands (near San Francisco) caught a 54 pound Pacific halibut (http://www.norcalfishreports.com/fish_reports/67880414/farallon-flatty.php). In response to increasing reports of Pacific halibut catches south of Point Arena, CDFW plans to increase public outreach efforts in those areas.

Coast Groundfish Fishery Final Environmental Impact Statement Including Regulatory Impact Review and Initial Regulatory Flexibility Analysis. Pacific Fishery Management Council, Portland, OR. January 2009, Table 4-56.

Each year there are several anecdotal reports of large (in excess of 70 pounds) Pacific halibut being caught and or landed in California. On September 4, 2017, an angler landed an 81.5 pound Pacific halibut out of Eureka (http://www.times-standard.com/article/NJ/20170913/SPORTS/170919926). This Pacific halibut won Englund Marine's 2017 "Big Halibut" contest in Northern California, besting a 79 pound Pacific halibut caught in August: (http://www.norcalfishreports.com/fish_reports/67880765/pacific-halibut-bite-heating-up-on-the-coast.php).

California Commercial Fishery

In 2017, five vessels participated across three of the opening days in the 2017 Area 2A directed fishery (Figure 5); the preliminary landings were 3,872 pounds dressed (head on, gutted). The landings were distributed from Crescent City to Eureka and sale of the fish produced an estimated $28,000 in ex-vessel revenue for northern California coastal communities. The 2017 total is a marked increase from commercial landings made in recent prior years, with only catches in 2016 exceeding 1,000 pounds.

Figure 5. Two commercial vessels offload their catches in Eureka on July 26, 2017 after the third directed commercial fishery opener in Area 2A.

CDFW staff were present during the offloading for four vessels in Eureka, and conducted biological sampling per the IPHC's protocols (Figure 6). Ageing structures for Pacific halibut were collected and provided to the IPHC for inclusion in the stock assessment.

Figure 6. Fin markings made by directed commercial fishery participants to signify a female Pacific halibut caught in the directed commercial fishery off California in July 2017. Two directed commercial fishery participants chose to participate in the IPHC's voluntary sex identification study in the directed commercial fishery in Area 2A in 2017.

During the 2017 PFMC process, the IPHC requested the Council consider options to transition from the current derby-style fishery to one that provides more flexibility and safety to the fleet. CDFW solicited input from commercial stakeholders via email and during a teleconference held on July 27, 2017.

Directed commercial fishery constituents expressed support for maintaining open access fishery opportunities on the west coast, and the desire to continue participating in a coastwide directed Pacific halibut fishery under the same terms as participants in Oregon and Washington. They also indicated that although directed commercial fishery participation in California is relatively new, and involves only a handful of individuals, catches have increased since 2015, and it is important to maintain this fishing opportunity as part of their fishing portfolios. For example, at least one directed commercial fishery participant noted that minimal commercial salmon fishing opportunity off Northern California in 2017 prompted his participation in the directed commercial halibut fishery this year. Several California commercial directed fishery participants expressed support for alternatives that would extend the existing derby fishery to longer time periods, with reduced trip limits depending on the vessel's size class.

Meanwhile, both open access and limited entry sablefish participants who commented expressed interest in incidental retention of Pacific halibut in the directed groundfish fishery concepts, though not at the exclusion of a directed commercial fishery for Pacific halibut.

CDFW expects some of the alternatives to be favored by California directed participants over the status quo, as it would add some flexibility when prosecuting the fishery to account for weather and other conditions.

Summary

CDFW plans to continue participating in the Pacific halibut management process with co-managers at the IPHC, NMFS, PFMC and in Area 2A, and collecting CRFS sample data for use in inseason tracking and monitoring and the catch estimation process in 2018.

For more information about California's Pacific halibut fishery, contact:

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Fisheries and Oceans Canada / Pêches et Océans Canada

Fisheries and Oceans Canada 2017 IPHC Annual Report

Catch Limits

Fisheries and Oceans Canada follows an allocation policy that defines access to the Pacific Halibut Canadian Total Allowable Catch (CTAC) for Canadian commercial, recreational, and food, social, and ceremonial (FSC) fisheries. For 2017, the CTAC was 7,855,000 net pounds (fresh, head-off, dressed weight). The CTAC is composed of the catch limit for regulatory area 2B and an allocation for FSC. In addition to the CTAC, a carryover of quota from previous seasons is allocated to some licences.

Priority access is provided to the CTAC for FSC purposes, while commercial and recreational access is divided between the sectors 85% / 15% respectively. The International Pacific Halibut Commission recommended a 2017 catch limit of 7,450,000 net pounds for regulatory area 2B. The net carryover from 2016 to 2017 was 21,927 net pounds between the commercial and Experimental Recreational Halibut fishery pilot program (XRQ fishery). The resulting TAC for commercial and recreational harvest in 2017 was 7,389,943 net pounds[1].

Commercial and Recreational Fishery Summaries

For allocation purposes, the commercial / recreational total allowable catch (TAC) is equal to the Canadian catch limit, plus "O26" wastage mortality. The TAC is then allocated between the commercial and recreational sectors, and the "O26" wastage mortality is removed from the commercial and recreational TACs (Table 1). The combined commercial and recreational TAC, including carryover adjustments, for 2017 was 7,389,943 net pounds. As of December 11, 2017, the combined commercial and recreational halibut catch (including landed catch and mortality associated with all released fish in the commercial groundfish fisheries) was 7,168,917 net pounds.

Commercial Fishery Summary

The 2017 Canadian commercial Halibut TAC, including the catch limit allocation and carryover, was 6,271,971 net pounds. Halibut may be caught and retained by all commercial hook and line, and trap groundfish fisheries in Canada. This includes category L, K, ZN, and Schedule II licences.

[1] Quota totaling 31,803 net pounds have been set aside for treaty mitigation and as part of the Pacific Integrated Commercial Fisheries Initiative (PICFI). See Table 1 for more details.

In 2017 the Canadian commercial Halibut catch totalled 6,025,226 net pounds (Table 2). This catch, reported by all hook and line/trap groundfish fisheries in area 2B, includes both landed and released at-sea mortality. Given that non-halibut groundfish fisheries continue throughout the Halibut winter closure, additional released at-sea mortality will continue to be attributed to the 2017 Halibut catch until February 20, 2018, after which released at-sea mortality will be attributed to the 2018 TAC. As such the 2017 commercial catch is current as of December 11, 2017.

Commercial Integrated Management Plan

First introduced as a pilot program in 2006, the Commercial Groundfish Integration Program (CGIP) was made permanent in January 2010 to manage groundfish fisheries, including Pacific Halibut, in British Columbia. The objectives of the CGIP are to improve and maintain groundfish harvest sustainability and management through improved catch monitoring and catch accountability. The CGIP implemented individual vessel accountability for all catch, both retained and released, via individual transferable quotas which may be reallocated between licences and fisheries to cover non-directed catch. In addition these management tools are supported by 100% at-sea monitoring and 100% dockside monitoring for all groundfish vessels.

Notable management changes for the 2017 season include the ongoing rebuilding measures for Yelloweye Rockfish and Bocaccio in all commercial groundfish fisheries.

The 2018/2019 commercial groundfish fishing season will commence February 21, 2018, at which time the renewed Groundfish Integrated Fisheries Management Plan (IFMP) will be available. All commercial groundfish management measures are detailed in the IFMP, which can be requested once available at: http://www.pac.dfo-mpo.gc.ca/fm-gp/ifmp-eng.html#Groundfish

Recreational Fishery Summary

There are two opportunities for recreational halibut fishing in area 2B, the recreational fishery, and the Experimental Recreational Halibut fishery pilot program (XRQ fishery). The 2017 recreational Halibut TAC was 1,118,029 net pounds. The XRQ fishery has acquired 11,287 net pounds, resulting in a combined recreational and XRQ fishery TAC of 1,129,316 net pounds as of December 11, 2017 (Table 3). The estimated 2017 Canadian recreational Halibut catch totalled 1,143,691 net pounds, including 5,824 net pounds of catch in the XRQ fishery. The estimation methods of the recreational catch are outlined in *2017 Canadian Recreational Fishery Halibut Catch Report*.

Management measures for the 2017 recreational fishery are summarised in the Area 2B Recreational Fishery Halibut Catch Report.

Halibut Experimental Recreational Fishery Pilot Program

The Experimental Recreational Halibut fishery pilot program allows individual anglers as well as guides, charters, lodges, marinas and other fishing experience providers to lease Halibut quota and subsequently retain Halibut that is in excess of the regular recreational fisheries daily and possession limits, and maximum size limits. An XRQ licence holder is permitted to fish for and retain Halibut from April 1 – December 31, even if the traditional recreational fishery is closed prior to December 31. Participants in the XRQ fishery must complete logbooks and submit them electronically within seven days of retaining a Halibut.

The XRQ fishery has operated as a pilot program since 2011, and was continued for a seventh season in 2017. A regulatory process is underway to create a category of annual sport fishing licence in s.17 of the *British Columbia Sport Fishing Regulations, 1996*. Public consultations about the regulatory changed were held throughout 2012/2013, and a Regulatory Impact Assessment Statement that summarizes feedback from the public meetings on the experimental licence and regulatory change has been presented to the Minister. A regulatory intent document will be presented for additional public comment prior to the proposed regulatory changes being posted in Canada Gazette 1.

The 2017 XRQ fishery has reallocated 7,455 net pounds of quota (as of December 11, 2017) from the commercial groundfish fisheries, and has carried over 3,832 net pounds of uncaught quota from the 2016 season (Table 3). Reallocations into and out of the XRQ fishery are permitted until January 31, 2018. Any uncaught quota may be reallocated back to the commercial fishery or it may be carried over into the 2018 XRQ fishery (the greater of the 200 net pounds or 10% of the total quota on the licence).

Additional details about the XRQ program are available online: http://www.pac.dfo-mpo.gc.ca/fm-gp/commercial/ground-fond/index-eng.html

Canadian Aquaculture Research

There were no halibut aquaculture research or production activities in area 2B for 2017.

Food, Social and Ceremonial and Treaty Fishery

The estimated Food, Social, and Ceremonial (FSC) halibut catch in area 2B is 405,000 pounds. Since 2009, new conditions have been applied to commercial Halibut licences and many communal halibut permits, to improve catch reporting of FSC caught fish on commercial trips. Of the total FSC halibut caught in 2017, approximately 51,602 net pounds were caught in conjunction with commercial fishing trips and were subject to all commercial monitoring requirements, including 100% at-sea and 100% dockside monitoring. In addition, First Nations engaging in fishing only for FSC used tools such as catch calendars, some dockside monitoring and phone surveys to estimate their catch. Fisheries and Oceans Canada continues to work with First Nations to improve catch reporting within the FSC fisheries.

In April 2011 the Maa-nulth Final Agreement came into effect. The agreement allocates 26,000 pounds of FSC Halibut (part of the 405,000 pounds described above) plus 0.39% of the total CTAC (equivalent to 30,635 pounds in 2017) to the Maa-nulth First Nations for FSC purposes. In 2011 DFO mitigated for the additional treaty allocation through acquisition of 0.47% of the commercial TAC which is set aside for the Maa-nulth First Nation on an annual basis (identified as part of the "net reallocations into/out of the commercial fishery" in Table 1). To date, the 2017 Maa-nulth First Nation's FSC Halibut catch totaled 39,467[2] net pounds of a total 56,635 net pounds allocated under the Maa-nulth Final Agreement.

Spatial Management Measures

The Government of Canada is committed to protecting 5% of Canada's marine and coastal areas by 2017 and 10% by 2020. The 2020 target is both a domestic target (Canada's Biodiversity Target 1) and an international target as reflected in the Convention on Biological Diversity's Aichi Target 11 and the United Nations General Assembly's 2030 Agenda for Sustainable Development under Goal 14. The 2017 and 2020 targets are collectively referred to as Canada's marine conservation targets. More information on the background and drivers for Canada's marine conservation targets is available online at http://www.dfo-mpo.gc.ca/oceans/conservation/index-eng.html. To meet these targets, Canada is establishing Marine Protected Areas (MPAs) and "other effective area-based conservation measures" ("Other Measures"), in consultation with industry, non-governmental organizations, and other interested parties.

New and longstanding spatial management measures have been established for groundfish fisheries, including the Halibut fishery. These measures include:

- the closure of Swiftsure Bank (west of Vancouver Island and the Strait of Juan de Fuca), and areas of Haida Gwaii;
- 164 Rockfish Conservation Areas throughout the coast (http://www.pac.dfo-mpo.gc.ca/fm-gp/maps-cartes/rca-acs/index-eng.html);
- glass sponge reefs in the Strait of Georgia (http://www.dfo-mpo.gc.ca/oceans/ceccsr-cerceef/closures-fermetures-eng.html);
- Hecate Strait and Queen Charlotte Sound Glass Sponge Reefs Marine Protected Area, officially established in 2017. Further information may be found at http://www.dfo-mpo.gc.ca/oceans/mpa-zpm/hecate-eng.html;

[2] The Maa-nulth FSC catch estimate is an in-season estimate which will continue to be updated throughout the year. As such the 2017 Maa-nulth catch is current as of December 12, 2017 and is included in the 405,000 pound estimate.

- Offshore Pacific Seamounts and Vents Fishery. These areas are closed to all commercial and recreational bottom contact fisheries using bottom trawl, hook and line, and trap gear for Groundfish, Halibut, Sablefish, and Shellfish. Further information may be found at: http://www.dfo-mpo.gc.ca/oceans/aoi-si/offshore-hauturiere-eng.html

More information on these management measures and conservation objectives is available in the groundfish IFMP.

Tables

Table 1. Halibut allocations in 2B as of December 11, 2017. All values in net pounds.

Commercial / recreational TAC for allocation	7,716,437
Commercial allocation	x 85%
O26 wastage	- 227,000
2017 Underages [A]	+ 157,034
2017 Overages [B]	- 135,107
Net carryover	+ 21,927
Net reallocations into/out of the commercial fishery [C]	- 22,804
Commercial TAC	6,271,971

Recreational allocation	x 15 %
O26 wastage	- 39,437
Recreational TAC	1,118,029
XRQ allocation	x 0 %
XRQ acquired quota	+ 7,455
2016 XRQ Underages [A]	+ 3,867
2016 XRQ Overages [B]	- 35
Net carryover	+ 3,832
XRQ TAC [D]	11,287
Recreational and XRQ TAC [D]	1,129,316

2B commercial and recreational TAC [D]	7,389,943
2B commercial and recreational catch [E]	7,168,917

A Underage. Unfished quota equaling 10% or less of a commercial licence's individual transferable quota is carried over into the following year.

B Overage. All catch that exceeds the available quota on an individual commercial licence at the end of a given fishing season is deducted from the individual commercial licence the following season.

C Net reallocations include quota reallocated from the commercial halibut sector to Maa-nulth First Nations Treaty, the Pacific Integrated Commercial Fisheries Initiative (PICFI), and Allocation Transfer Program (ATP), as well as the Halibut Experimental Recreational Fishery pilot program. Of the current net reallocations, 38,988 net pounds have been set aside for treaty mitigation and as part PICFI, and are unavailable to either the commercial or recreational fisheries. This value is current as of December 11, 2017.

D There is no initial allocation provided to XRQ fishery, though quota may be transferred into the XRQ fishery from commercial Halibut fisheries. As a result the XRQ TAC changes proportionately with the commercial TAC as quota is transferred between fisheries.

E Catch includes all landed fish, as well as the mortality associated with legal-sized released fish in the commercial fishery.

Table 2. Halibut for 2B commercial groundfish fisheries as of December 11, 2017. All values in net pounds.

Commercial TAC	6,271,971
Commercial Groundfish catch	6,025,226

Table 3. Halibut for 2B recreational and the Halibut Experimental Recreational pilot program (XRQ) fisheries as of January 3, 2017. All values in net pounds.

Recreational TAC	1,118,029
Recreational catch	1,137,867
XRQ TAC	11,287
XRQ catch	5,824 [F]
Recreational and XRQ TAC [D]	1,129,316
Recreational and XRQ catch [E]	1,143,691

D There is no initial allocation provided to XRQ fishery, though quota may be transferred into the XRQ fishery from commercial Halibut fisheries. As a result the XRQ TAC changes proportionately with the commercial TAC as quota is transferred between fisheries.

E Catch includes all landed fish.

F Effective December 11, 2017.

IPHC-2018-AM094-AR10 Rev_1
Recieved: 20 Dec 2017 & 11 Jan 2018

2017 Canadian Recreational Fishery Halibut Catch Report

December 13, 2017

Report Prepared for the
International Pacific Halibut Commission (IPHC)

Submitted by:
Fisheries and Oceans Canada (DFO)
401 Burrard St.
Vancouver, British Columbia
Canada

Contents

1. SUMMARY

This report summarizes the 2017 harvest and biological data from the Canadian recreational Halibut fishery in the tidal waters of British Columbia (BC). The recreational total allowable catch for 2017 was 1,118,029 pounds[1] and the estimated harvest is 1,137,867 pounds (19,838 pound overage). The estimated harvest by pieces is 68,127.

The 2017 season opened on February 1 and closed on September 6. Traditional monitoring and reporting programs, such as logbooks, lodge manifests and recreational creel surveys, collected catch, effort and biological data during peak months and areas of the fishery. Estimates of catch in months and areas not monitored by traditional programs were generated from data collected during DFO's internet-based recreational survey (iREC). Initiated in 2012, the iREC survey collects catch and effort information from recreational licence holders on a monthly basis throughout the recreational fishing year[2].

Final estimates are anticipated to be available by the spring of 2018. Estimated harvest in pieces and net weight by regional areas are noted below.

1.1. Harvest

Area	Pieces	Pounds
North Coast	38,151	533,436
Central Coast	2,184	28,229
South Coast	27,792	576,202
Totals	**68,127**	**1,137,867**

Table 1. Estimated Harvest in Pieces and Pounds by Regional Area

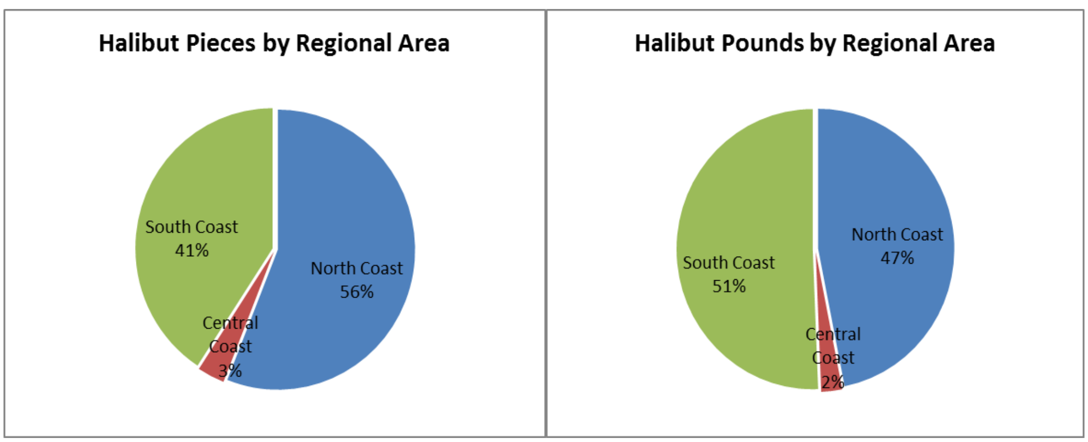

Figure 1. Percentage of Halibut harvested by piece and weight by Regional Area

[1] Pounds in this document refer to net weight (head off, dressed) pounds. See Biological Sampling section for the equations used to convert round weight (head on, undressed) and fork length to net weight.
[2] For more information on the Internet Recreational Effort and Catch (iREC) Survey please visit the following internet site; http://www.dfo-mpo.gc.ca/csas-sccs/publications/sar-as/2015/2015_059-eng.html.

1.2. Biological Samples

A coast wide total of 21,414 halibut were biologically sampled for either length or weight in 2017, representing 31% of the estimated harvest. The number of biological samples collected by regional areas is noted below.

Area	Samples
North Coast	17,233
Central Coast	2,132
South Coast	2,049
Totals	**21,414**

Table 2. Number of Halibut Biologically Sampled by Regional Area

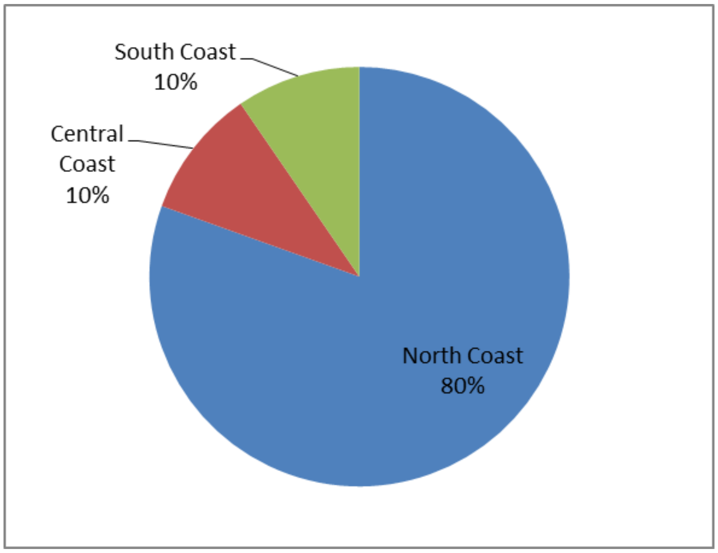

Figure 2. Proportion of Halibut size samples taken from each regional area.

1.3. Fishery Logistics

Catch monitoring of the recreational fishery in BC is extremely challenging given the large geographic area (numerous remote areas), the diversity of fishing opportunities and the diversity of participants.

Starting in 2015, Tidal Waters Sport Fishing Licences included Conditions of Licence that make catch reporting mandatory. Specifically, the conditions state that "*The licence holder shall provide accurate information regarding their catch and fishing activities upon request of a Creel Surveyor or an on-line surveyor, authorities designated under s.61(5) of the Fisheries Act".* Conditions of Licence also included regulations related to possession limits, size limits and an annual limit.

In response to the IPHC's 2012 request for data collection programs on recreational discards, Fisheries and Oceans Canada reviewed its existing recreational halibut catch and release information and examined options for the estimation of release mortalities. DFO obtains information from anglers on the number of halibut releases through creel surveys, logbooks and internet surveys. In BC, anglers are not required to keep any records of released Halibut. Fishers are not required to record sizes of released Halibut in part because Such a practice may increase release mortality and present challenges in terms of angler safety, and provide data of variable quality.. Size limits and angler preference are some reasons why released halibut may be a different average size compared to the average size of retained fish. Given these various limitations of the information available, DFO does not currently use recreational release data for the purposes of recreational halibut management or allocation decisions.

DFO estimates recreational fishery discard mortality based on the ratio of recreational halibut discard mortality to landed catch in adjacent management areas. The current ratio is 3.6%. Applying this ratio to the 2017 landed catch results in an estimate of 40,963 pounds. This discard mortality is accounted for before the 2B recreational catch limit is established and thus is not included in the calculation of catch relative to the recreational catch limit described elsewhere in this report.

DFO continues to work with the recreational fishery sector in BC to improve recreational fishery monitoring and catch reporting. While the focus remains on strengthening data collection and monitoring for retained catch in recreational fisheries, new reporting tools such as the iREC survey of recreational harvesters include questions about anglers' releases. As the survey continues to be refined and improved, DFO will be exploring how the data gathered on releases may be used to inform management.

2. MANAGEMENT, MONITORING and POLICY DEVELOPMENT

2.1. 2017 Recreational Fishery Management Plan

The current domestic sharing arrangement between commercial and recreational fisheries is 85% of the resource allocated to the commercial sector and 15% to the recreational sector, after accounting for First Nations' Food, Social, and Ceremonial requirements. The 15% recreational share in 2017 equates to a total allowable catch of 1,118,029 pounds.

The recreational halibut fishery opened on February 1.The management measures included:

- A maximum length of 133 cm (approx. 52 inches)
- A daily limit of one and a possession limit of two, only one of which may be greater than 83cm (35 inches) was implemented on Feb 1, 2017 and remained in effect for the rest of the season.
- An annual limit of six (6), to be recorded on the Tidal Waters Licence.
- All halibut retained must be recorded on the Tidal Waters Licence plus the area from which each halibut is caught and its length
- A mandatory Condition of Licence to report catch when surveyed.

The opening was for all Pacific Fishery Management Areas (PFMAs) with the exception of portions of Area 121. Anglers were not permitted to fish for nor retain halibut in Area 121 outside the twelve nautical mile limit and in the waters of Swiftsure Bank.

DFO and the Halibut Sub-committee of the Sport Fishing Advisory Board (SFAB) reviewed in-season catch estimates on a monthly basis. By the end of August, it was determined that the estimated harvest to date plus the forecasted catch to the end of September 6 would likely exceed the 1,118,029 pound Total Allowable Catch. On September 4, DFO announced the fishery would close as of September 6, 2017.

For 2018, the SFAB is considering various management options they may recommend to DFO. These options include considering changes to:

- Minimum and Maximum size limits
- Individual annual limits
- Daily and total possession limits
- Season length
- Time and area closures

2.2. Halibut Experimental Recreational Fishery Program

In 2011, the Department piloted an experimental fishery program where interested recreational stakeholders, such as individual recreational harvesters, lodges, charters, guides or marinas, could request an experimental licence that would allow them to lease quota from commercial harvesters through a market based transfer mechanism. The experimental licence permits licence holders to fish halibut beyond the limits and times of the regular recreational licence.

In 2012, the Minister of Fisheries and Oceans Canada confirmed that the experimental licence would continue to be available and announced the Department was moving forward with a regulatory proposal to continue the experimental fishery for the long term.

This year, the experimental fishery commenced April 1 and remained open until December 31, 2017. For the 2017 season, 11,287 pounds of halibut quota was transferred from the commercial sector to experimental licence holders, of which 5,942 pounds of halibut was caught.

3. RECREATIONAL CATCH MONITORING and REPORTING PROGRAMS

3.1. Background

Marine creel surveys in BC began in 1980. Originally developed to estimate the catch of chinook and coho salmon in the Strait of Georgia, the geographical scope expanded to include Barkley Sound and Alberni Inlet in 1984, the entire West Coast of Vancouver Island (WCVI) in 1991, Haida Gwaii and the rest of the North Coast in 1995, and most recently Johnstone Strait in 1998. The objectives of the creel survey have been expanded to include estimates for most recreationally caught finfish, including halibut. In 2016, creel programs were implemented in peak fishing times and areas with specific emphasis on halibut and chinook fishing activities.

Lodges operating along the coast provide census data to the Department through the logbook program, manifest data or the electronic log (elog) pilot program. The Department also receives data from some independent guides and avid anglers via logbook programs. These data are combined with the creel survey data to produce estimates of catch for each PFMA by month where traditional monitoring and reporting programs exist.

To address monitoring gaps in the recreational fishery the Department has been using and enhancing an online survey since 2012. The Internet Recreational Effort and Catch (iREC) survey was peer reviewed by the Canadian Scientific Advisory Secretariat (CSAS) in 2015. The iREC survey was developed to provide catch and effort estimates for all areas, months, fishing methods, and species harvested by the recreational sector. To minimize the effect of potential biases in iREC survey estimates, a calibration procedure was developed to relate iREC survey estimates and creel survey estimates in areas and times not covered by a creel survey.

3.2. 2016 Recreational Fishery Catch Monitoring

DFO has been working with the Sport Fishing Advisory Board on an implementation plan to strengthen recreational fishery monitoring and catch reporting in the Pacific Region. For the 2017 recreational halibut fishery, DFO used estimates from three sources; the iREC survey, logbook and lodge manifest program, and creel surveys.

As in previous years, traditional monitoring and catch reporting programs such as logbook, lodge manifest and the creel survey were used during peak months and areas of the recreational fishery. In areas and months where traditional programs were not implemented in 2017, DFO used the average iREC survey bias corrected catch estimates from the most recent years for which these estimates were available at the beginning of the season (the 2013, 2014 and 2015 surveys). Catch estimates in these areas and months will be updated with 2017 survey results when bias corrected estimates became available in the summer.

3.3. Haida Gwaii

Haida Gwaii recreational monitoring and reporting programs include a lodge logbook program and a creel survey. Lodge logbook data accounts for approximately 85% of the estimated halibut catch in Areas 1 and 2.

The Haida Gwaii Creel Survey (HGCS) estimates recreational catch from Areas 1 and 2 surrounding Haida Gwaii. Since 1995, the program has conducted creel surveys to estimate catch from recreational anglers in Masset Inlet, Naden Harbour, Langara Island, Skidegate Channel, Cartwright Sound and Rennell Sound. Fish caught in Haida Gwaii by recreational harvesters are also subject to random audits by the Haida Watchmen (Guardians) through the HGCS, which operates in the main fishing months in Area 1 and parts of Area 2.

Information collected from the creel survey is combined with data submitted through the lodge logbook program to generate total catch estimates for Areas 1 and 2. In 2017, 16,223 halibut were sampled for either length or weight.

3.4. North Coast Creel Survey

The North Coast Creel Survey program collects catch information from the recreational fishery surrounding Prince Rupert and Port Edward on the North Coast of B.C. It is focused in Areas 3 and 4, comprising the waters of Chatham Sound between the mouths of the Nass and Skeena Rivers. Chatham Sound is bordered by the Alaska/BC border to the north, Dundas and Stephens Island groups to the west and Porcher Island to the south, covering an area of approximately 4,200 km^2.

The North Coast Creel Survey program has a hybrid design with four components: an access point angler interview survey, an aerial effort count survey, a trailer census and a fishing lodge logbook program. The study design is similar to the one used in the South Coast Creel Survey.

Access point angler interview surveys collect catch information, angling activity times and biological samples of selected species from anglers at the completion of the fishing trip. The data is used to calculate species specific Catch per Unit Effort (CPUE) values and create angler activity profiles. Aerial surveys are conducted to capture the ‘instantaneous’ counts of the number of boats fishing at the time of the flight and are expanded using the angler effort profiles generated from the ground surveys to produce an estimate of total daily effort. Lodges in the area submit logbooks to DFO post-season. Lodge data is treated as a complete census of catch, is summed and added to the creel estimates to get an estimate of total catch. To prevent bias in the effort estimates from lodge boats counted during the aerial surveys, a temporal-spatial analysis is conducted of lodge logbook data for days when the overflight occurs and any boats that were fishing in the survey area during the time of the flight are removed from the final count of boats fishing in the area.

In 2017, 1,010 halibut were sampled for either length or weight.

3.5. Central Coast

Catch information in Areas 7, 8 and 9 on the Central Coast is collected from lodges and some charter operators operating in these areas, primarily through the logbook program. Most lodges participate in the logbook program and collect catch, effort and biological data that are submitted to the Department on a monthly basis. There is no creel program to estimate the number of halibut caught by independent anglers or guides in these areas due to challenges with implementing a survey in this remote and geographically dispersed fishery.

This year 17 lodges participated in the halibut logbook and biological sampling project. The three main objectives of the project are to collect logbook and halibut weight data, to check the scales at the lodges for make, model and accuracy, and to verify the weights being recorded in the logbooks. In 2017, 2,132 biological samples were reported.

3.6. South Coast Creel Survey

In the southern waters of BC creel surveys are the main tool to estimate catch of halibut. Surveys are conducted in select fishery strata based on: the highest catch of halibut and chinook, the highest effort, in-season management requirements, and potential impact on stocks of concern. Creel surveys consist of effort surveys and estimation of catch per boat trip based on fishery observers at selected ramps and marinas.

Data collected during angler interviews are recorded in the South Coast Marine Creel Survey form and provide average catch per unit effort by species and fishing times, while aerial counts from chartered aircraft capture ‘instantaneous’ counts of the number of recreational boats fishing on randomly selected dates. Fishing times obtained from angler interviews are used to generate daily fishing activity profiles which are used to expand the ‘instantaneous’ aerial counts to estimate the number of boats fishing each day. The estimate of boats fishing is multiplied by the average catch to estimate the total number of halibut caught each day. Estimates are generated monthly, or occasionally for two week periods where samples rates are high. The estimates are stratified by weekend and holidays vs. weekday dates. In addition, logbook catch data submitted by remote fishing lodges, independent guides and expert anglers are incorporated into creel estimates post season. The survey in Kyuquot Sound (PFMA's 26, 126) is entirely logbook-based, as fishing from lodges represents essentially all recreational effort in this remote area; in 2017 estimates were improved through use of iREC survey information on the proportion of guided to unguided trips.

Catch and effort is estimated by creel sub-area and rolled up to DFO PFMAs by month. South Coast waters include PFMAs11 through 29. The Port Hardy survey also collects information from recreational fishing trips in Area 10.

Creel surveys are active during the peak season of recreational angling and vary in duration depending on location. The spatial and temporal coverage of the survey program can vary year to year in response to budget and fishery priorities. In 2017 surveys were conducted in months outlined in Tables 3 and 4 below.

Table 3. South Coast surveys in inside waters (Johnstone and Georgia and Juan de Fuca Straits)

Location	**PFMAs**	**Duration**
Port Hardy	11, 12	Jun. – Aug.
Campbell River	13, 14	Jun.- Sep.*
Sunshine Coast	15, 16	Jun. – Sep.*
Nanaimo	17, 18	Jun. - Sep.*
Victoria	19, 20	Mar. - Sep.
Vancouver	28, 29	Jun. – Sep.*

Note:
*coverage may be incomplete during these months

Table 4. South Coast surveys in outside waters (West Coast of Vancouver Island)

Location	PFMAs	Duration
Port Renfrew	20, 21, 121	Jun. – Sep.
Barkley Sound	123	Jun. – Sep.
Port Alberni	23	Jun. – Sep.
Tofino	124, 123	Jul. – Sep.
Tahisis/Nootka	25, 125	Jul. – Sep.
Kyuquot	26, 126	Jun. – Aug.
Winter Harbour	27, 127	Jul.– Aug.

For further details on the methodology and results of the South Coast Creel survey, including catch and effort estimates with level of uncertainty, please visit:

http://www-ops2.pac.dfo-mpo.gc.ca/xnet/content/salmon/sc%20stad/bulletins.htm

In 2017, 2,049 halibut were sampled for length or weights during the South Coast Creel survey interviews.

3.7. Biological Sampling

A total of 21,414 halibut were sampled for lengths or weights, representing 31% of the total estimated coastwide harvest. Samples were collected from lodges, guides and independent anglers interviewed at access points and converted to net weight, head off and dressed, using the following formulas developed by the IPHC:

$$\text{Net Weight} = \text{Fork Length (cm)}^{3.24} \times (6.921 \times 10^{-6})$$
$$\text{Net Weight} = \text{Round Weight} \times 0.75$$

Average net weights were calculated for each Area on a monthly basis to generate estimates of total net weight by month and area caught in the fishery.

4. DATA

The following tables provide detailed catch and biological information collected during the 2016 recreational halibut fishery in BC.   Note: these figures are preliminary and subject to change.

Table 5. Summary of the 2017 Recreational Halibut Catch by Pacific Fishery Management Area (PFMA)

Regional Area	DFO PFMA	Est. Halibut Piece Count	Est. Halibut Total Net Wt. (lbs)
North Coast	1	13,350	154,301
	2	6,150	94,459
	3	6,075	94,767
	4	9,485	144,168
	5/6	3,091	45,741
Central Coast	7/8/9	2,184	28,229
South Coast	10/11	1,620	34,832
	12	1,614	23,548
	13/14	1,088	13,534
	15-18/28/29	608	7,846
	19	3,118	91,139
	20	768	16,646
	21/121	4,981	90,741
	23/123	5,003	83,766
	24/124	1,115	28,694
	25/125	2,857	61,746
	26/126	3,296	82,333
	27/127	1,724	41,377
	Total Landed in Canada	68,127	1,137,867
		Rec TAC (15% of total CDN)	1,118,029
		Balance (net wt lbs).	-19,838

Table 6. Recreational Halibut Monthly Catch Estimates (net wt. lbs) for 2015, 2016 and 2017

Month	Net Weight (lbs)			Cumulative Net Weight (lbs)		
	2015	2016	2017	2015	2016	2017
Feb	8,082	2,880	17,199	919	2,880	17,199
March	18,389	30,615	17,868	10,353	33,495	35,068
April	47,765	22,213	16,985	25,598	55,708	52,053
May	22,768	53,720	62,654	70,451	109,428	114,706
June	211,587	241,328	273,084	265,534	350,756	387,790
July	337,436	358,114	437,991	580,609	708,870	825,782
Aug	302,395	254,620	285,783	878,048	963,490	1,111,565
Sept	23,795	97,213	26,302	908,212	1,060,703	1,137,867
Oct	4,782	23,064	0	910,432	1,083,767	1,137,867
Nov	3,833	10,603	0	911,946	1,094,371	1,137,867
Dec	3,833	1,091	0	913,461	1,095,461	1,137,867
Total	980,832	1,095,461	1,137,867			
Recreational Allocation (15% of Canadian TAC)						1,118,029
Estimated Total Catch						1,137,867
Balance (net wt lbs)						-19,838

Table 7. 2017 Estimated Halibut Catch in Pieces by Area and Month

PFMA		Feb	March	April	May	June	July	August	Sep (1-6)	Oct	Nov	Dec	Total
1		0	0	0	300	3,700	5,100	3,800	450	0	0	0	13,350
2		0	0	0	400	1,850	2,000	1,800	100	0	0	0	6,150
3		0	0	9	57	1,440	2,788	1,753	28	0	0	0	6,075
4		0	215	68	452	3,193	3,775	1,657	124	0	0	0	9,485
5/6		0	11	29	229	771	907	1,091	53	0	0	0	3,091
7/8/9		0	0	0	65	309	894	895	21	0	0	0	2,184
10/11		142	0	5	67	491	600	243	72	0	0	0	1,620
12		0	26	185	375	354	330	230	114	0	0	0	1,614
13/14		88	83	16	159	128	75	516	23	0	0	0	1,088
15-18/28/29		0	354	13	169	0	0	67	5	0	0	0	608
19		469	138	324	409	900	257	472	149	0	0	0	3,118
20		14	12	56	15	314	222	135	0	0	0	0	768
21/121		4	150	89	357	377	3,303	676	24	0	0	0	4,981
23/123		0	8	65	345	568	2,510	1,503	4	0	0	0	5,003
24/124		7	20	14	138	324	340	197	74	0	0	0	1,115
25/125		0	4	21	82	739	1,086	806	118	0	0	0	2,857
26/126		0	11	0	37	566	1,594	1,039	50	0	0	0	3,296
27/127		7	0	0	75	408	735	465	34	0	0	0	1,724
2017	**Monthly**	**733**	**1,032**	**895**	**3,731**	**16,432**	**26,516**	**17,344**	**1,443**	**0**	**0**	**0**	**68,127**
Totals	**Cum.**	**733**	**1,765**	**2,660**	**6,391**	**22,824**	**49,339**	**66,684**	**68,127**	**68,127**	**68,127**	**68,127**	

Note:
Estimates in shaded cells are three year (2013-15) averages of iREC survey bias corrected estimates for those month-areas.

1.

Table 8: 2017 Average Net Weight Estimates by Area and Month

PFMA	Feburary	March	April	May	June	July	August	Sept	Oct	Nov	Dec
1	13	13	13	14	11	11	12	14	11	11	11
2	16	16	16	16	16	15	15	15	15	15	15
3	16	16	16	16	16	16	16	16	16	16	16
4	15	15	15	15	15	15	15	15	15	15	15
5/6	14	14	14	14	14	15	15	15	15	15	15
7/8/9	14	14	14	17	11	15	15	19	15	15	15
10/11	13	13	13	13	13	13	11	19	15	15	15
12	13	13	13	13	13	12	13	12	12	12	12
13/14	21	21	21	19	23	20	22	21	21	21	21
15-18/28/29	12	12	12	9	15	18	20	19	19	19	19
19	13	13	13	13	13	12	12	12	12	12	12
20	13	13	13	13	13	12	12	12	12	12	12
21/121	26	27	26	33	30	32	31	25	28	28	28
23/123	20	20	19	23	17	29	23	26	26	26	26
24/124	23	23	23	16	30	17	17	17	17	17	17
25/125	16	16	16	16	16	16	18	17	17	17	17
26/126	26	26	26	26	26	29	19	24	24	24	24
27/127	15	15	15	15	15	23	26	25	25	25	25

Table 9. 2017 Estimated Halibut Catch in Net Weight (lbs) by Area and Month

PFMA		Feburary	March	April	May	June	July	August	Sept	Oct	Nov	Dec	Total
1		0	0	0	4,118	41,903	57,375	44,460	6,446	0	0	0	154,301
2		0	0	0	6,210	28,721	30,900	27,135	1,493	0	0	0	94,459
3		0	0	139	887	22,464	43,493	27,347	438	0	0	0	94,767
4		0	3,275	1,038	6,876	48,534	57,380	25,186	1,879	0	0	0	144,168
5/6		0	150	411	3,205	10,794	13,792	16,576	813	0	0	0	45,741
7/8/9		0	0	0	878	3,773	11,835	11,377	366	0	0	0	28,229
10/11		2,991	0	107	1,237	11,511	12,183	5,288	1,514	0	0	0	34,832
12		0	303	2,190	3,320	5,239	5,871	4,496	2,130	0	0	0	23,548
13/14		1,152	1,080	203	2,072	1,668	935	6,139	285	0	0	0	13,534
15-18/28/29		0	4,610	175	2,205	0	0	799	58	0	0	0	7,846
19		12,368	3,674	8,446	13,303	26,738	8,259	14,667	3,684	0	0	0	91,139
20		278	236	1,083	338	5,269	6,364	3,078	0	0	0	0	16,646
21/121		105	3,507	1,447	5,784	11,461	56,471	11,557	410	0	0	0	90,741
23/123		0	137	1,048	5,597	9,210	40,659	27,046	68	0	0	0	83,766
24/124		187	516	377	3,649	8,541	9,954	3,684	1,785	0	0	0	28,694
25/125		0	66	321	1,237	11,190	25,212	20,823	2,898	0	0	0	61,746
26/126		0	315	0	1,049	16,220	39,017	24,538	1,196	0	0	0	82,333
27/127		118	0	0	691	9,849	18,294	11,588	837	0	0	0	41,377
2017	**Monthly**	**17,199**	**17,868**	**16,985**	**62,654**	**273,084**	**437,991**	**285,783**	**26,302**	**0**	**0**	**0**	**1,137,867**
Totals	**Cum.**	**17,199**	**35,068**	**52,053**	**114,706**	**387,790**	**825,782**	**1,111,565**	**1,137,867**	**1,137,867**	**1,137,867**	**1,137,867**	

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Fisheries and Oceans Canada Pêches et Océans Canada

CANADIAN REPORT

TO THE

INTERNATIONAL PACIFIC HALIBUT COMMISSION

ON

2017 HALIBUT FISHERY ENFORCEMENT ACTIVITIES

COMPLIANCE ISSUES AND STRATEGIES

Overview

Fisheries and Oceans Canada (DFO) is a natural resource management organization with an infrastructure necessary to support professional law enforcement activities. The enforcement policies and activities of DFO with respect to regulatory compliance of aboriginal, commercial and recreational fisheries, is the responsibility of the Conservation and Protection (C&P) program. The program is delivered through a three pillar enforcement approach which includes:

- Promotion of compliance through education and shared stewardship;
- Monitoring, control and surveillance activities; and,
- Management of major cases/special investigations in relation to complex compliance issues.

C & P, Pacific Region, is responsible for providing monitoring, control and surveillance activity along a coastline of 27,000 kilometers extending from the southern tip of Vancouver Island to northern British Columbia and the Yukon Territory.

Management of the groundfish fisheries off the west coast of Canada is described within the Groundfish Integrated Fishery Management Plan (IFMP). The IFMP is not enforceable; rather, fishery officers rely on conditions of licence, variation orders and acts and regulations for enforcement purposes.

There are approximately 142 fishery officers in the Pacific Region, the majority of which are located within four distinct operational Areas and the Aquaculture Enforcement unit. These areas/units are supported by the National Fisheries Intelligence Service.

More information about DFO Compliance and Enforcement is available at the following website: http://www.dfo-mpo.gc.ca/fm-gp/enf-loi/index-eng.htm

Sanctions and Deterrence

DFO's C&P program pursues violations of fisheries legislation and regulations in three ways.

1. For violations that are considered minor, an officer may issue warning letters or tickets that will form part of the fisher's compliance history and will be considered when investigating future occurrences.

2. Restorative Justice (RJ), a community based approach, may be used as an alternative measure to the court process for people faced with fisheries offences and conflict in an inclusive and meaningful way.

3. Finally, serious or repeat offenders are dealt with through the provincial and federal courts where sentencing may include significant fines, prohibitions, licence suspensions and jail time.

MONITORING, CONTROL AND SURVEILLANCE

National Aerial Surveillance Program in Pacific Region

C &P operates a coastal air surveillance program utilising a specially configured aircraft with a fishery officer on board all flights. Close monitoring of the halibut fleet for compliance with hail-out, use of seabird avoidance gear, and area closures such as Rockfish Conservation Areas is an integral element of all patrols. Patrol coverage also monitors vessel activity within Canada's Exclusive Economic Zone. Air surveillance resources are utilized weekly throughout the year subject to weather conditions and conflicting requirements.

Information collected on the flights is available to fishery officers via an internet-based flight information system.

Fisheries Patrol Vessels

Inshore and near shore patrols are conducted by fishery officers using program vessels, which are primarily rigid hull inflatable boats, 7.33, 7.53, 8.5 and 10 metres in length.

Marine Patrol Program

There are two Canadian Coast Guard (CCG) mid-shore patrol vessels (MSPV) based in the southern and northern patrol areas. Each of the ships is dedicated to the C&P program and annually conduct 22 patrols each, resulting in between 286 to 309 operational days per year. There are two to three fishery officers on each patrol.

The National Aerial Surveillance Program and the Marine Patrol Program work together to ensure effective and efficient use of C&P assets.

Fisheries Observer Programs

Additionally, certified fisheries observers, both dockside and at-sea, are designated under Section 39. (1) of the *Fishery (General) Regulations* and perform duties related to monitoring of fishing activities, examination and measurement of fishing gear, collection of biological samples, recording of scientific data, monitoring of the landing of fish and verification of the weight and species of fish caught and retained. Fisheries observers are not armed and do not have authority to enforce the law. They perform an observe, record and report function.

In 2017, dockside monitoring program fisheries observers attended 100% of all hailed-in commercial landings in the commercial halibut fishery.

TRANSFORMATION OF THE CONSERVATION AND PROTECTION PROGRAM

C&P continues to develop into a fully integrated, risk-based and intelligence-led program.

National Fisheries Intelligence Service (NFIS) and Major Case Management

In 2017 NFIS continued to develop its intelligence-led program. In the Pacific Region this program will improve C&P's ability to set priorities and make decisions which focus on activities that are most harmful to fisheries and ocean resources.

The application of Major Case Management principles and practices will enable the C&P program to focus its resources on investigations that lead to successful prosecutions and sanctions.

NFIS has developed a national verification program and several fishery officers from across Canada have been trained in the fall of 2017. In 2018 fishery officers will begin verifying that dockside and at-sea fisheries observers are carrying out their duties as required by regulation and national and regional policies and procedures.

This national initiative along with the Marine Patrol Program and Aerial Surveillance Program round out C&P's commitment to improved compliance monitoring and enforcement.

HALIBUT ENFORCEMENT OVERVIEW

Fisheries observers and electronic monitoring (EM) systems perform a key role in observing and documenting fishing-related occurrences. Fishery officers have access to EM and observer data for enforcement purposes.

Fishery officers conduct inspections both dockside and at sea for compliance with licence conditions. Directed enforcement effort on the Halibut fishery is dependent on work load and the priorities identified by the respective C&P Area Chiefs.

The hook and line halibut fishery has 100% monitoring through the use of sophisticated GPS and video imaging equipment, logbooks and dockside observers. This along with significant court sanctioned penalties has resulted in a high rate of compliance.

Licence Categories

A Commercial Halibut category 'L' or Communal Commercial Halibut category 'FL' licence is required to participate in the directed commercial Pacific Halibut fishery.

Category 'L' Halibut eligibilities are limited entry and vessel-based. Category 'FL' eligibilities are party-based; an indigenous group or organization is the licence eligibility holder and the eligibility must be designated to a commercially registered fishing vessel.

Vessels are permitted to conduct combined Halibut ‘L’ or ‘FL’ and Sablefish ‘K’ or ‘FK’ trips. These vessels are required to identify their intentions at the time of hail-out.

HALIBUT COMPLIANCE AND ENFORCEMENT - COMMERCIAL HALIBUT SUMMARY 2017

2017 Halibut Fishery

The 2017 commercial halibut fishery commenced 12:00 hours local time, March 11, 2017 and closed at 12:00 hours local time, November 7, 2017. A total of 167 vessels and 557 fishing trips were recorded during the 2017 commercial halibut fishing season.

Compliance and Enforcement Priorities - 2017

Groundfish, including commercial halibut, enforcement priorities for 2017 were identified in the Groundfish Integrated Fisheries Management Plan and by the Groundfish Enforcement Coordinator as follows:

- Investigate occurrences of closed area fishing such as Rockfish Conservation Areas (RCAs), sponge and coral reef marine protection areas, and marine conservation areas.
- Continue to enforce compliance with hail-out, hail-in and other elements of the Dockside Monitoring Program (DMP) and At-Sea Observer Program (ASOP).
- Investigate occurrences where groundfish is caught, retained or possessed without the authority of a licence. Priority will be placed on retention of groundfish for the purpose of sale.
- Enforce compliance with conditions of licence for dual fishing, where dual fishing is defined as ‘fishing for and retaining groundfish under the authority of a Commercial Groundfish Licence and a Communal Food, Social, Ceremonial (FSC) Groundfish Licence during the same fishing trip’.

- Enforce compliance with the electronic monitoring (EM) conditions of licence, especially time gap occurrences.
- Investigate false and misleading information provided to dockside observers.
- Investigate allegations of dockside observers not carrying out their duties.

HALIBUT COMPLIANCE AND ENFORCEMENT - OCCURRENCE SUMMARY 2017

Occurrences

Occurrences are reported or observed incidents which are potential violations of any Act or Regulation which falls under the mandate of a Canadian fishery officer.

Table 1: ***Commercial Halibut Fishery*** *Occurrences - January 1, 2017 to December 15, 2017*[1]

Occurrence Type (not all are found to be violations)	**Number of Occurrences**
Dual fishing	27
Area/Time (closed area)	6
Illegal Buy/Sell/Possess	4
Gear Illegal/Used Illegally	3
Partial Offload – Not Authorized	1
Registration / Licence	9
Prohibited Species	3
Release Rockfish	13
Reporting	1
Species/Size Limit	1
Total	**68**

[1] Source: DFO *Departmental Violations System (DVS) and Archipelago Marine Research Ltd. Portal for Clients*

Table 2: ***Recreational Halibut Fishery*** *Occurrences - January 1, 2017 to December 15, 2017*[2]

Occurrence Type	**Number of Occurrences**
Reporting	9
Quota/Bag Limits	12
Gear-Illegal/Used Illegally	1
Area/Time	4
Species/Size Limit	5
Registration/Licence	4
Illegal Buy/Sell/Possess	9
Illegal Transportation	2
Total	**46**

Table 3: ***Aboriginal Halibut Fishery*** *Occurrences - January 1, 2017 to December 15, 2017*[3]

Occurrence Type	**Number Of Occurrences**
Illegal Buy/Sell/Possession	24
Registration/Licence	4
Area/Time	2
Species/Size Limit	1
Total	**31**

[2] Source: DFO *Departmental Violations System (DVS)*
[3] Source: DFO *Departmental Violations System (DVS)*

HALIBUT COMPLIANCE AND ENFORCEMENT - FISHERY OFFICER ENFORCEMENT EFFORT SUMMARY 2015/2016/2017

Table 4: *2015, 2016, 2017, C&P Fishery Officer Groundfish enforcement hours for aboriginal, commercial, and recreational Halibut fisheries and recreational hours comparing halibut to finfish and salmon in tidal waters*[4]

ENFORCEMENT ACTIVITY – Comparison of years 2015, 2016 and 2017 (January 1, 2017 to December 15, 2017)						
HALIBUT DEDICATED HOURS and % of TOTAL ENFORCEMENT EFFORT FOR PACIFIC REGION						
	2015	**2015**	**2016**	**2016**	**2017**	**2017**
FISHERY TYPE	**HOURS**	**% TOTAL ENF. EFFORT**	**HOURS**	**% TOTAL ENF. EFFORT**	**HOURS**	**% TOTAL ENF. EFFORT**
ABORIGINAL HALIBUT	717.25	1%	481.25	1%	427.5	0.6%
COMMERCIAL HALIBUT	1845	2%	1297.5	1%	592.25	0.8%
RECREATIONAL HALIBUT	705.5	1%	445	0%	500.5	0.7%
TOTAL	**3267.50**	**4%**	**2223.75**	**2%**	**1520.5**	**2%**
RECREATIONAL HOURS and % of TOTAL ENFORCEMENT EFFORT FOR PACIFIC REGION						
RECREATIONAL HALIBUT	705.25	1%	445	0%	500.5	0.65%
RECREATIONAL FINFISH – TIDAL WATERS	1713.25	1%	1082.25	1%	1366.25	1.77%
RECREATIONAL SALMON – TIDAL WATERS	6707.50	3%	5607.5	6%	5025.5	6.5%
TOTAL	**9126.00**	**5%**	**7134.75**	**7%**	**6892.25**	**8.92%**

NOTE: The recreational patrols are typically conducted on a "multi species" or "multi fishery" basis with the predominant effort in recreational tidal directed toward salmon and other finfish as the primary purpose. Halibut checks are conducted on these multi-species/multi fishery trips so the effort identified as

[4] Source: DFO *Fisheries Enforcement Activity Tracking System (FEATS)*

specific to “Rec. Salmon Tidal” and “Rec. Finfish Tidal” (typically Rockfish species) are included as they are relevant to understand the totality of fishery officer enforcement efforts toward recreational halibut compliance.

HALIBUT COMPLIANCE AND ENFORCEMENT - AERIAL SURVEILLANCE PATROL SUMMARY 2014/2015

Table 5: *2017, 2016, 2015 C&P Aerial Surveillance Patrols – number of missions, total hours spent flying, and number of halibut vessels viewed during missions*[5]

AERIAL SURVEILLANCE PROGRAM (ASP) ACTIVITY			
Air Patrols	***Missions***	***Hours***	***Total Halibut Vessels Recorded Per Year***
January 1, 2017 – December 15, 2017	166	879.49	500 (461 L, 39 FL)
January 1, 2016 – December 15, 2016	154	876.04	388 (338 L, 50 FL).
January 1 - December 15, 2015	160	973.56	402 (360 L, 42 FL)

L = commercial halibut licence FL= communal commercial halibut licence

HALIBUT COMPLIANCE AND ENFORCEMENT – VIOLATION SUMMARY 2013/2014/2015

Table 6: *2014, 2015, 2016 and 2017 Violations for Aboriginal, Commercial and Recreational Halibut – Charges Laid, Charges Pending/Under Review, and Ticket/Warning Issued*[6]

PACIFIC/PACIFIQUE REGION

VIOLATIONS	2014	2015	2016	2017	GRAND TOTAL
ABORIGINAL GROUNDFISH – HALIBUT	**23**	**12**	**6**	**14**	**55**
CHARGES LAID	1				1
CHARGES PENDING/UNDER REVIEW		5	4	13	22
TICKET ISSUED		1			1

[5] Source: Provincial Aerospace Limited - Surveillance Information System (SIS)
[6] Source: DFO Departmental Violations System (DVS)

WARNING ISSUED		5		1	6
COMMERCIAL GROUNDFISH - HALIBUT	**38**	**44**	**27**	**25**	**125**
CHARGES LAID	1		1		2
CHARGES PENDING/UNDER REVIEW	15	14	11	5	45
TICKET ISSUED	1			7	8
WARNING ISSUED	7			13	20
RECREATIONAL GROUNDFISH - HALIBUT	**103**	**78**	**51**	**80**	**446**
CHARGES LAID	11	3	5	8	27
CHARGES PENDING/UNDER REVIEW	2	20	5	10	37
TICKET ISSUED	29	12	20	26	87
WARNING ISSUED	55	42	21	36	154
GRAND TOTAL	**164**	**134**	**84**	**119**	**626**

[6] Source: DFO Departmental Violations System (DVS)

SIGNIFICANT CONVICTIONS:

- **2017** – Closed Area: -Marine Protected Area - $45,000.00
  -Rockfish Conservation Area - $25,000.00

SIGNIFICANT 2017 INVESTIGATIONS:

- Two closed area – Northern Reef Marine Protected Areas and Rockfish Conservation Areas.
- One illegal sales of halibut to seafood businesses – charges laid.
- One unauthorized FSC fishing during dual fishing halibut trip.

Prepared by: *A. Bussell, Groundfish Enforcement Coordinator, DFO Pacific Region, Conservation and Protection, Vancouver, BC 2017-12-19*

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North Pacific Fishery Management Council

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MEMORANDUM

TO: IPHC Commissioners

FROM: Dan Hull, Chairman
David Witherell, Executive Director

DATE: December 21, 2017

RE: Update on Council actions at its December 2017 meeting

At the IPHC Interim meeting, we provided updates on actions related to the Council's Halibut Management Framework, a follow-up from the Joint IPHC/NPFMC meeting in June, and an update on management actions from the June and October meetings. The written report is posted here: https://iphc.int/uploads/pdf/im/2017im/iphc-2017-im093-ar03.pdf This memorandum was prepared to provide updates on recent actions related to halibut fisheries and halibut bycatch, taken by the Council at its December meeting under its management authorities pursuant to the Magnuson-Stevens Act and the Halibut Act.

Groundfish Harvest Specifications

The Council approved harvest specification for the 2018 and 2019 groundfish fisheries in the Gulf of Alaska and Bering Sea/Aleutian Islands areas. One of the biggest changes this year was an 80% reduction in the overall catch limit (including state waters) for Pacific cod in the Gulf of Alaska due to a drastic decline in the stock. Scientific information suggests that this decline is the result of an unusually warm mass of water (the 'blob') that persisted from 2014 through 2016. The warm water increased the metabolism of cod while reducing available food, resulting in poor body condition and increased mortality. The warm water also impacted cod egg production and larval survival, greatly reducing recruitment during these years. The lower number of adult and juvenile cod will affect the population and fishery for several years to come. This reduction will negatively impact a large number of trawl and fixed gear fishermen, as well as fishing communities of the Western and Central GOA.

A reduction in the Pacific cod catch limit potentially frees up halibut PSC to be used in other fisheries. To balance the interests of trawl fishermen and the fishing community of Kodiak, with the interests of halibut fishermen and halibut conservation, the Council increased the catch limits slightly for arrowtooth flounder but retained last year's fishery and seasonal apportionments of halibut PSC. This will allow the trawl fishery an opportunity to catch additional arrowtooth to somewhat offset the loss due to Pacific cod, while still operating under restrictive seasonal deep-water species halibut PSC limits. It is anticipated that given these restrictions, some halibut PSC may go unused in 2018.

As part of the groundfish harvest specifications process, the Council also approved halibut discard mortality rates (DMRs) for 2018 and 2019, as listed in the table below.

Gear	Sector	Groundfish fishery	Halibut discard mortality rate (percent)
Pelagic trawl	Catcher vessel	All	100
	Catcher/processor	All	100
Non-pelagic trawl	Catcher vessel	Rockfish Program	62
	Catcher vessel	All others	67
	Mothership and catcher/processor	All	84
Hook-and-line	Catcher/processor	All	10
	Catcher vessel	All	17
Pot	Catcher vessel and catcher/processor	All	7

<u>Halibut charter management measures for Area 2C and 3A</u>

Each year, the Council makes recommendations to the IPHC on management measures for the halibut charter fisheries in Areas 2C and 3A, to keep the halibut mortality attributed to the charter fisheries from exceeding the allocations set forth in the NPFMC Catch Sharing Plan. Under the Catch Sharing Plan, the charter fishery is allocated a percentage of the combined catch limit (15.9% - 18.3% in 2C, and 14.0% - 18.9% in 3A), based on a series of tiers determined by the total combined catch limit.

The Council's Charter Halibut Management committee develops potential management measures for the next year, and these measures are analyzed by ADFG staff. The estimated halibut removals under each combination of management measures (taking into account the most recent season's data on harvest and average size fish) are compared to the catch amounts resulting from the reference spawning potential ratio (SPR) amounts produced at the IPHC interim meeting.

Although the charter allocations are not known when the Council makes its recommendations, the Council bases its recommendations on the allocations determined from the combined commercial-charter catch limits associated with maintaining the IPHC's reference level of SPR as identified in IPHC preliminary catch tables for Areas 2C and 3A. The Council recommendations may also include contingencies to accommodate IPHC adoption of higher or lower combined halibut catch limits.

In December, the Council reviewed the ADF&G analysis of proposed management measures for charter halibut fisheries in Areas 2C and 3A and recommended the following management measures for application in 2018:

<u>Area 2C</u>

- If the charter fishery allocation is 0.69 million pounds: one fish per day with a reverse slot limit U35:O80. No annual limit.
- If the allocation is <u>below</u> 0.69 million pounds: one fish per day with a reverse slot limit U35:O80. Four-fish annual limit, or if necessary to remain within the allocation, three-fish annual limit.
- If the allocation is <u>above</u> 0.69 million pounds: one fish per day with a reverse slot limit. Adjust the lower slot limit as allowed to remain within the allocation, upper slot limit remains O80. No annual limit.

<u>Area 3A</u>

- Status quo measures: two-fish daily bag limit, including one fish of any size and 28-inch maximum size limit on one fish. Four-fish annual limit, one trip per Charter Halibut Permit per day, one trip per vessel per day, Wednesdays closed all year, three Tuesdays closed between July 24 and August 7.

- If the charter fishery allocation is 1.70 million pounds: Status quo measures plus close seven additional Tuesdays as outlined in Table 11 of the ADF&G analysis (June 19 – August 21).
- If the allocation is higher or lower than 1.70 million pounds: increase or decrease Tuesday closures to remain within the allocation, as described in Table 11 in the ADF&G analysis (shown below).

Number of Closed Tuesdays	Beginning and Ending Dates	Percentage reduction in harvest relative to status quo	Projected Harvest (no. Fish)	Projected Removals (Mlb)
3 (Status quo)	Jul 24 - Aug 07	0.0%	136,734	1.855
4	Jul 17 - Aug 07	-1.3%	134,986	1.830
5	Jul 17 - Aug 14	-2.5%	133,298	1.808
6	Jul 10 - Aug 14	-4.1%	131,068	1.777
7	Jul 03 - Aug 14	-5.5%	129,257	1.752
8	Jul 03 - Aug 21	-6.4%	127,977	1.736
9	Jun 26 - Aug 21	-7.6%	126,313	1.712
10	Jun 19 - Aug 21	-8.8%	124,686	1.689
11	Jun 19 - Aug 28	-9.5%	123,794	1.677
12	Jun 12 - Aug 28	-10.4%	122,449	1.659
13	Jun 05 - Aug 28	-11.2%	121,391	1.645
47 (all season)	Feb 01 - Dec 31	-13.2%	118,749	1.608

Charter Halibut Permit (CHP) Management

Annual CHP Trip Limits

The Council chose to take no action at this time on a proposal to establish annual charter halibut permit (CHP) trip limit categories. The proposal was suggested because the amount of effort expended in the fishery is one of the contributing factors to the overall charter halibut harvest. Therefore, increased effort can contribute to increasingly restrictive management measures. The proposal was an attempt to reduce the level of unused and underutilized (latent) capacity in the halibut charter sector, in order to have more control over the level of effort (in terms of trips or angler-trips taken).

However, the analysis, public testimony, and further discussion highlighted that the extent of unused and underutilized CHPs makes it difficult to project and ultimately control the level of effort in the fishery. Most of the other factors that influence the amount of effort in the charter halibut sector (e.g., seasonal tourism trends, ocean and weather days, angler demand, etc.) are outside of the Council's control (expect for annual management measures), and this may impede the use of CHP trip limits as an effective input control.

While concerns were expressed about increasingly restrictive charter halibut management measures, and charter businesses' desire for more stability and personalized choice in responding to the factors influencing management measures, Council members stated this proposed tool might not be responsive to these concerns. Particularly at low levels of halibut biomass, even if the action was successful at "freezing" the level of effort the fishery, management measures could continue to become more restrictive. Thus, participants could have restrictive management measures and have the negative distributional impacts associated with diminished flexibility in the number of halibut trips they take each season.

Council members stated that they believed that the possibility of having more control in levels of effort, would not out-weigh the risks and potential inequities that this action would cause. For instance, the action would not be effective capping effort unless a business that wanted to increase the number of halibut trips it took in a season, could not do so. While this could might produce the benefit of relaxed management measures (relative to what they would have been with increased effort) for all operators, it would have negative distributional impacts on certain charter businesses. In particular, this would affect new entrants that have recently purchased a CHP and have not had time to build up history, those business that may have scaled back or diversified operations due to increasingly restrictive management measures and are now capped at those levels, and businesses that have had unlucky circumstances during a qualification period (e.g., unfavorable ocean and weather conditions, vessel issues, health or family concerns for captain and crew), resulting in less activity than they might have had. Thus, the Council felt the proposed action ran the risk of limiting entry and removing flexibility and business opportunity for some operations, without necessarily being able to provide businesses with stability and more personalized choice in response to the dynamic halibut resource.

RQE Ownership Caps

The Council chose to postpone an action that considered increasing the CHP ownership caps for a future recreational quota entity (an RQE). Current Federal regulations limit individuals and entities from holding more than five CHPs (with some exceptions). The proposed action would allow an RQE to purchase and hold up to 30 percent of the CHPs in each Area 2C and Area 3A. The intent behind this action is to allow the RQE to influence effort in the charter halibut fishery by temporarily removing capacity from the charter fleet (through the purchase of CHPs) and selling it back into use in times of high halibut abundance. The Council chose to postpone this action, stating that the creation of RQEs has not yet been approved by the Secretary of Commerce, let alone having an RQE established or funded in either area. One Council member stated that while some support was expressed for this capability, he felt it unwise to dedicate resources to pursuing this change until it was at least clear that an RQE would be functional.

Self-guided halibut rental boats

The North Pacific Fishery Management Council received public testimony in June requesting that the Council consider ways to address data gaps in self-guided halibut sport fishing in regulatory areas 2C and 3A. Currently, some unknown number of entities are offering opportunities for clients to rent small boats to fish for halibut without a registered guide aboard. This allows the clients to harvest halibut at the unguided limit of two halibut of any size per day, rather than area-specific size and number limits set for guided anglers. Because we are unable to determine the number of entities offering self-guided fishing, or the number of vessels that are available for rent, the impact of these operations is not known.

At the December meeting, the Council identified a purpose and need statement and directed staff to develop a discussion paper further exploring an unguided rental boat registration requirement. The Council took this action in response to a preliminary report that identified concerns that the Council would need to address in order to move forward on consideration of a registry for self-guided halibut rental boats in Alaska. The purpose and need statement identifies that the Council is concerned that differences in regulations between the charter and non-charter sectors may result in increased halibut harvest in the non-charter sector, which may negatively impact other sectors. To address this, the Council intends to establish a registration requirement for vessels affiliated with charter operations, remote lodges, or businesses that require annual saltwater fishing guide licenses, and to estimate halibut catch from this segment of the sector. The discussion paper will provide focused consideration of several components of how to set up a selective registry and to whom it would apply. Registration information will help the Council determine whether additional management measures are necessary for this segment of the fishery.

Response to IPHC Requests

IPHC Proposal IPHC-2017-IM093-PropC3

At the Interim meeting, the IPHC was presented with a proposal from the public to require logbook-style record keeping and reporting requirements for unguided anglers fishing from self-guided rental boats. The IPHC requested that the Council and IPHC staff coordinate on reviewing this proposal, and requested the Council perspective on this issue. Accordingly, the NPFMC Halibut Charter Management Committee scheduled a review of IPHC proposal IPHC-2017-IM093-PropC3 and recommended that the Council not address this proposal until after the 2018 IPHC annual meeting (if necessary). At this point, the Council is moving ahead with development of a registration requirement for self-guided rental boats (as described in the previous section) for collecting catch and effort data from this sector, rather than through individual angler logbooks.

IPHC staff request to revise meeting dates

At the Interim meeting, we were alerted to a possible conflict with meeting dates in 2019 for the December Council meeting (currently scheduled for the week of December 2) and the Interim IPHC meeting (currently scheduled for December 3-4). The IPHC staff requested that the Council consider shifting our dates to accommodate their meeting. In response to this request, the Council has agreed to delay the start of the Council meeting by a day, so that the Council meeting would begin on Thursday December 5. This would potentially allow staff and members of both bodies to fly to Anchorage the evening of the 4^{th} and attend both meetings. To provide additional travel time, the IPHC could also consider shifting the IPHC Interim meeting a day earlier (i.e., December 2 and 3).

IPHC-2018-AM094-AR13
Received: 8 January 2018

Annual Report to the International Pacific Halibut Commission From the Alaska Region, National Marine Fisheries Service January 2018

Section 1: Charter Halibut Fisheries

Harvest under 2017 Annual Management Measures and Proposed Management Measures for 2018 Charter Fisheries in Areas 2C and 3A

The Area 2C and 3A Halibut Catch Sharing Plan was implemented in 2014, and is the method for determining allowable levels of charter halibut harvests in those areas. The Catch Sharing Plan also endorses a process through which the North Pacific Fishery Management Council (Council) recommends annual management measures to the IPHC that are likely to limit charter harvests to their annual catch limits.

In Area 2C, the 20176 charter catch limit was 915,000 pounds (lb), and the fishery was managed under a daily bag limit of one fish that had to be less than 44 inches or greater than 80 inches total length. The preliminary 2017 charter halibut harvest estimate of 921,000 lb is less than 1 percent above the catch limit.

In Area 3A, the 2017 charter catch limit was 1,890,000 lb, and the fishery was managed under a two-fish daily bag limit, with a maximum size limit of 28 inches total length on one fish, a Wednesday closure for the entire season as well as three Tuesday closures in June and July, a 4-fish annual limit, a one-trip per day per charter vessel limit, and a one-trip per day per charter halibut permit limit. A prohibition on halibut harvest by skipper and crew during charter vessel fishing trips was effective in both management areas. The preliminary 2017 charter halibut harvest estimate of 2,093,000 lb indicates that harvest exceeded the catch limit by approximately 10.7 percent.

In December 2017, the Council recommended charter management measures for the 2018 fishery. These management measures are described in the Council's management letter for the 2018 IPHC Annual Meeting.

NMFS supports the Council's recommendations and will continue to provide staff support to the IPHC to implement management measures for the 2018 directed halibut fisheries.

Guided Angler Fish Program - 2017 Summary

In 2014, NMFS implemented the guided angler fish (GAF) program to authorize limited annual transfers of commercial halibut IFQ as GAF to qualified charter halibut permit holders for harvest by charter vessel anglers in Areas 2C and 3A. The GAF program allows qualified charter halibut permit holders to offer charter vessel anglers the opportunity to retain halibut up to the limit for unguided anglers when the charter management measure in place limits charter vessel anglers to a more restrictive harvest limit. In 2017, by using GAF, charter vessel anglers in Area 2C and Area 3A could harvest up to two halibut of any size per day, and GAF were not subject to the annual limit or daily closures in Area 3A. Table 1 summarizes IFQ to GAF transfers for 2014 through 2017. In 2017, approximately 53,000 lb of Area 2C IFQ was transferred as GAF and 43,000 lb was harvested in the charter fishery. This was a slight increase over 2016. In 2017, approximately 9,700 lb of Area 3A IFQ was transferred as GAF and 6,600 lb was harvested in the charter fishery.

Table 1. Summary of IFQ to GAF transfers

Year	IPHC Regulatory Area	Number of Transfers (GAF Permits Issued)	IFQ Pounds Transferred	Number of GAF Transferred	Number of GAF Harvested (% of amount transferred)
2014	2C	92	29,498	1,117	800 (72%)
	3A	19	11,654	910	269 (30%)
	Total	111	41,152	2,027	1,069 (53%)
2015	2C	119	36,934	548	428 (78%)
	3A	25	10,337	269	143 (53%)
	Total	144	47,271	817	571 (70%)
2016	2C	132	47,064	723	529 (73%)
	3A	26	10,442	289	220 (76%)
	Total	158	57,506	1,012	749 (74%)
2017	2C	207	53,206	719	576 (80%)
	3A	22	9,786	233	157 (67%)
	Total	229	62,992	952	733 (77%)

Section 2: Commercial Groundfish Fisheries

Halibut Bycatch Management

Halibut PSC Limits and Use

Halibut bycatch mortality in the Bering Sea and Aleutian Islands (BSAI) and Gulf of Alaska (GOA) groundfish fisheries is highly regulated and closely managed by the Council and NMFS through the Fishery Management Plans (FMPs) for each management area. Through regulations implementing the FMPs, NMFS manages halibut bycatch by (1) establishing annual halibut prohibited species catch (PSC) limits, (2) apportioning PSC limits to fishery categories and seasons to accommodate halibut PSC needs in specific groundfish fisheries, and (3) managing groundfish fisheries to prevent PSC from exceeding the established limits.

The FMPs specify that halibut bycatch in groundfish fisheries is managed as PSC. Catch of PSC species must be avoided while fishing for groundfish and PSC species may not be retained unless required under the FMP. Halibut PSC limits are an apportioned, nonretainable amount of halibut provided to a groundfish fishery to provide an upper limit on the bycatch of halibut in a fishery. **When a halibut PSC limit is reached in an area, further fishing with specific types of gear or modes of operation is prohibited by those types of operations taking halibut PSC in that area.**

Although halibut PSC is taken by vessels using all types of gear (trawl, hook-and-line, pot, and jig gear), halibut PSC primarily occurs in the trawl and hook-and-line (non-trawl) groundfish fisheries. The Council and NMFS annually establish halibut PSC limits for vessels in the trawl and non-trawl groundfish fisheries in the BSAI and GOA. NMFS manages groundfish fisheries to ensure these limits are not exceeded.

The established halibut PSC limits and total estimated halibut PSC use for 2017 are shown in Tables 2 and 3.

Table 2. 2017 BSAI halibut PSC limits and estimated halibut PSC use

BSAI Fishery	Halibut PSC Limit metric tons (mt)	Halibut PSC Use (mt)	Remaining PSC limit (mt and %)
Trawl (Amendment 80 and Trawl Limited Access)	2,490	1,635	855 (34%)
Non-trawl	710	174	536 (75%)
Community Development Quota (trawl and non-trawl)	315	151	164 (52%)
TOTAL	3,515	1,960	1,555 (44%)

Table 3. 2017 GOA halibut PSC limits and estimated halibut PSC use

GOA Fishery	Halibut PSC Limit (mt)	Halibut PSC Use (mt)	Remaining PSC limit (mt and %)
Trawl	1,706	1,215	491 mt (29%)
Non-trawl	257	168	89 mt (34%)
TOTAL	1,963	1,383	580 mt (30%)

As shown in Figures 1-3 below, halibut PSC use has not exceeded established limits in the trawl or non-trawl fisheries in the BSAI or GOA in recent years. Additional information on 2016 and 2017 halibut PSC use is provided in the Appendix to this report.

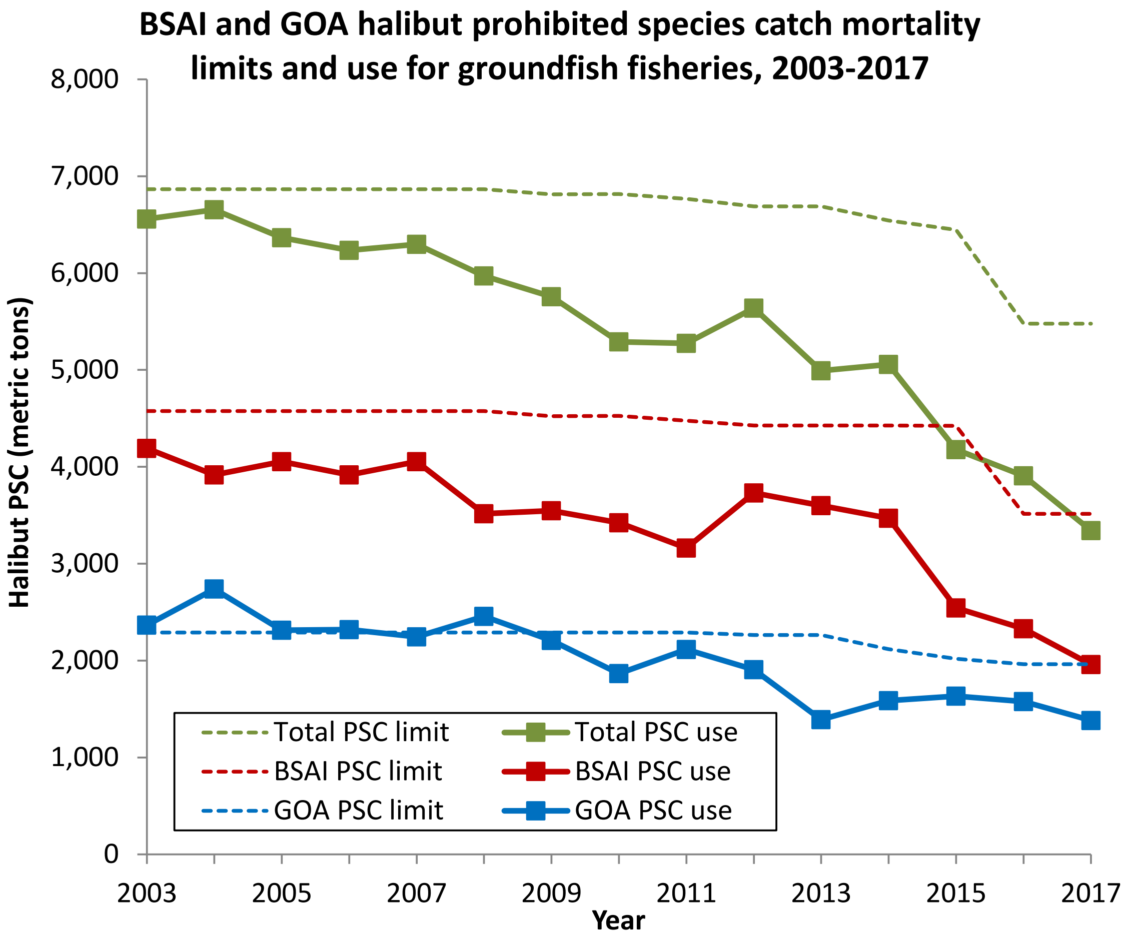


Figure 1. Total BSAI (including CDQ and deck sorting exempted fishing permit for 2016 and 2017) and GOA halibut prohibited species catch limits and use for all groundfish fisheries, 2003 through 2017.

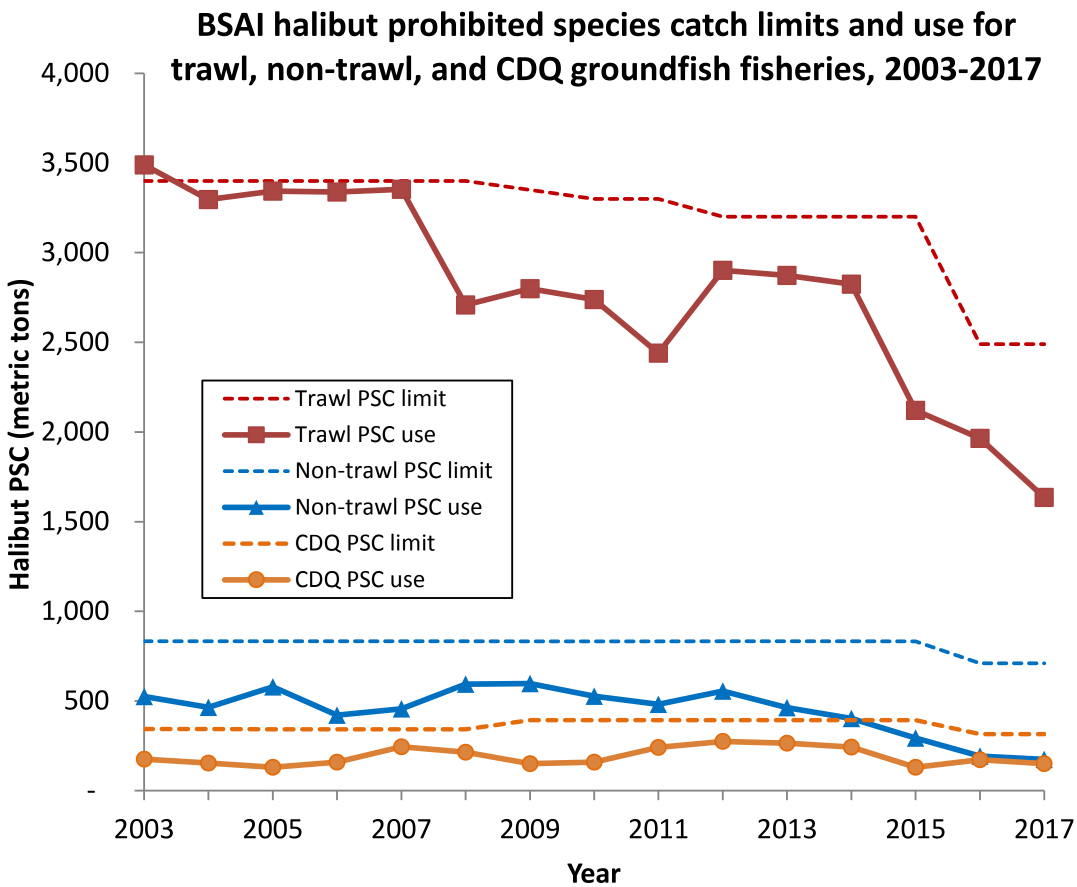


Figure 2. BSAI halibut prohibited species catch limits and use for the trawl (including deck sorting exempted fishing permit for 2016 and 2017), non-trawl, and CDQ groundfish fisheries, 2003 through 2017.

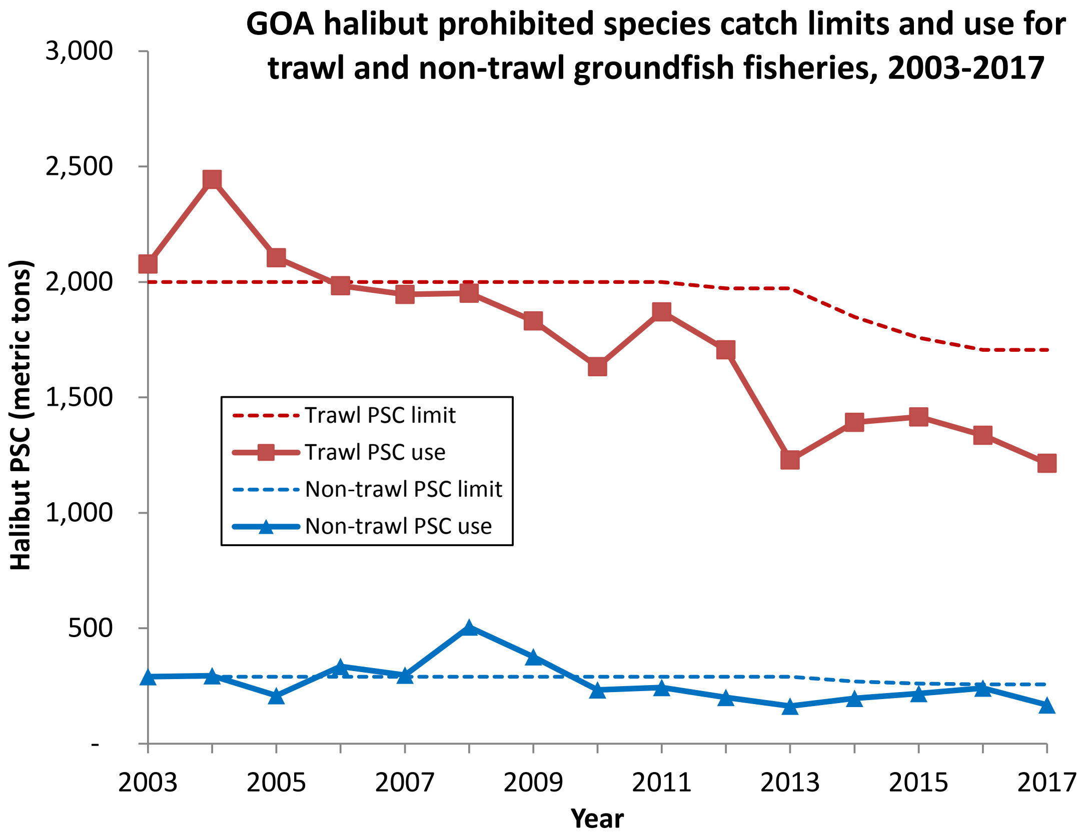


Figure 3. GOA halibut prohibited species catch limits and use for the trawl and non-trawl groundfish fisheries, 2003 through 2017.

2017 Halibut PSC Estimates

The 2017 halibut PSC estimates were developed using a method to spatially account for PSC. This is the same method that was developed in 2015 by NMFS in consultation with the IPHC. NMFS submitted preliminary 2017 PSC data to the IPHC for its halibut stock assessment in October 2017. NMFS provided final revised estimates to the IPHC on January 8, 2018.

Exempted fishing permits to reduce halibut mortality

Over the past several years NMFS has issued several exempted fishing permits (EFP) to permit otherwise unauthorized sorting of halibut PSC on the deck of non-pelagic trawl catcher/processor vessels while targeting flatfish in the Bering Sea. The EFPs test methods for quickly returning halibut to the water to reduce halibut PSC mortality in non-pelagic trawl fisheries. The objective of the EFPs is to test methods for improving survival of halibut PSC in flatfish fisheries by expeditiously returning halibut to the water. Participants in the EFPs are operating under the existing halibut PSC limits and target catch quotas for their respective sectors, and no additional target species or PSC amounts were authorized by the EFPs.

EFP for 2017

The EFP in place for the 2017 fishing year built on work conducted by the fishery participants under similar EFPs in 2009, 2012, 2015, and 2016. Seventeen vessels participated in the EFP in 2017. This was an increase in EFP participation from twelve vessels in 2016 and nine vessels in 2015. The 2017 EFP is available on the NMFS Alaska Region webpage: 2017 halibut deck sorting EFP.

Overall, operations during EFP fishing worked well in 2017. Under prior EFPs to test halibut deck sorting on Amendment 80 vessels, vessels carried project-specific sea samplers in addition to observers to collect the EFP data. In 2017, each vessel participating in the EFP was required to have two NMFS-certified observers on board during EFP trips to collect required data and conduct required sampling during all hauls. The Commission will receive a detailed report at the 2018 Annual Meeting on 2017 EFP performance from the participants.

EFP for 2018 and 2019

On December 20, 2017, NMFS issued an EFP to the Alaska Seafood Cooperative to permit deck sorting of halibut PSC on non-pelagic trawl catcher/processor vessels fishing for flatfish in the BSAI. *In addition, the EFP has been expanded to include non-pelagic trawl catcher/processor vessels fishing for flatfish in the GOA*. There are 24 vessels named on the EFP, which will be effective until December 31, 2019.

Regulatory amendment to authorize deck sorting

The data collected during EFP fishing shows that the practice of deck sorting halibut can improve the viability and therefore lower the total halibut mortality estimate of the halibut encountered by the vessel. This reduction in halibut mortality benefits the trawl fleet by reducing the amount of halibut that accrues toward PSC limits. Halibut deck sorting may also benefit the directed halibut fishery by returning halibut to the water in better condition thus reducing mortality of discarded halibut and potentially increasing halibut biomass.

NMFS is currently developing an analysis for a regulatory amendment to implement monitoring and enforcement provisions to allow halibut deck sorting on non-pollock trawl catcher/processors, including those acting as motherships. NMFS intends to present an update to the Council in April 2018 followed by a detailed analysis in June or October 2018. NMFS will analyze the no action alternative against an alternative that would allow voluntary deck sorting in the non-pollock fisheries in the BSAI or the BSAI and the GOA. Throughout this process, NMFS will continue to engage with the Council as necessary or as requested thereafter. NMFS intends to finalize the analysis and undergo the rulemaking process during 2018 and 2019, with implementation by January 2020.

Section 3: Observer Program

In 2013, NMFS implemented a restructured North Pacific Groundfish and Halibut Fisheries Observer Program that made important changes to how observers are deployed, how observer coverage is funded, and the vessels and processors that must have some or all of their operations observed. The restructured Observer Program expanded observer coverage to vessels less than 60 feet length overall, providing better estimates of halibut bycatch, and added observer coverage to the previously unobserved commercial halibut fleet.

In June 2017, NMFS presented to the Council and public an annual report that evaluated observer activities, costs, sampling levels, and issues in 2016, and potential changes for 2018. Overall, the 2016 Observer Program generally met anticipated at-sea deployment goals. Observers collected data on board 500 fixed gear and trawl vessels and at 7 processing facilities for a total of 43,706 observer days (39,029 full coverage days on vessels and in plants; and 4,677 partial coverage days). Among all fishing in Federal fisheries off Alaska in 2016, 6,066 trips (44.3%) were observed.

Under the Observer Program, all vessels and processors in the groundfish and halibut fisheries are assigned to one of two observer coverage categories: 1) full coverage, or 2) partial coverage. The program met expected rates of coverage for all of the full coverage and trip-selection strata. In the partial coverage trip selection strata, the realized coverage rates were 15.0% for hook-and-line; 14.7% for pot; and 28.0% for trawl.

The 2018 Annual Deployment Plan was presented to the Council in October 2017 and finalized in December 2017. For 2018, NMFS will implement an observer deployment strategy using a "hurdle" approach where observer sea days are first allocated equally up to a 15% coverage rate and the remaining sea-days are allocated using an optimal allocation algorithm that maximizes precision of discards for the least cost. This method provides minimum level of sampling of each stratum to ensure adequate coverage and is precautionary with respect to avoiding bias and providing data across all gear types.

All vessels in the partial coverage category are placed into one of three selection pools with differing requirements: observer trip selection, EM trip selection and no selection. In the 2018 Annual Deployment Plan, anticipated selection probabilities for the observer trip selection pool will be 20% for trawl; 17% for tender trawl; 17% for hook-and-line; 16% for the pot and 17% for the tender pot.

The anticipated selection probability for the EM trip selection pool will be 30%. The EM trip selection pool incudes fixed gear vessels. A total of 147 vessels requested to be in the 2018 EM trip selection pool. Of these, 4 were not approved because they were fishing with trawl gear, and 2 vessels will continue participating in NMFS' ongoing EM research and development program. All of the remaining, 141 fixed gear vessels were approved to be in the EM selection pool in 2018. Of these vessels, 69 vessels were new to the EM program and did not have EM systems installed, and 72 vessels were previous participants that had EM systems installed during pre-implementation. The no selection pool will include vessels less than 40 feet in length and fishing pot or hook and line gear and vessels fishing with jig gear.

The Observer Program 2016 Annual Report and 2018 Annual Deployment Plan are available on the NMFS Alaska Region website at: http://alaskafisheries.noaa.gov/sustainablefisheries/observers/.

Section 4: Commercial Halibut IFQ Program

Litigation on Regulations Limiting the Use of Hired Masters in the Halibut and Sablefish IFQ Program

On January November 16 2016, NMFS received an order from the District Court for the Western District of Washington at Tacoma in *Fairweather Fish, Inc. and Captain Ray Walsh v. Pritzker*. The case was a challenge to regulations in the Halibut and Sablefish IFQ Program prohibiting the use of hired masters to harvest IFQ derived from quota share received by transfer after February 12, 2010. The Council recommended the final rule to maintain progress toward predominantly owner-onboard IFQ fisheries.

The Court found that:

- The restrictions on halibut quota share transferred BEFORE the rule's publication date are VACATED and are not enforceable. **Therefore, halibut quota share acquired before July 28, 2014 can be used by a hired master.** NMFS made the necessary changes to halibut quota share for the 2017 fishing season.
- All other parts of the rule remain in effect, including the limitation on the use of hired masters for sablefish QS acquired after February 12, 2010.
- The rule is remanded to NMFS for public notice and comment on the analysis of the National Standards in the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act).
- The court ruled in NMFS's favor on the Plaintiff's Rehabilitation Act and Due Process claims.

In response to the Court order, NMFS prepared an analysis of the rule in consideration of the National Standards in the Magnuson-Stevens Act. NMFS completed this analysis after evaluating the information used to prepare the rule, information presented to the Court, and the best scientific information available relevant to the impacts of the final rule. NMFS has determined that the final rule is consistent with the National Standards as required by the Magnuson-Stevens Act, subject to further consideration after public comment. NMFS will publish a Notice of Availability in the Federal Register in early 2018 to request public comment on the analysis before making a final determination.

Additional information on this litigation is available through the NMFS Alaska Region website at: https://alaskafisheries.noaa.gov/.

Retention of Halibut in Pots Used in the GOA Sablefish IFQ Fishery

In April 2015, the Council recommended regulatory revisions to authorize the use of longline pot gear in the GOA sablefish IFQ fisheries. As part of this action, the Council recommended that vessels be able to retain legal-sized halibut that are caught incidentally in sablefish pots if the person(s) on the vessel hold sufficient area-specific halibut IFQ to cover the incidental catch. The Council's recommendation included a request to the IPHC to consider revisions to the annual management measures to authorize retention of incidentally caught halibut in sablefish pot gear in the GOA. At the 2016 IPHC annual meeting, the Commissioners approved amendments to Section 19 of the management measures to authorize retention of legal-size halibut in the GOA sablefish IFQ fishery if such retention is authorized by NMFS regulations. The Commission also stated its intent to review the use of pot gear as a legal gear for halibut in the GOA sablefish fishery after three years.

NMFS authorized the use of longline pot gear in the GOA sablefish IFQ fishery beginning with the 2017 fishing season. Consistent with IPHC regulations, NMFS regulations at 50 CFR 679.42(l)(6) require retention of legal-size halibut caught in longline pots in the IFQ fishery if any person on board the vessel holds sufficient halibut IFQ.

In December 2016, NMFS provided the Council with a report on the use of pot gear in the GOA sablefish IFQ fishery, including information on halibut retained in pot gear. See Table 3 and Figures 3 and 4 in the Appendix.

Regulatory Proposals

The NMFS AKR submitted three regulatory proposals for consideration by the Commission at its 2018 Annual Meeting:

- IPHC-2018-AM094-PropB1 Rev_1: Leasing IFQ to CDQ groups in IPHC Regulatory Area 4
- IPHC-2018-AM094-PropB2: Clarify Alaska Sport Fishery Regulations

- IPHC-2018-AM094-PropB3: Clarify Head-On Weight Requirement in Alaska Commercial Fisheries

NMFS AKR staff will speak to these proposals at the IPHC 2018 Annual meeting.

Appendix

Table 1. 2016 and 2017 Halibut PSC Use in the Gulf of Alaska and the Bering Sea and Aleutian Islands by gear type and IPHC Management Area (rounded to the nearest metric ton).

	2016	*2017 Estimate (10/24/2017)*	2017 (1/4/2018)
Area 2C			
Hook-and-line (non-sablefish)	9	4	3
Hook-and-Line (sablefish)	8	6	8
Total	**17**	**10**	**11**
Area 3A			
Trawl	900	720	744
Hook-and-line (non-sablefish)	127	80	77
Hook-and-Line (sablefish)	16	20	21
Pot	24	6	6
Total	**1,066**	**826**	**848**
Area 3B			
Trawl	427	456	464
Hook-and-line (non-sablefish)	76	60	56
Hook-and-Line (sablefish)	5	11	10
Pot	19	8	8
Total	**527**	**535**	**538**

	2016	*2017 Estimate (10/24/2017)*	2017 (1/4/18)
Area 4A			
Trawl	284	174	184
Hook-and-line (non-sablefish)	59	63	54
Hook-and-Line (sablefish)	1	1	1
Pot	3	4	3
Total	**347**	**242**	**241**
Area 4B			
Trawl	84	106	117
Hook-and-line (non-sablefish)	3	11	8
Hook-and-Line (sablefish)	1	0	0
Pot	0	1	0
Total	**88**	**118**	**126**
Area 4CDE			
Trawl	809	611	663
Hook-and-line (non-sablefish)	122	113	108
Hook-and-Line (sablefish)	0	0	0
Pot	0	0	0
Total	931	**724**	**771**
Area 4 Closed			
Trawl	952	857	813
Hook-and-line (non-sablefish)	66	57	54
Hook-and-Line (sablefish)	0	0	0
Pot	1	1	1
Total	**1,019**	**915**	**867**
TOTAL (all Areas)			
Trawl	3,456	2,925	2,985
Hook-and-line (non-sablefish)	462	387	358
Hook-and-Line (sablefish)	30	39	41
Pot	47	19	18
Total	**3,995**	**3,370**	**3,402**

Table 2. 2010 through 2017 BSAI and GOA Halibut PSC Use by Sector

Halibut Mortality (Data through 1/4/18)	2010	2011	2012	2013	2014	2015	2016	2017
BERING SEA AND ALEUTIAN ISLANDS								
Bering Sea and Aleutian Islands Trawl								
Non-Pelagic Trawl (Amendment 80 C/P)	2,243	1,810	1,944	2,166	2,178	1,633	1,405	1,167
Non-Pelagic Trawl (AFA C/P)	33	95	117	127	204	71	78	57
Non-Pelagic Trawl (Catcher Vessels)	254	250	497	382	305	310	410	337
Non-Pelagic Trawl (CDQ)	77	135	203	194	185	100	140	129
Pelagic Trawl (AFA C/P)	109	167	180	166	79	74	64	57
Pelagic Trawl (AFA catcher vessels)	87	116	165	33	57	30	19	17
Pelagic Trawl (CDQ)	8	38	13	12	21	8	9	6
Bering Sea and Aleutian Islands Hook-and-line and Pot gear								
Hook-and-Line	501	482	556	463	402	293	196	174
Hook-and-Line (CDQ Groundfish)	73	68	58	58	37	22	25	16
Hook-and-Line (IFQ/CDQ sablefish)	21	10	8	6	3	2	1	0
Pot Gear	7	7	6	5	4	3	3	3
Total BSAI	**3,414**	**3,180**	**3,747**	**3,611**	**3,476**	**2,547**	**2,347**	**1,963**
GULF OF ALASKA								
Gulf of Alaska Trawl								
Non-Pelagic Trawl (Central GOA C/Vs)	1,090	1,304	1,199	740	821	975	967	751
Non-Pelagic Trawl (Western GOA C/Vs)	6	37	111	93	70	47	107	18
Pelagic Trawl	19	19	5	19	1	13	12	13
Trawl (C/P)	516	510	389	377	502	375	246	433
Gulf of Alaska Hook-and-line and Pot gear								
Hook & Line (C/P)	127	131	53	34	77	69	76	70
Hook & Line (Catcher vessels)	107	114	147	129	119	148	166	99
Hook & Line - IFQ sablefish	41	40	51	31	30	34	29	40
Pot Gear	29	45	42	15	11	22	44	15
TOTAL GOA	**1,936**	**2,198**	**1,997**	**1,440**	**1,630**	**1,684**	**1,647**	**1,439**
TOTAL All Areas	**5,350**	**5,378**	**5,743**	**5,051**	**5,106**	**4,231**	**3,995**	**3,402**

Figure 1. 2016 and 2017 BSAI Trawl Halibut PSC Use by Groundfish Fishery

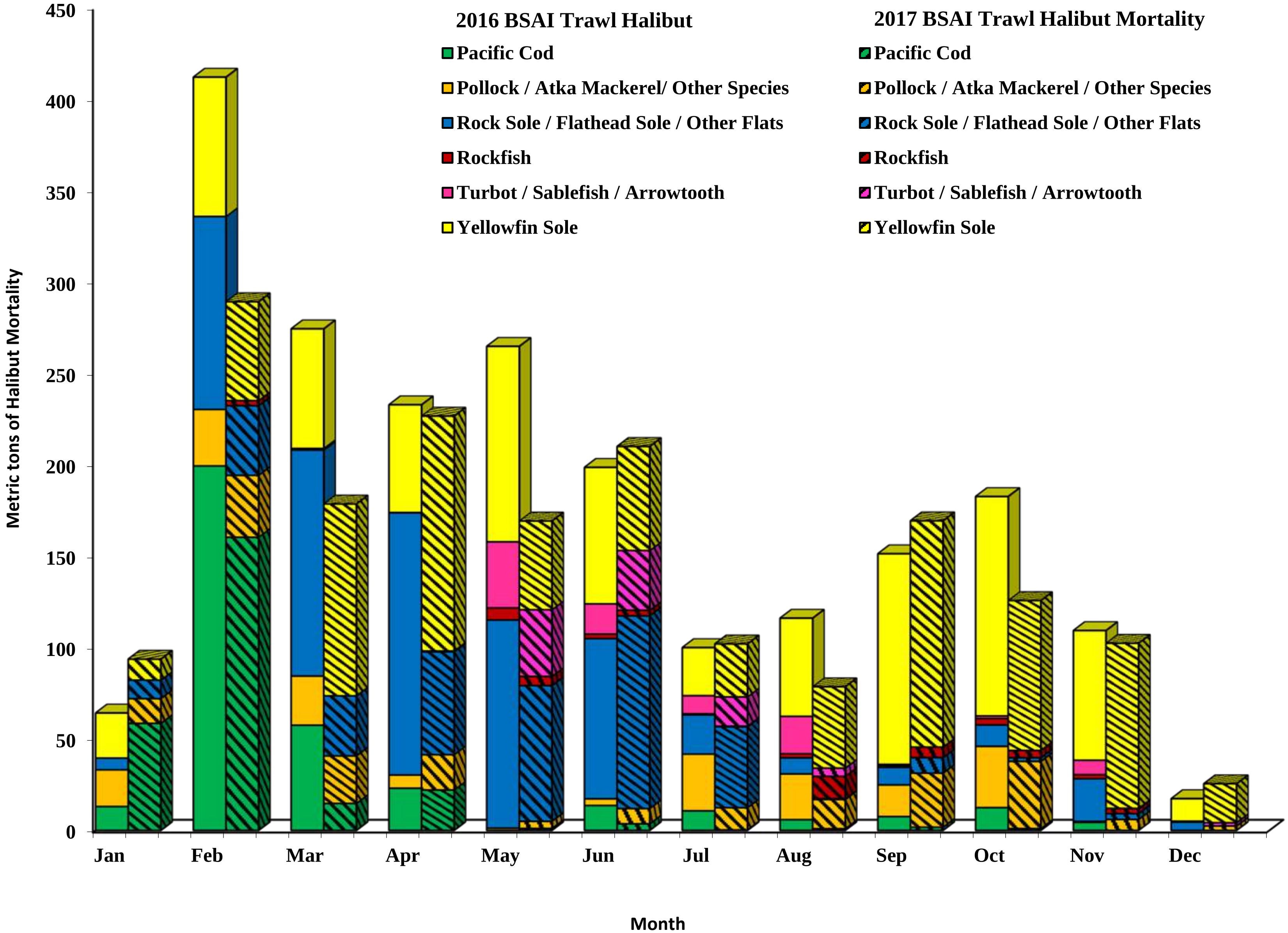


Figure 2. 2016 and 2017 GOA Trawl Halibut PSC Use by Groundfish Fishery

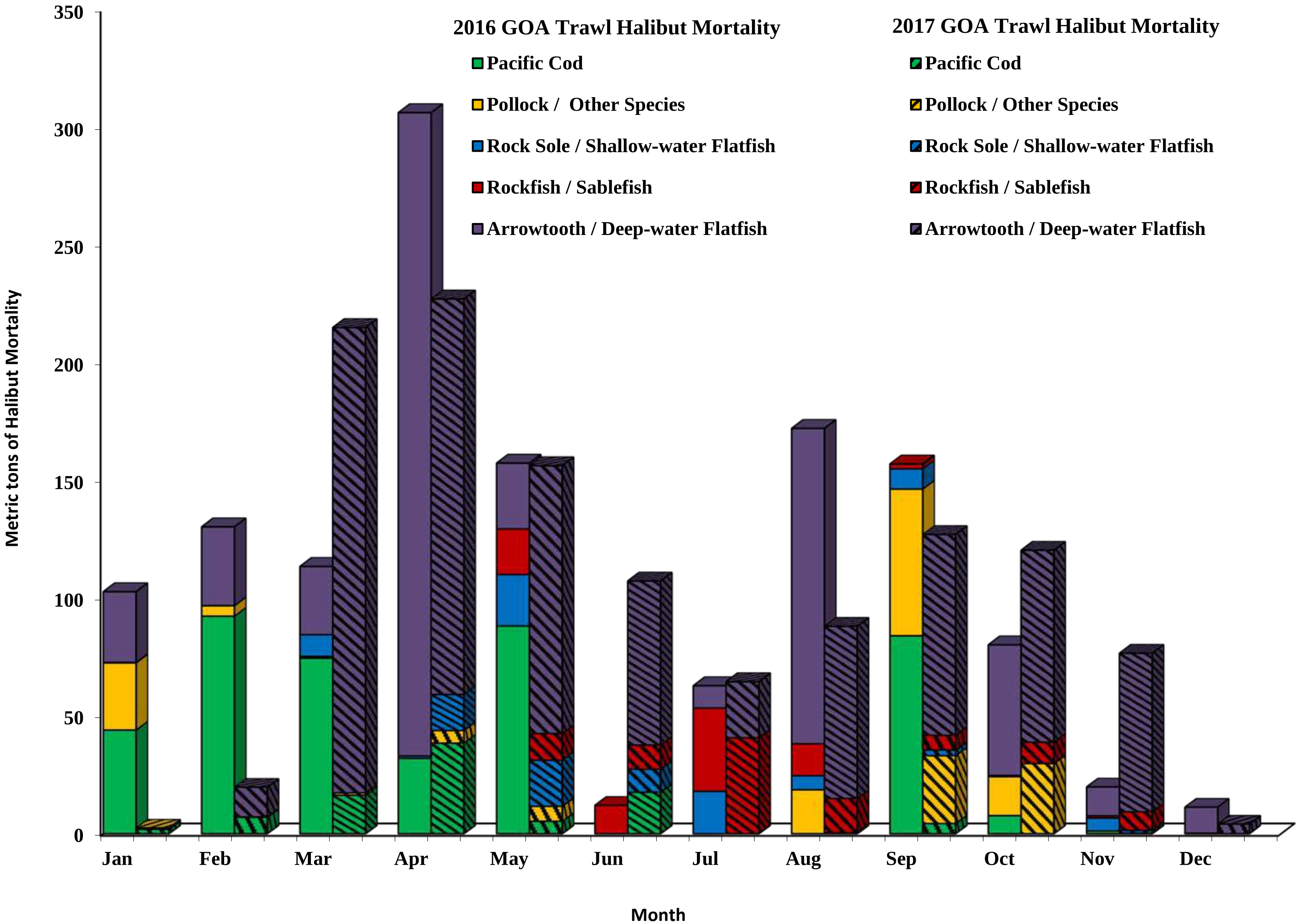


Table 3. 2017 GOA Sablefish IFQ Fishery by Gear Type

2017 Sablefish	Hook-and-Line			Pot				
	Unique Vessels	Sablefish (mt)	% of IFQ Sablefish	Unique Vessels	Sablefish (mt)	% of IFQ Sablefish	Pots Registered	Pots Lost
Southeast	165	2,659	95%	10	138	5%	1,900	29
West Yakutat	95	1,378	94%	10	92	6%	1,950	7
Central GOA	143	3,186	88%	19	443	12%	4,552	76
Western GOA	55	887	78%	6	226	22%	3,155	56
GOA Wide	**275**	**8,111**	**90%**	**22**	**891**	**10%**	**11,557**	**168**

Figure 3. 2017 Sablefish and Other Species Incidental Catch in GOA Fixed Gear Sablefish Targets

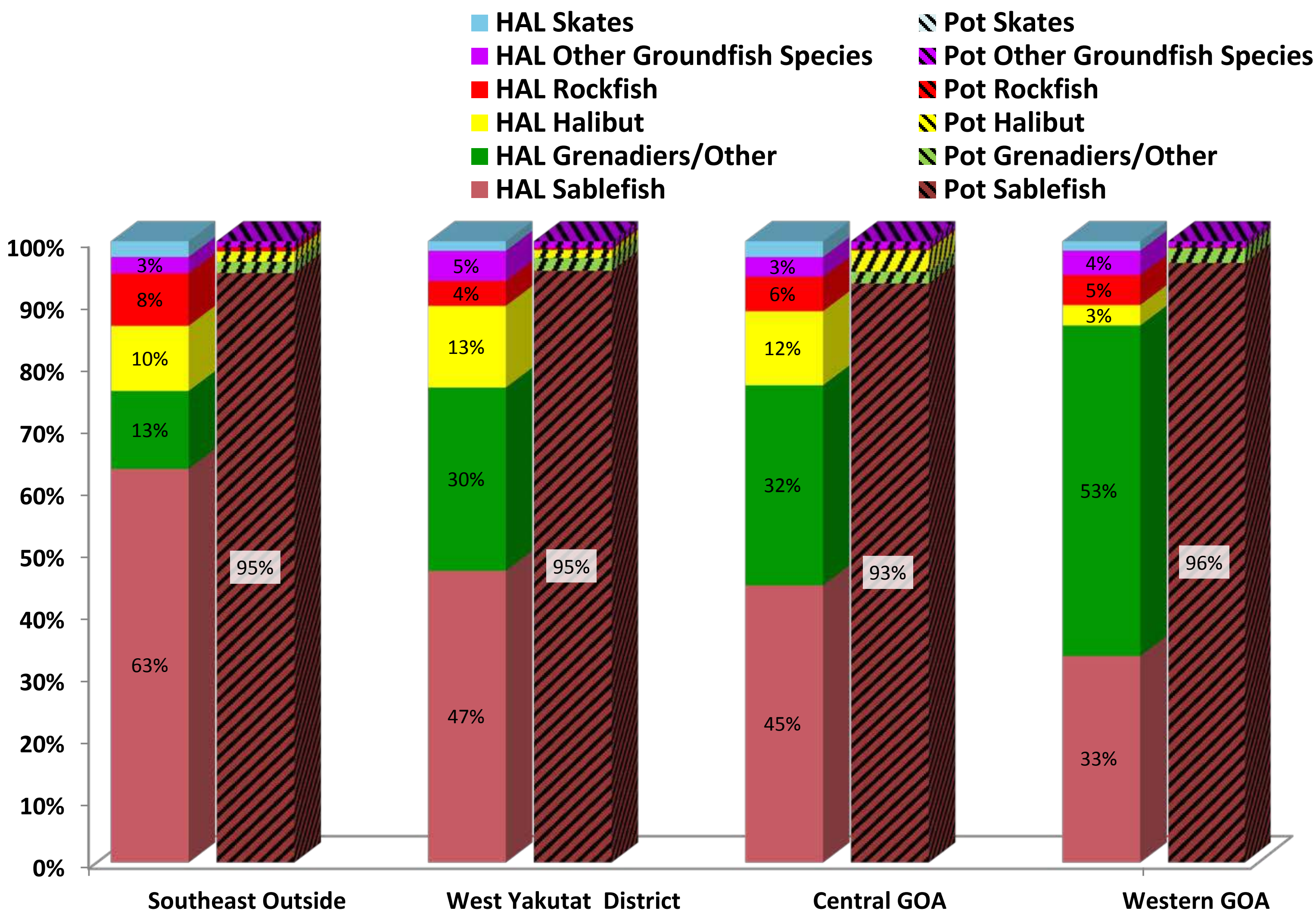
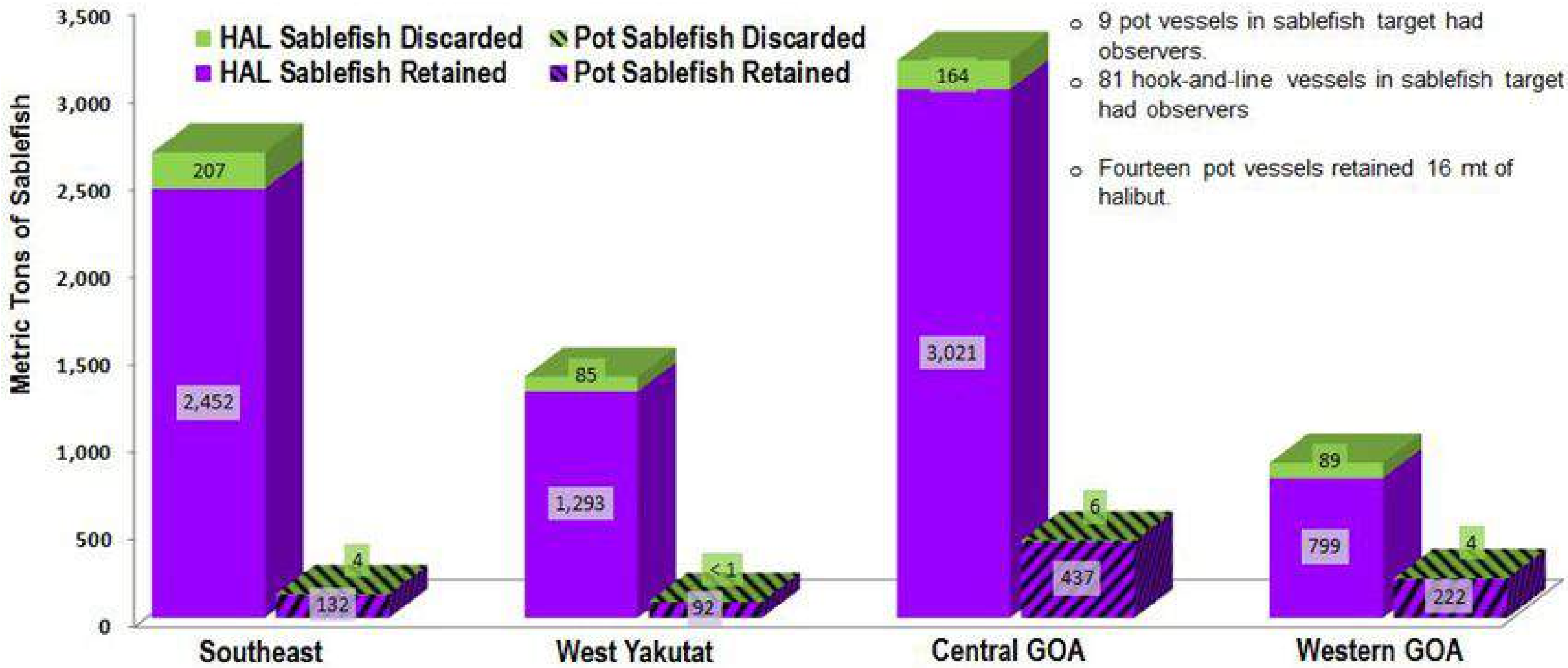


Figure 4. 2017 Sablefish Retained and Discarded by GOA Fixed Gear



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October 20, 2017

Lara Erikson
International Pacific Halibut Commission
P.O. Box 95009
Seattle, WA 98145

Dear Ms. Erikson:

This letter represents our report on the Alaska recreational halibut fishery in support of the annual IPHC stock assessment. This year's letter provides:

1. Final 2016 estimates of sport fishery harvest and yield by IPHC regulatory area,
2. Preliminary 2017 estimates of harvest and yield by IPHC area,
3. Final 2016 and preliminary 2017 estimates of sport fishery release mortality by IPHC area, and
4. Final 2016 and preliminary 2017 estimates of sport fishery yield prior to the mean IPHC longline survey date in Areas 2C and 3A.

Each section includes a summary of the methods used and basic results. More detailed information on methods can be found in the following project operational plans:

Southeast Region creel sampling: *http://www.adfg.alaska.gov/FedAidPDFs/ROP.SF.1J.2017.02.pdf*

Southcentral Region creel sampling: *http://www.adfg.alaska.gov/FedAidPDFs/ROP.SF.2A.2016.20.pdf*

Statewide halibut estimation: *http://www.adfg.alaska.gov/FedAidPDFs/ROP.SF.4A.2014.08.pdf*

We hope this information satisfies the IPHC's needs. Please feel free to contact us if you require clarification or additional information.

Sincerely;

(sent via email)

Scott Meyer, Mike Jaenicke, Diana Tersteeg, and Martin Schuster
Fishery Biologists

Final Estimates of 2016 Sport Harvest and Yield

In November 2016 we provided preliminary estimates of the 2016 sport harvest for Areas 2C, 3A, 3B, and 4. This letter provides final estimates based on Alaska Department of Fish and Game (ADF&G) saltwater logbook data as of September 12, 2017, and final estimates from the ADF&G Statewide Harvest Survey (SWHS). The final estimates for Area 2C and 3A will also be posted on the North Pacific Fishery Management Council web site.

The Area 2C charter fishery regulations for 2016 included a one-fish daily bag limit and reverse slot (or “protected slot”) limit that allowed harvest of halibut less than or equal to 43 inches and halibut greater than or equal to 80 inches. The Area 3A charter regulations included a two-fish bag limit with a maximum size on one of the fish of 28 inches, a limit of one trip per charter vessel per day (on which halibut are harvested), a limit of one trip per Charter Halibut Permit (CHP) per day, a closure of halibut retention on Wednesdays all year, and a 4-fish annual limit with a harvest recording requirement. Charter captains and crew were not allowed to retain halibut while guiding clients in Area 2C or Area 3A under regulations of the North Pacific Fishery Management Council’s Catch Sharing Plan (CSP) for these areas. Charter fishery regulations in the remainder of the state included a daily bag limit of two fish of any size, and there was no prohibition on retention of halibut by captains or crew. Noncharter (or unguided) fisheries statewide were managed under a two-fish bag limit with no size limit.

Methods:

For Areas 2C and 3A, sport fishery yield was calculated separately for the charter and noncharter sectors as the product of the number of fish harvested and average weight of harvested halibut. Yield estimates do not include release mortality (provided later in this document). Estimates were done for six subareas in Area 2C and eight subareas in Area 3A and summed. Charter harvest was based entirely on logbook data, per the provisions of the CSP. Noncharter harvest was estimated through the SWHS. Standard errors of the SWHS estimates for the noncharter sector were obtained by bootstrapping. Average net weight was estimated by applying the IPHC length-weight relationship to length measurements of harvested halibut sampled at major ports in Areas 2C and 3A. All fish from each vessel-trip selected for sampling were measured. Bootstrapping was used to estimate the standard errors of average weight. The estimate of charter average weight for Homer was stratified to account for differences in sizes of halibut cleaned at sea and cleaned onshore. Length measurements from sites in the Glacier Bay subarea included fish caught in Areas 3A and 2C; average weights were calculated separately for each area and sector. All noncharter harvest in the Glacier Bay subarea was assumed to have occurred in Area 2C. Charter-caught halibut taken under a Guided Angler Fish (GAF) permit from the National Marine Fisheries Service were not included in charter harvest calculations because the CSP specifies that this harvest accrues toward the commercial catch limit.

Final estimates of sport fishery yield for Areas 3B and 4 are for the charter and noncharter sectors combined and are based entirely on the SWHS. Because ADF&G does not sample the sport harvest in these areas, we followed past practices of the IPHC and used the average weight of Kodiak sport harvest as a proxy for average weight in Areas 3B and 4. Specifically, we used the average weight from the noncharter sector because it was unaffected by size limits. Even so, use of the Kodiak average weight may bias the yield estimates for these areas. Anecdotal reports from the Dutch Harbor/Unalaska area suggest that average weight in the sport fishery is higher than at Kodiak.

As has been done historically, harvest from SWHS Area R (Alaska Peninsula and Aleutian Islands south of Cape Douglas) was apportioned to IPHC Areas 3B and 4 using specific locations reported in the survey. In some years, Area R harvest estimates have included harvests for sites that are actually in Area 3A. Since 1991, the estimated harvest of Area 3A halibut included in Area 3B estimates has ranged from 0 to 728 fish per year (average = 126). For 2016, no harvest was estimated from Area 3A locations in Area R.

Results:

The 2016 Area 2C estimated sport harvest (excluding release mortality) was 132,861 fish, for a yield of 2.035 million pounds (Table 1). Charter yield represented 39% of the total. Average net weight was estimated at 15.32 lb overall, but was lower for the charter sector due to size limit restrictions. Average weights were based on length measurements of 5,653 charter fish and 4,984 noncharter fish.

The Area 3A estimated sport harvest was 286,794 fish, for a yield of 3.542 Mlb (Table 1). The charter sector accounted for 57% of the total yield. Average net weight was estimated at 12.35 lb overall, and was slightly higher for the charter sector. Average weight was estimated from samples of 4,435 charter halibut and 2,022 noncharter halibut.

The final estimates of charter halibut yield were about 0.4% lower than last year's preliminary estimate in Area 2C and 2.1% higher than the preliminary estimate in Area 3A. These differences were largely due to errors in estimating the proportions of harvest taken through July 31, the cutoff date for using logbook data. The final estimates of noncharter yield were 5% lower in Area 2C and <1% higher than the preliminary estimate for Area 3A. The preliminary estimates were derived from simple exponential time series forecasts (SAS ESM procedure) and large forecasting errors are expected due to high annual variability in the harvest time series.

The final harvest estimates for western areas were 581 halibut in Area 3B and 1,097 halibut in Area 4 (Table 1). Applying the Kodiak average weight of 13.26 lb resulted in yield estimates of 0.008 Mlb in Area 3B and 0.015 Mlb in Area 4. These final estimates were close to last year's preliminary estimates of 0.005 in Area 3B and 0.012 in Area 4.

Preliminary 2017 Estimates of Harvest and Yield

Methods:

Sport charter fishery mortality for Areas 2C and 3A is based on numbers of halibut reported harvested and released in ADF&G mandatory charter logbooks. Harvest and release estimates from the SWHS are still used for all noncharter fishery estimates as well as total sport fishery estimates for Areas 3B and 4. Neither complete logbook data nor SWHS estimates are available yet for the current year, and creel sampling is not designed to produce estimates of harvest. A variety of methods were used to provide preliminary estimates of the numbers of fish harvested by each sector or regulatory area.

Charter harvest for Areas 2C and 3A was projected from partial-year logbook data. Logbook data were entered and available in early October for most trips taken through July 31. Areas 2C and 3A are divided into several subareas closely corresponding to state management areas. Harvest data were adjusted upward to account for late logbook submissions and other reporting errors based on past data. These minor adjustments increased the harvest in each area by less than 1%. The harvest data were then expanded by forecasting the proportion of harvest taken through July in each subarea. Forecasts and their standard errors were obtained from a simple exponential smoother using 2006-2016 logbook data as of October 6, 2017.

Noncharter harvest in Areas 2C and 3A, and overall sport harvests for Areas 3B and 4 were projected from the existing time series of SWHS estimates using simple exponential smoother forecasts. Charter and noncharter yield were estimated by multiplying the subarea harvest forecasts by the corresponding estimates of average weight. Average weights were estimated by applying the IPHC length-weight relationship to length measurements of harvested halibut obtained through sampling of the recreational harvest. No sampling was conducted in Areas 3B or 4 in 2017, so the Kodiak area average weight from the noncharter fishery was again substituted for these areas.

Results:

The preliminary estimate of 2017 sport halibut harvest (excluding release mortality) was 140,287 halibut, or 2.295 Mlb (Table 2). Charter harvest was estimated using a projection that 65% of the harvest was taken through the end of July. Average weight was estimated at 16.36 lb. The charter average weight was more than 8 lb lower than the noncharter average weight due to the charter fishery size limit. Average weights for Area 2C were based on length measurements of 4,339 charter halibut and 4,368 noncharter halibut.

The preliminary estimate for Area 3A was 274,847 halibut, for a total sport fishery yield of 3.905 Mlb (Table 2). Charter harvest was estimated using a projection that 68% of the harvest was taken through the end of July. The estimated average weights in Area 3A was 14.21 lb overall. Average weights were estimated from samples of 3,360 charter and 1,624 noncharter halibut.

The preliminary harvests for 2017 were 540 halibut in Area 3B and 982 halibut in Area 4. Applying the noncharter average weight of 15.35 lb from Kodiak resulted in yield projections of 0.008 Mlb in Area 3B and 0.015 Mlb in Area 4 (Table 2). Although the levels of sport harvest are low, there is large uncertainty in the time series forecasts as well as use of the Kodiak noncharter average weight as a proxy for average weight in these areas.

Final 2016 and Preliminary 2017 Estimates of Release Mortality

Methods:

Release mortality (*R*) was calculated in pounds net weight for each subarea of Areas 2C and 3A as:

$$R = \widehat{N} \cdot DMR \cdot \widehat{\bar{w}}$$

where

$\hat{N}$ = the number of fish released,

DMR = the assumed short-term discard mortality rate due to capture, handling, and release, and

$\hat{\bar{w}}$ = the estimated average net weight (in pounds) of released fish.

The numbers of halibut released ($\widehat{N}$) in the charter sector in 2016 were based on final logbook data. The numbers of halibut released in 2017 were projected using logbook data through July 31. The projections used simple exponential forecasts of the proportion of releases through July 31 from 2006-2016 data. For the noncharter fishery, and the overall sport fisheries in Areas 3B and 4, the estimated number of fish released in each subarea in 2016 was obtained from the SWHS. The projections for 2017 were simple exponential time series forecasts using previous release numbers from the SWHS.

Assumed mortality rates (*DMRs*) were 5% for Area 3A charter-caught halibut, 6% for Area 2C charter and Area 3A noncharter, and 7% for Area 2C noncharter halibut. These rates were developed by assuming a 3.5% mortality rate for halibut released on circle hooks and a 10% mortality rate for halibut released on all other hook types. The hook type data were collected in 2007 and 2008 in Area 2C, and every year since 2007 in Area 3A. These rates were applied to the reported number of fish released on each hook type to calculate a weighted mean mortality rate for each user group in each subarea. These weighted mean rates were then rounded up to the next whole percentage point to address uncertainty and account for possible cumulative effects of multiple recaptures. A discard mortality rate of 6% was assumed for Areas 3B and 4, as no data on hook use were collected.

For most IPHC regulatory areas, the average weights of released fish in each subarea were estimated using a logistic model of the proportion of catch retained at length, as described in the operational plan for statewide halibut estimation (see cover page for link). The model uses the length composition of the retained fish to infer the length distribution of released fish. The resulting length distributions are partitioned into U26 (<26 inch) and O26 (≥ 26 inch) components, and average weight was calculated using the IPHC length-weight relationship. The U26 and O26 separation was done for consistency with how these two size classes of waste have been handled by the IPHC.

For the Area 2C charter fishery, additional steps were needed to estimate release mortality due to the reverse slot limits in place in 2016 and 2017. In 2016, charter anglers were prohibited from harvesting fish between 43 and 80 inches in length. The protected slot was 44-80 inches in 2017. This required partitioning the released fish into size categories as follows: the 2016 size classes were U43 (≤ 43 inches), 43-80, and O80 (≥ 80 inches). The 2017 size classes were simply U44 and O44. The proportions of fish in each size class were obtained from creel survey interviews where anglers were asked to report the numbers of released fish by size class. The average weight of released fish in the U43 (2016) and U44 (2017) size classes was estimated using the model described above. The average weights of released fish in the protected slot and above the upper limit were estimated as the average weight of fish in these size ranges in 2010, the most recent year without a charter size limit.

The North Pacific Fishery Management Council's Scientific and Statistical Committee reviewed the logistic modeling approach in 2007 and concluded that it provided "reasonable" estimates of average weight given the lack of data. One problem inherent in this method is that the size distribution of released fish is truncated at the size of the smallest fish measured in the harvest sample. It is likely that some halibut are released that are smaller than the smallest halibut retained and measured. Therefore, the method may in effect underestimate the numbers of U26 fish released but overestimate their average weight. Because the model assumes that the percent of fish kept at length never exceeds 95%, it may also overestimate the numbers of O26 fish released, but probably has little effect on their average weight.

<u>Results:</u>

For 2016, estimated U26 release mortality was 0.004 Mlb in Area 2C, 0.019 Mlb in Area 3A, and virtually zero in Areas 3B and 4 (Table 3). Estimated O26 release mortality was 0.067 Mlb in Area 2C, with 0.050 Mlb of that coming in the charter fishery. The size class breakdown of the Area 2C charter O26 release mortality indicated that while the majority of fish released were in the length range 26-43 inches, the poundage of release mortality was greatest in the 43-80 inch protected slot because of the higher average weight (Table 4). Estimated O26 release mortality in Area 3A was 0.037 Mlb, with 0.017 Mlb from the charter fishery (Table 3). Areas 3B and 4 each had negligible amounts of release mortality from the sport fishery.

Preliminary estimates of release mortality for 2017 were similar in magnitude to 2016 estimates. Mortality of U26 halibut was 0.004 Mlb in Area 2C, 0.019 Mlb in Area 3A, and virtually zero in Areas 3B and 4 (Table 5). Mortality of O26 releases in Area 2C was estimated at 0.055 Mlb, with 0.039 Mlb of that from the charter fishery. The O44 size category in the Area 2C charter fishery accounted for 30% of charter releases (in numbers of fish) but 72% of release mortality by weight (Table 4). Mortality of O26 releases in Area 3A was 0.033 Mlb, with most (0.019 Mlb) coming from the noncharter fishery (Table 5). The O26 release mortality was negligible in Area 3B and Area 4.

The 2016 total sport fishery removals, including harvest and all sizes of release mortality, added up to 2.106 Mlb in Area 2C and 3.598 Mlb in Area 3A. Release mortality made up 3.3% of all Area 2C removals and 1.6% of Area 3A removals. For 2017, the preliminary estimates of total sport removals are 2.354 Mlb in Area 2C and 3.957 Mlb in Area 3A. Release mortality accounted for 2.5% of Area 2C removals and 1.3% of Area 3A removals in 2017.

Sport Fishery Yield Prior to the Mean IPHC Survey Dates in 2016 and 2017 (Areas 2C and 3A only)

This information is provided to aid the IPHC's adjustment to survey CPUE that is used to apportion estimated exploitable biomass among regulatory areas. The mean survey dates for 2016 were June 25 in Area 2C and July 4 in Area 3A. The mean survey dates for 2017 were July 5 in Area 2C and July 1 in Area 3A.

<u>Methods:</u>

The proportions of harvest prior to the mean survey date were calculated separately for the charter and noncharter sectors. For the charter sector, the proportion of harvest taken prior to the mean survey date in 2016 was obtained from logbook harvest data. For 2017, the preliminary estimate was based on the average proportion of logbook harvest prior to the mean survey date over the last three years. For the noncharter sector, the proportions were calculated based on harvest reported in dockside interviews. These proportions were calculated separately for each subarea of Area 2C and 3A and weighted by the 2016 final estimated harvests or the 2017 projected harvests in each subarea to derive the overall proportions. The total sport yield taken prior to the mean survey date was calculated by multiplying the charter and noncharter proportions by their respective final or projected yields and summing.

Results:

In 2016, an estimated 0.491 Mlb of halibut were taken by the sport fishery in Area 2C prior to June 25, and an estimated 1.357 Mlb were taken in Area 3A prior to July 4. In 2017, an estimated 0.756 Mlb of halibut were harvested by the sport fishery in Area 2C prior to July 5, and about 1.368 Mlb of halibut were taken in Area 3A prior to July 1 (Table 6). The proportions of 2017 sport harvest projected to have been taken prior to the mean survey date in each area were similar – 33% in Area 2C and 35% in Area 3A. The preliminary estimates for 2017 will be updated next year once logbook data, interview data, and SWHS estimates are finalized.

Table 1. Final estimates of the 2016 sport halibut harvest (numbers of fish), average net weight (pounds), and yield (millions of pounds net weight) in Areas 2C, 3A, 3B, and 4. "NA" indicates no estimate is available.

IPHC Area	Sector	Harvest (no. fish)	Average Net Wt. (lb)	Yield (Mlb)	95% CI for Yield (Mlb)
Area 2C	Charter	66,147	11.93	0.789	0.770 – 0.808
	Noncharter	66,714	18.68	1.246	1.101 – 1.391
	Total	132,861	15.32	2.035	1.889 - 2.181
Area 3A	Charter	158,212	12.67	2.004	1.848 – 2.161
	Noncharter	128,582	11.96	1.538	1.350 – 1.726
	Total	286,794	12.35	3.542	3.297 – 3.787
Area 3B	Total	581	13.26[a]	0.008	NA
Area 4	Total	1,097	13.26[a]	0.015	NA

[a] – No size data were available from Areas 3B and 4, so the noncharter average weight from Kodiak was substituted.

Table 2. Preliminary estimates of the 2017 sport halibut harvest (numbers of fish), average net weight (pounds), and yield (millions of pounds net weight) in Areas 2C, 3A, 3B, and 4. "NA" indicates no estimate is available.

IPHC Area	Sector	Harvest (no. fish)	Average Net Wt. (lb)	Yield (Mlb)	95% CI for Yield (Mlb)
Area 2C	Charter	71,711	12.31	0.882	0.831-0.934
	Noncharter	68,576	20.59	1.412	1.132-1.693
	Total	140,287	16.36	2.295	2.009-2.580
Area 3A	Charter	143,654	14.48	2.079	1.903-2.256
	Noncharter	131,193	13.91	1.825	1.521-2.130
	Total	274,847	14.21	3.905	3.553-4.257
Area 3B	Total	540	15.35[a]	0.008	NA
Area 4	Total	982	15.35[a]	0.015	NA

[a] – No size data were available from Areas 3B and 4, so the noncharter average weight from Kodiak was substituted.

Table 3. Final estimates of release mortality for sport fisheries in Areas 2C, 3A, 3B, and 4 in 2016. Some columns may not appear to add correctly due to rounding.

IPHC Area	Size Class	Sector	Estimated No. Halibut Released	Assumed Mortality Rate	Number Released that Died	Estimated Average Net Weight (lb)	Release Mortality (Mlb)
Area 2C	U26	Charter	5,452	6.0%	327	3.63	0.001
		Noncharter	9,961	7.0%	697	3.39	0.002
		Total	15,413		1,024	3.47	0.004
	O26	Charter	25,805	6.0%	1,548	32.02	0.050
		Noncharter	21,652	7.0%	1,516	11.46	0.017
		Total	47,457		3,064	21.85	0.067
Area 3A	U26	Charter	66,590	5.0%	3,330	3.69	0.012
		Noncharter	33,711	6.0%	2,023	3.33	0.007
		Total	100,302		5,352	3.56	0.019
	O26	Charter	42,497	5.0%	2,125	7.96	0.017
		Noncharter	41,582	6.0%	2,495	8.08	0.020
		Total	84,079		4,620	8.03	0.037
Area 3B	U26	Total	231	6.0%	14	3.46	0.000
	O26	Total	120	6.0%	7	8.64	0.000
Area 4	U26	Total	390	6.0%	23	3.46	0.000
	O26	Total	208	6.0%	12	8.64	0.000

Table 4. Breakdown of Area 2C estimates of O26 charter release mortality by size class for 2016 (final) and 2017 (preliminary). Some columns may not appear to add correctly due to rounding.

Year	Size Class (inches)	Estimated No. Halibut Released	Assumed Mortality Rate	Number Released that Died	Estimated Average Net Weight (lb)	Release Mortality (Mlb)
2016	O26U43	18,226	6.0%	1,094	9.92	0.011
	O43U80	6,525	6.0%	391	59.40	0.023
	O80	1,054	6.0%	63	244.70	0.015
	Total O26	25,805	6.0%	1,548	32.02	0.050
2017	O26U44	17,069	6.0%	1,024	10.65	0.011
	O44	7,213	6.0%	433	64.74	0.028
	Total O26	24,281		1,457	26.72	0.039

Table 5. Preliminary estimates of release mortality for sport fisheries in Areas 2C, 3A, 3B, and 4 in 2017. Some columns may not appear to add correctly due to rounding.

IPHC Area	Size Class	Sector	Estimated No. Halibut Released	Assumed Mortality Rate	Number Released that Died	Estimated Average Net Weight (lb)	Release Mortality (Mlb)
Area 2C	U26	Charter	6,793	6.0%	408	3.54	0.001
		Noncharter	11,915	7.0%	834	3.51	0.003
		Total	18,709		1,242	3.52	0.004
	O26	Charter	24,281	6.0%	1,457	26.72	0.039
		Noncharter	20,804	7.0%	1,456	11.15	0.016
		Total	45,085		2,913	18.93	0.055
Area 3A	U26	Charter	47,164	5.0%	2,358	3.46	0.008
		Noncharter	49,441	6.0%	2,966	3.67	0.011
		Total	96,605		5,325	3.58	0.019
	O26	Charter	28,366	5.0%	1,418	9.60	0.014
		Noncharter	38,085	6.0%	2,285	8.29	0.019
		Total	66,451		3,703	8.79	0.033
Area 3B	U26	Total	175	6.0%	11	3.38	0.000
	O26	Total	105	6.0%	6	9.39	0.000
Area 4	U26	Total	574	6.0%	34	3.38	0.000
	O26	Total	318	6.0%	19	8.46	0.000

Table 6. Estimated sport harvest prior to the mean IPHC survey dates in 2016 (final) and 2017(preliminary) in Areas 2C and 3A.

			Charter		Noncharter		Total	
Year	Area	Mean Survey Date	Percent	Harvest (Mlb)	Percent	Harvest (Mlb)	Percent	Harvest (Mlb)
2016	2C	June 25	23.1%	0.182	23.6%	0.308	23.4%	0.491
	3A	July 04	33.9%	0.679	44.4%	0.678	38.4%	1.357
2017	2C	Jul7 05	33.1%	0.292	32.8%	0.464	33.0%	0.756
	3A	July 01	30.8%	0.640	39.9%	0.728	35.0%	1.368

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Subsistence Harvests of Pacific Halibut in Alaska, 2016

Division of Subsistence
Alaska Department of Fish and Game

Presentation to the
International Pacific Halibut Commission

Portland, OR
January 2018

Project funded through a grant from the National Marine Fisheries Service: No. NA16NMF4370166

For the full study findings, see:

Fall, James A. and David Koster. 2018. Subsistence Harvests of Pacific Halibut in Alaska, 2016. Alaska Department of Fish and Game, Division of Subsistence Technical Paper No. 436. Anchorage.

Project Background

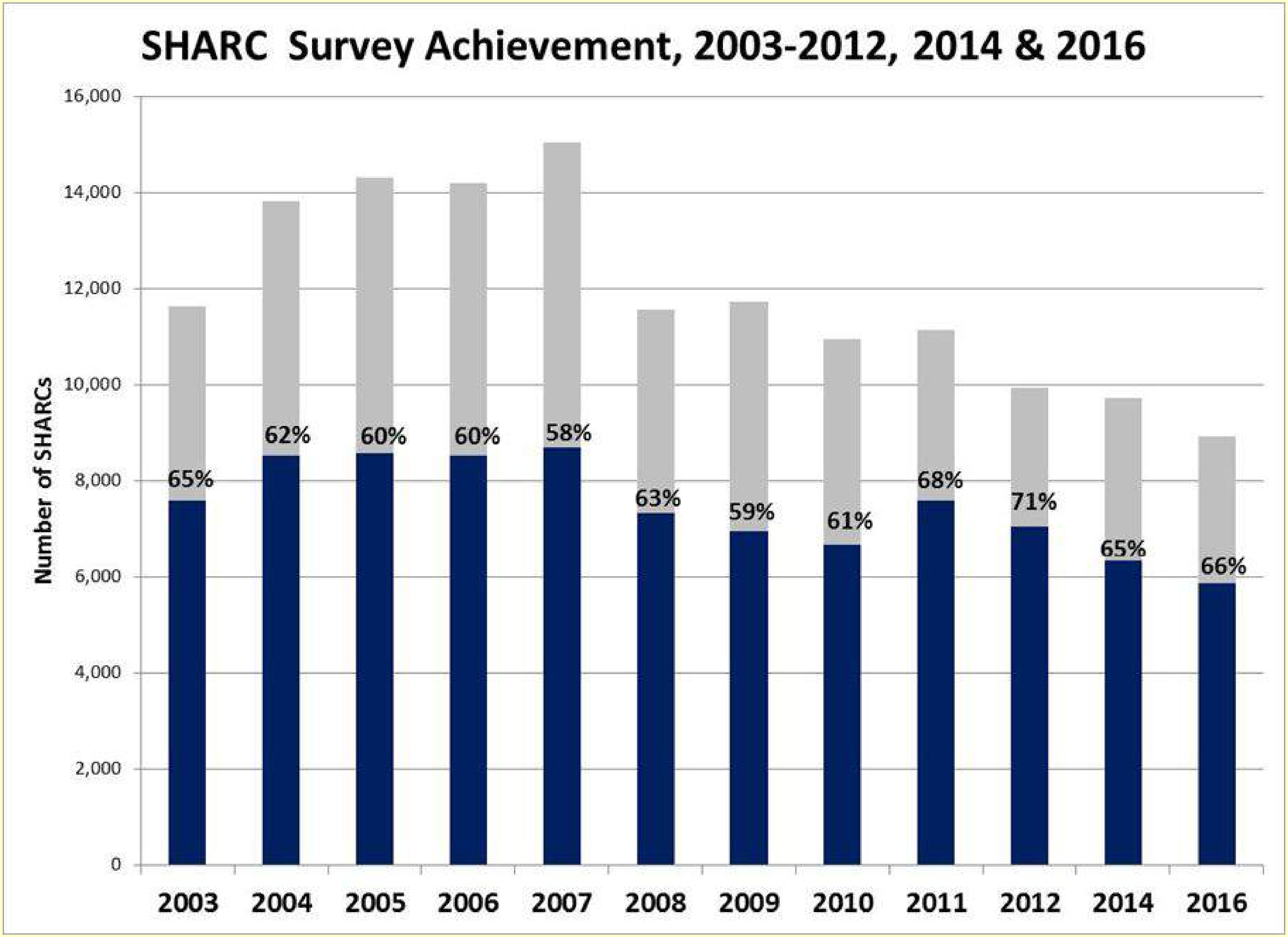
- New subsistence regulations in effect May 2003
- 118 communities and 123 tribes eligible, plus residents of designated rural areas
- Registration requirement (SHARC)
- Regulations have provision for collecting harvest data
- This report covers the 12th year of the harvest assessment program (harvests in 2016)
- Due to funding constraints, the project did not document 2013 or 2015 harvests and will not document 2017 harvests
- If funding available, could continue for 2018

Methods

- Mailed survey is primary data collection method; response voluntary
- Mailed to all persons holding SHARCs during 2016: 8,779
- Three rounds of mailings
- Supplemented by contacts & interviews in 5 communities in southeast and western AK
- Harvests of some non-SHARC holders (146) included in estimates
- Total target group = 8,925 potential fishers

Sample Achievement for 2016

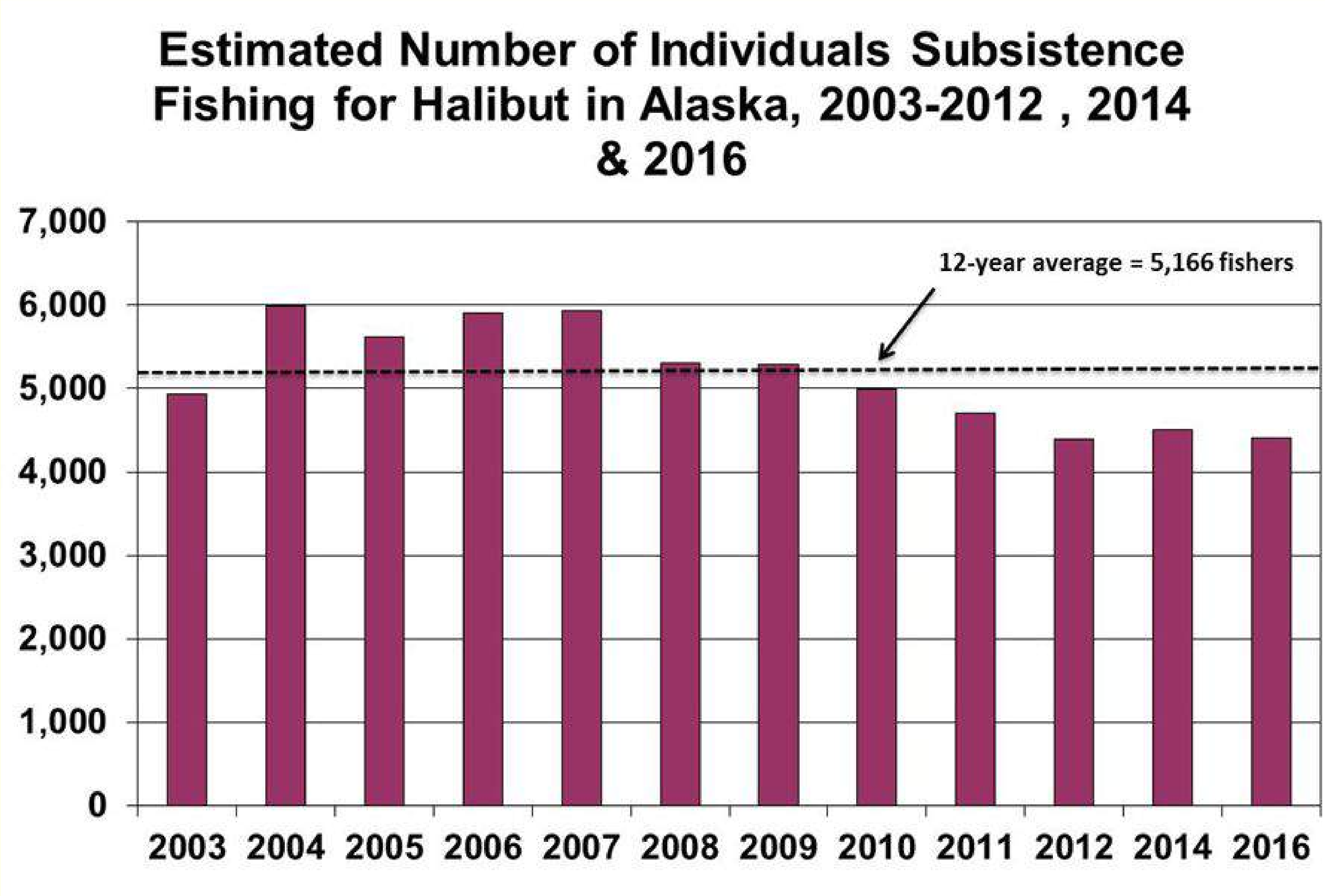
- **5,862 surveys returned**, of 8,925 potential fishers
- **Sampling fraction of 66%**
- **High rates of return** achieved in most larger communities with the most SHARCs issued



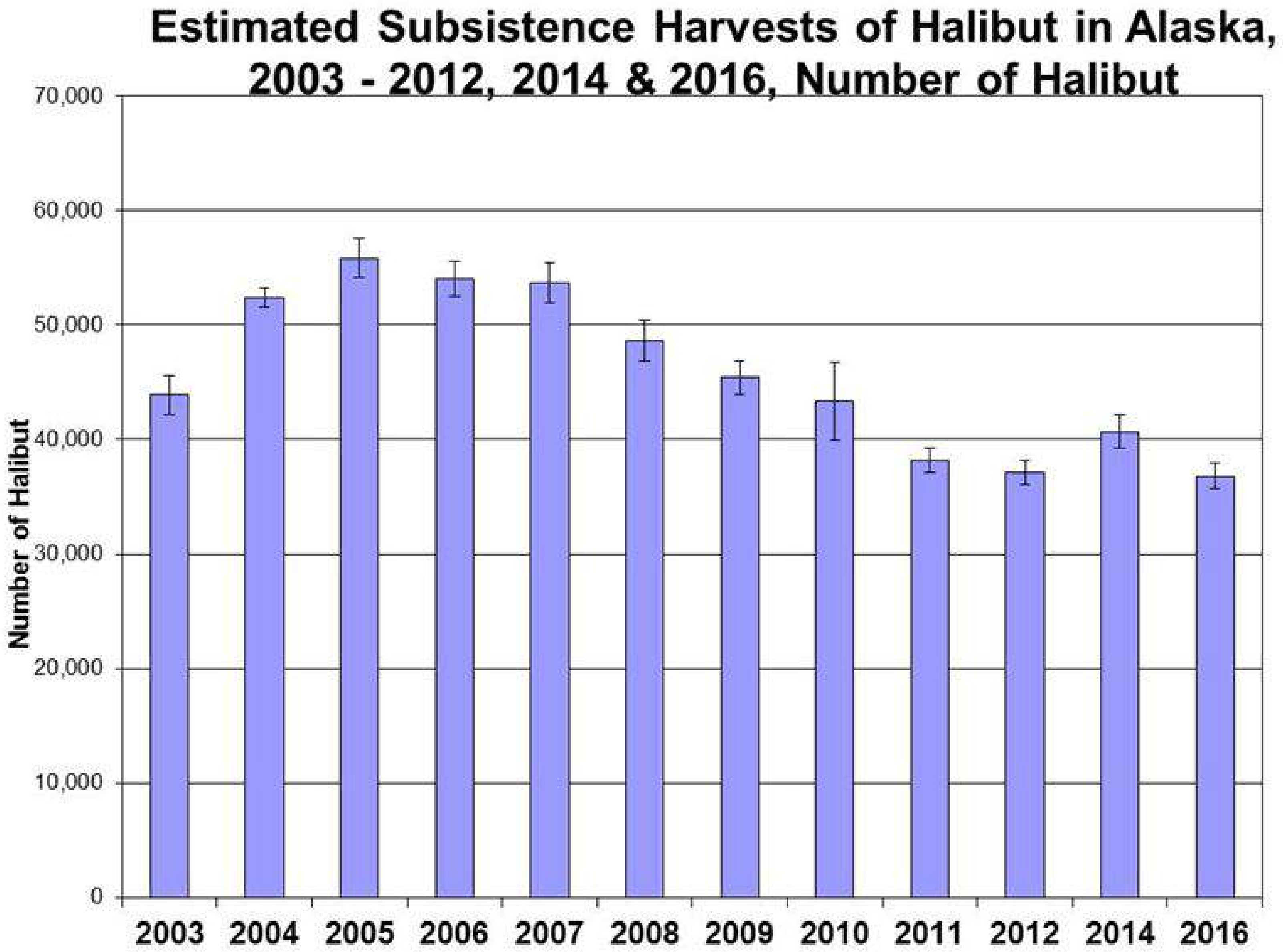
SHARC Survey Achievement, 2003-2012, 2014 & 2016
Number of SHARCs
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
65%
62%
60%
60%
58%
63%
59%
61%
68%
71%
65%
66%
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2014
2016

Study Findings: Halibut 2016

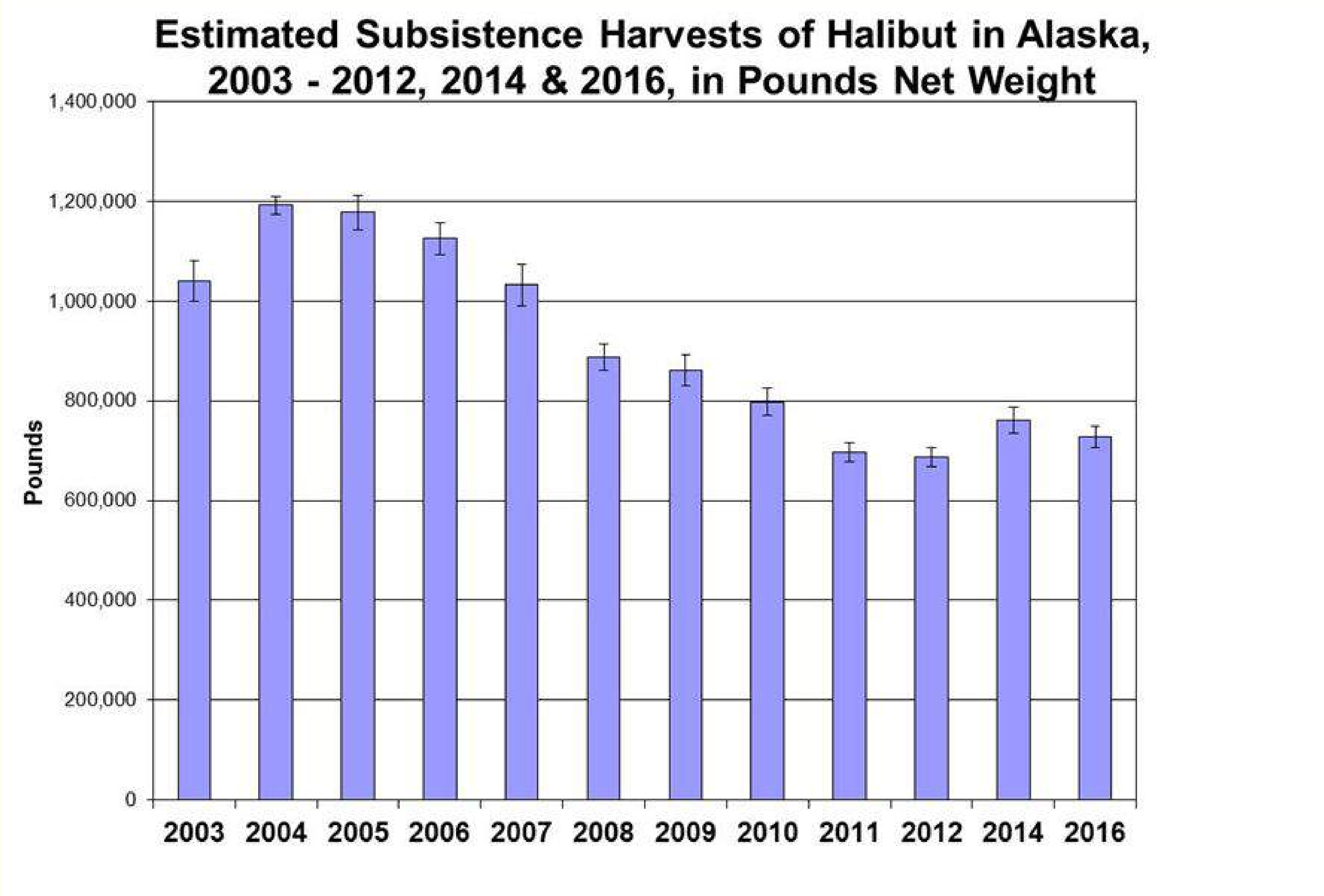
- Estimated number of **subsistence fishers = 4,408**
- Estimated subsistence harvest = **36,815 halibut**
- Estimated subsistence harvest = **727,178 lbs** net weight (= 75% of round weight) (19.8 lbs/fish)
- **60% of harvest occurred in Area 2C** (SE Alaska), 31% in Area 3A (SC Alaska), & 6% in Area 4E (East Bering Sea Coast)
- 75% of harvest taken with setline gear; 25% with hand-operated gear

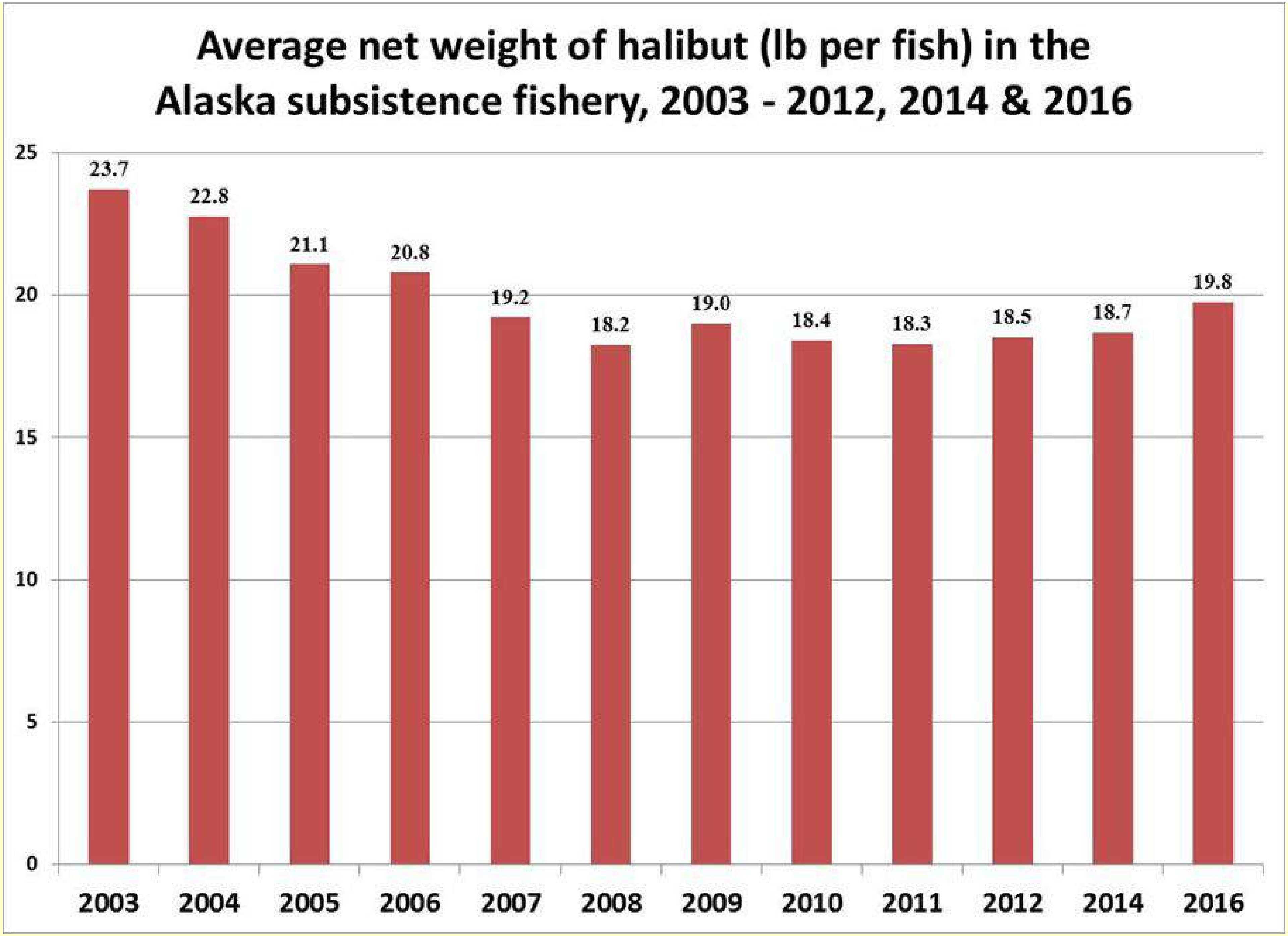


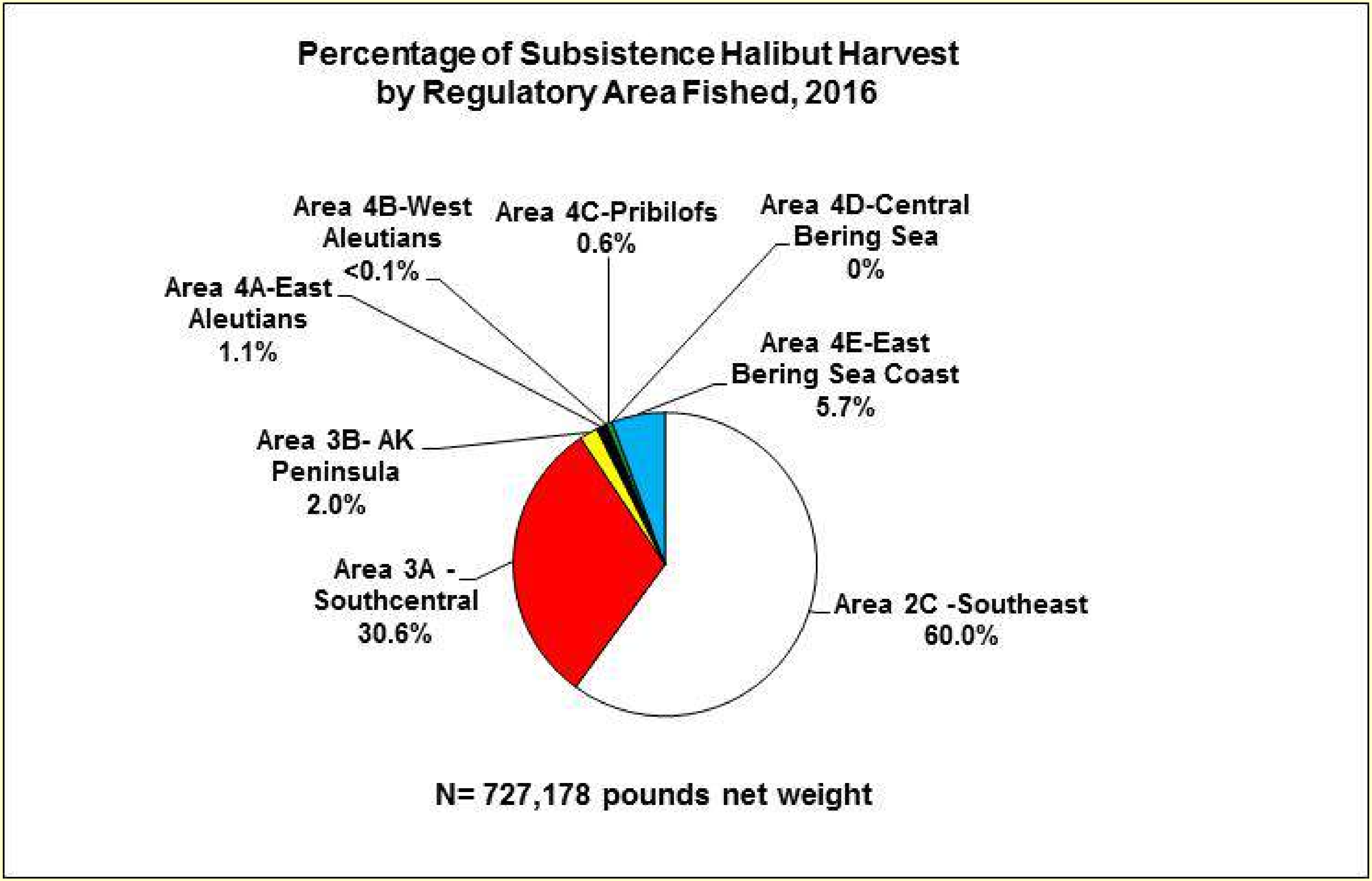
Estimated Number of Individuals Subsistence Fishing for Halibut in Alaska, 2003-2012 , 2014 & 2016
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
12-year average = 5,166 fishers
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2014
2016

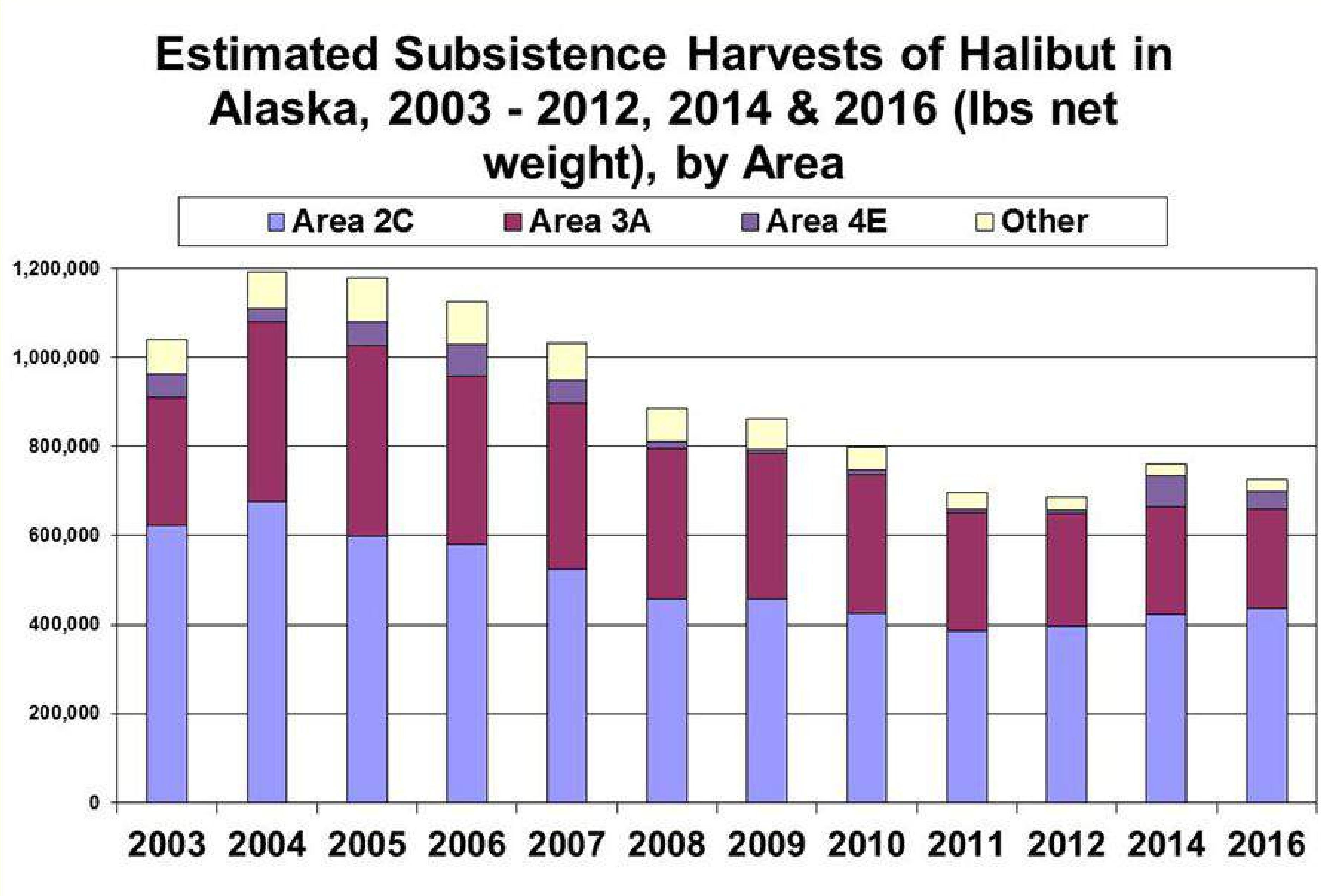


Estimated Subsistence Harvests of Halibut in Alaska, 2003 - 2012, 2014 & 2016, Number of Halibut
Number of Halibut
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2014
2016

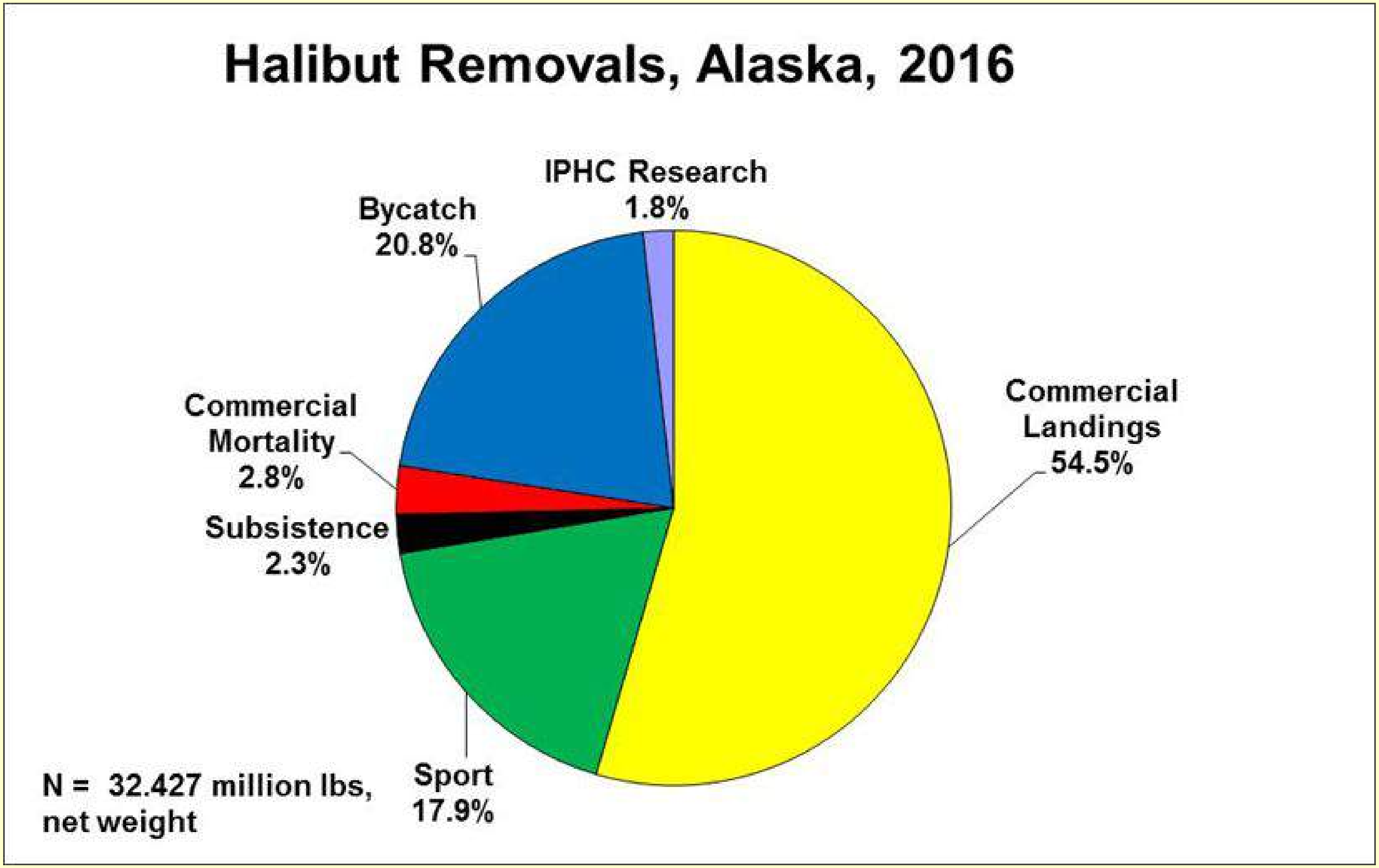

Estimated Subsistence Harvests of Halibut in Alaska, 2003 - 2012, 2014 & 2016, in Pounds Net Weight
Pounds
1,400,000
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2014
2016


Average net weight of halibut (lb per fish) in the
Alaska subsistence fishery, 2003 - 2012, 2014 & 2016
25
20
15
10
5
0
23.7
22.8
21.1
20.8
19.2
18.2
19.0
18.4
18.3
18.5
18.7
19.8
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2014
2016


Percentage of Subsistence Halibut Harvest
by Regulatory Area Fished, 2016
Area 4B-West Aleutians <0.1%
Area 4C-Pribilofs 0.6%
Area 4D-Central Bering Sea 0%
Area 4A-East Aleutians 1.1%
Area 4E-East Bering Sea Coast 5.7%
Area 3B- AK Peninsula 2.0%
Area 3A - Southcentral 30.6%
Area 2C -Southeast 60.0%
N= 727,178 pounds net weight



Estimated Subsistence Harvests of Halibut in Alaska, 2003 - 2012, 2014 & 2016 (lbs net weight), by Area
Area 2C
Area 3A
Area 4E
Other
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2014
2016



- Subsistence harvests by area ranged from 6.4% in Area 2C to 0.4% in Area 3B

Conclusions: Harvest Survey, 2016

- Overall, 2016 harvest survey was a success: good response rates and overall reliable harvest estimates
- Can discern some general patterns in the fishery since the new regulations came into effect
- Reasons for overall decline in harvests likely complex and require further investigation
- Concerns about nonrenewal of SHARCs, especially in certain regulatory areas
- Need to supplement mailed SHARC survey with in-person survey in portions of Area 4
- Recommendation to continue harvest monitoring

For More Information

- Division of Subsistence Website: www.subsistence.adfg.state.ak.us and go to publications for final report
- Or: call us at 907-465-4147, or 465-3617, or 267-2353
- Or write: ADF&G, Division of Subsistence, 333 Raspberry Road, Anchorage, AK, 99518
- Or contact NMFS at: 1-800-304-4846 (option 2) or www.fakr.noaa.gov/ram/subsistence/halibut.htm

IPHC-2018-AM094-AR16
Received: 9 January 2018

NOAA Fisheries Office of Law Enforcement
Alaska Enforcement Division
Report to the
International Pacific Halibut Commission

January 1, 2017 to December 1, 2017

NOAA Fisheries Office of Law Enforcement
Alaska Enforcement Division
P.O. Box 21767
Juneau, AK 99802
907-586-7225

TO REPORT VIOLATIONS:
Call 1-800-853-1964

The Alaska Enforcement Division utilizes Enforcement Officers, Special Agents and partnerships with the Alaska Wildlife Troopers and the U.S. Coast Guard to enforce federal fishing regulations over 842,000 square miles of ocean, 6,600 miles of coastline and 2,690 islands off of Alaska. Compliance is achieved by providing outreach and education, conducting patrols, monitoring offloads, and by investigating violations of civil and criminal marine resource laws.

Compliance Assistance

During 2017, Alaska Enforcement Division personnel spent over 1983 hours providing compliance assistance by way of outreach and education with marine resource users. This is an increase from 1711 hours in 2016, and 1687 hours in 2015. Outreach efforts occurred at a number of organized events as well as contacts in communities, ports, and at-sea to ensure that the most current and accurate regulatory information is widely distributed and understood.

Halibut Related Violations

	2015 Violations Documented	**2016*** Violations Documented	**2017** Violations Documented
Subsistence Halibut	18	33	26
Commercial Halibut	178	211	121
Charter Halibut	186	309	203
Sport Halibut	36	64	15
TOTAL	**418**	**602**	**365**

*** In July 2016 OLE implemented a new records management system (RMS) that contains data migrated from the old RMS to the new RMS. Not all data fields were exact matches between the two RMS systems and some data transfer error may have occurred.**

Halibut Related Violations documented by NOAA in Alaska in 2017:

26 Subsistence halibut fishing violations, most common violations included:

- Unqualified person applied for SHARC
- Improperly or unmarked subsistence halibut fishing gear
- Subsistence halibut fishing without SHARC
- Exceeding bag and/or possession limits
- Mutilating Halibut

121 Commercial IFQ or CDQ halibut, most common violations included:

- 34 IFQ halibut overages in 2017
  - 33 IFQ halibut overages in 2016
  - 40 IFQ halibut overages in 2015
- Record keeping or reporting violations (PNOL, Landing Report, Logbook)
- Gear marking violations
- Retain undersized halibut, or discarding legal sized halibut
- Hired Skipper and Permit Holder violations

- Vessel Cap Overages
- Misreporting IFQ area fished or fishing in an area with no IFQ available
- Crab pots onboard
- Fishing without an FFP

203 plus Charter halibut fishing violations were documented, most common violations included:

- Logbook violations-
    - Fail to ensure charter halibut anglers sign the logbook
    - Fail to record CHP on front of ADFG logbook, invalid CHP
    - Report inaccurate information
- GAF reporting violations- Failure to report GAF in the required time, submitting inaccurate information
- Illegal guiding - No CHP
- Filleting, mutilating or skinning halibut onboard a vessel
- Exceeding bag limit; possession limit; size limits or annual limits
    - Over annual limit
    - Crew retaining Charter halibut
- Fishing on closed days
- Charter fish without a CHP

15 Sport halibut fishing violations were documented, most common violations included:

- Sale or attempted sale of sport caught halibut
- Exceeding bag and/or possession limits
- Filleting, mutilating or skinning halibut onboard a vessel-10 cases
- Fishing without a permit
- Using illegal gear
- Sport caught halibut onboard with commercial caught salmon

19 Commercial groundfish violations involving halibut, most common violations included:

- Fail to carefully release halibut or allow halibut to contact a crucifier or hook stripper.
- Retain halibut caught with fixed gear without a valid IFQ permit in the name of an individual aboard.
- Making an IFQ landing without an IFQ permit in the name of the individual making the landing.
- Failure to have an IFQ hired master permit, as appropriate, in the name of the individual making the landing.

Patrol and Boardings

During 2017, Alaska Enforcement Division personnel spent over 4,972 hours conducting patrols to provide a visible deterrence to potential violators, to monitor fishing and other marine activities, to detect violations, to provide compliance assistance, and to provide outreach and education. This is compared to 4,476 patrol hours in 2016, and 3,363 patrol hours in 2015. Alaska Enforcement Division personnel boarded 1216 fishing vessels during 2017; 698 were halibut related boardings.

	2015			2016*			2017		
	Vessel Boardings	Violations Discovered During Boarding	Observed Compliance	Vessel Boardings	Violations Discovered During Boarding	Observed Compliance	Vessel Boardings	Violations Discovered During Boarding	Observed Compliance
Subsistence Halibut	4	2	50%	18	9	50%	34	4	88%
Commercial Halibut	195	5	97%	550	65	88%	231	27	88%
Charter Halibut	70	18	75%	197	56	72%	185	24	87%
Sport Halibut	229	8	97%	368	59	84%	248	12	95%
Total	**498**	**33**	**93%**	**1133**	**189**	**83%**	**698**	**67**	**90%**

*** In July 2016 OLE implemented a new records management system (RMS) that contains data migrated from the old RMS to the new RMS. Not all data fields were exact matches between the two RMS systems and some data transfer error may have occurred.**

Incidents

During 2017, NOAA's Alaska Enforcement Division opened 986 halibut related incidents including outreach, vessel boardings, dockside monitoring, and compliance assistance. Of the 986 incidents, officers identified 523 halibut related violations which were handled by Compliance Assistance, Summary Settlement or a Written Warning.

Alaska Enforcement Division Investigations

	2015	2016*	2017
Total Cases Opened	623	2873	3151
Total Violations Documented	1,393	1741	1621
Halibut Related Violations	475	602	523
Percentage of Violations Halibut Related	34%	35%	32%

*** In July 2016 OLE implemented a new records management system (RMS) that contains data migrated from the old RMS to the new RMS. Not all data fields were exact matches between the two RMS systems and some data transfer error have may occurred.**

Partnerships
NOAA OLE works closely with the U.S. Coast Guard and the Alaska Wildlife Troopers to accomplish common goals and priorities by working together on a daily basis to maximize compliance with marine resource laws and regulations.

An Enforcement Officer completed a 14-day joint patrol with the Alaska Wildlife Troopers onboard the P/V Enforcer. 1,251 nautical miles were patrolled, 140 vessels were boarded, and 404 individuals were contacted. Additionally, 112 individual pieces of gear were inspected. These actions resulted in the issuance of 29 citations and 40 warnings/compliance assistance (state/federal). Common violations encountered were over limit of halibut, possession of sport caught halibut with commercial fish, failure to log as required (sportfish), and possession of undersized king salmon. Additionally, during the patrol, the P/V Enforcer rescued two occupants of a sport fishing vessel stranded by gale force winds on eastern Prince of Wales Island.

An Enforcement Officer completed an 11-day joint patrol with the Alaska Wildlife Troopers onboard the P/V Enforcer. 566 nautical miles were patrolled, 27 vessels were boarded, and 120 individuals were contacted. Additionally, 123 pieces of gear were checked, of which 50 were seized, including two derelict longlines. These actions resulted in three citations being issued along with 8 incidents of compliance assistance/verbal warnings. Common violations observed were, inaccurate charter halibut logbook entries, failure to properly mark subsistence longline, non-resident fail to log King Salmon, unmarked personal use/sportfish gear, failure to maintain proper escapement device, and using sport caught fish as bait.

An Enforcement Officer completed a nine-day joint patrol with the Alaska Wildlife Troopers onboard the P/V Stimson. Areas patrolled included the Gulf of Alaska and Bering Sea/Aleutian Islands (BSAI), with port / processor visits in Sand Point, King Cove, and Akutan. Eleven vessels were boarded.

An Enforcement Officer completed a 12-day joint patrol onboard the USCGC Sherman. Areas patrolled included BSAI, Pribilof Islands, St. Matthew Island, and the U.S./Russian Maritime Boundary Line; Six vessels were boarded.

Adjudicated Significant Halibut Investigations

An AKD Special Agent completed an investigation into the sale of subsistence halibut from a subsistence fisherman to a restaurant in Ketchikan, Alaska. The subsistence fisherman was approached by the management of the restaurant who requested that he harvest halibut for the restaurant. This occurred on two separate occasions. The subsistence fisherman was paid $1,870 for the halibut he provided to the restaurant. A settlement agreement was signed and a $6,870 penalty was assessed.

An individual was charged under the Halibut Act for unlawfully retaining halibut caught with fixed gear without a valid IFQ permit in the name of that individual aboard. This individual was a member of the Annette Island Reserve (AIR) who was fishing for halibut in IPHC Area 2C, which is outside of AIR waters, without an IFQ permit or a State of Alaska CFEC license. An $8,000 NOVA was issued.

Subsistence fisherman from Craig, Alaska was issued and paid an $800 summary settlement for retaining 24 halibut when the limit was 20.

<u>Photos documenting illegal commercial halibut fishing without IFQ permits</u>

IPHC Closed Area (Section 10)

PREPARED BY: IPHC SECRETARIAT (19 DECEMBER; 2017)

PURPOSE

To consider the intent and purpose of the IPHC Closed Area, as defined in IPHC Fishery Regulations (2017) Section 10, which currently excludes directed *"halibut fishing"* (i.e. the longline fleet), with the intent of protecting juveniles from extraction.

BACKGROUND

In 1967, the IPHC designated part of Regulatory Area 4E in Bristol Bay as a separate area closed to longline fishing. The justification for the closure was that it was considered to be a nursery area for juvenile Pacific halibut.

In 1990, IPHC Regulatory Area 4E was expanded into "inner" Bristol Bay, reducing the IPHC Closed Area to its current boundaries as described in Regulation 10 of the IPHC Fishery Regulations (2017).

At the time of the closure's implementation, limited trawling occurred in Bristol Bay. Since then, trawling has expanded substantially in the Bering Sea region and now includes Bristol Bay, thereby negating any likely benefits of closing the area to the directed Pacific halibut fishery only.

At the 92nd Session of the IPHC Interim Meeting (IM092, 29-30 November 2016), the Commission reviewed the draft regulatory proposal from the IPHC Secretariat, and made the following comments/requests:

Removal of the IPHC Closed Area.

IM092, Para 66: *The Commission* ***REQUESTED*** *that additional supporting information be provided for consideration at the 93rd Session of the IPHC Annual Meeting, including any supporting evidence for the area as a nursery ground and the likely impacts of the directed fishery being allowed access*.

IM092, Para 67: *The Commission* ***AGREED*** *that as appropriate, information on other gears which are currently permitted to fish in the IPHC Closed Area (i.e. trawl), and their impact (i.e. bycatch of juveniles), along with information on the history of the lines marking Areas 4CDE, and past considerations by IPHC and the NPFMC*.

IM092, Para 68: *The Commission* ***NOTED*** *that the IPHC Secretariat considers Regulatory Areas 4CDE and the IPHC Closed Area to be a single unit for assessment purposes*.

At the 93rd Session of the IPHC Annual Meeting (AM093, 23-27 January 2017), the Commission considered the draft regulatory proposal from the IPHC Secretariat, as well as the accompanying information paper, and made the following comments and requests:

IPHC-2017-AM093-PropB: IPHC Closed Area - removal

AM093, Para 50: *The Commission **CONSIDERED** a proposal aimed at removing the IPHC Closed Area, as defined in IPHC Regulation 10, which applies to "halibut fishing" only (IPHC-2017-AM093-PropB), but agreement could not be reached and the proposal was **DEFERRED** until the 94th Annual Meeting of the Commission*.

AM093, Para 51: ***NOTING** the detailed information gathered and presented to the Commission in support of the removal of the IPHC Closed Area (PropB), as detailed in paper IPHC-2017-AM093-INF03 on the following topics:*

- *Past considerations*
- *History of boundaries*
- *Bycatch*
- *Nursery grounds*
- *Other nearby closed areas*
- *Impacts of allowing directed Pacific halibut fishing*

*the Commission **REQUESTED** further information be provided on whether the area is a nursery ground for Pacific halibut, by examining juvenile abundance from data sources including but not limited to observer programs and the NMFS trawl surveys, and comparing this information with the impact of the directed fishery operating in nearby areas, as well as the non-directed fisheries currently operating within the Closed Area.*

AM093, Para 52: ***NOTING** that while the Processor Advisory Group (PAG) provided unanimous support for the proposal, the Conference Board did not, making the following statement on Regulatory Proposal B:*

> "The Conference Board discussed the idea of the Closed Area as a nursery and felt it should be closed to all other fisheries rather than allowing the longline halibut fleet to fish in the area."

AM093, Para 53: ***NOTING** the Conference Board's comment detailed in para 52, the Commission **AGREED** that closing the area to fisheries not managed by the IPHC is not permissible under the IPHC mandate and thus, it would not be proposing such a measure at this time, or at any time in the future. Should members of the Conference Board wish to further their proposed course of action, they should take up the matter with the relevant management body, in this case the NPFMC*.

In response to the Commission's requests detailed in paragraph 51 of the AM093 Report, these data are expected to be available before the 94th Session of the IPHC Annual Meeting (AM094) in January 2018, with an accompanying analysis of the IPHC Closed Area's performance as a nursery ground relative to nearby areas.

Further background information is provided in Appendix I, including:

1) Past considerations
2) History of boundaries
3) Bycatch
4) Areas of high juvenile abundance
5) Other nearby closed areas
6) Impact of allowing directed Pacific halibut fishing.

DISCUSSION

1) Definitions:
    a. Nursery ground: geographic area where Pacific halibut larva settle in large numbers and where they remain for a period of growth prior to initiating large-scale dispersal
    (ref: IPHC-2014-RARA24; Chapter 24).
    b. Juvenile fish: Post-settlement fish, mostly similar in form and coloration to adult fish, that are yet to attain sexual maturity
    (ref: IPHC-2014-RARA24; Chapter 24).
2) Noting the definitions above, retaining the IPHC Closed Area in its current form, whereby the directed fishery is prohibited from fishing within the area, is unfounded, as the intention is to protect juveniles. The directed Pacific halibut fishery is dominated by adults by nature, and catches few juvenile Pacific halibut. However, the non-directed trawl fleet is currently permitted to fish within the Closed Area and is known to have a substantial negative impact on juveniles. Prohibiting a longline fishery from the area, while permitting a trawl fishery, is at odds with the Commission's stated objective for the IPHC Closed Area.
3) In order to be compatible with current domestic management of commercial Pacific halibut fisheries in the other IPHC Regulatory Areas in Alaska, a move by the Commission to open the IPHC Closed Area to directed Pacific halibut fishing should include coordination with the North Pacific Fishery Management Council (NPFMC) and NMFS regarding domestic management of access to the fishery. For this reason, the Commission may wish to consider a phased approach to making this change during its discussion at AM094.
4) Noting that the IPHC Closed Area was formerly part of IPHC Regulatory Area 4E, and that the stock assessment includes the IPHC Closed Area together with IPHC Regulatory Areas 4C, 4D, and 4E as a single unit, the Secretariat recommends that it become part of IPHC Regulatory Area 4CDE if it is opened to directed Pacific halibut fishing. Removing the IPHC Closed Area would not create any new fish or increase the harvest recommendations in Regulatory Area 4CDE. This designation should be considered in conjunction with the domestic fishery management coordination discussed in the preceding paragraph.

Conclusion: Retaining the IPHC Closed Area (IPHC Regulation 10 (2017) in its current form, whereby the directed fishery is prohibited from fishing within the area, and with the intent of protecting juveniles from extraction by the longline fleet, will continue to be ineffectual if other fisheries which are known to catch and have a high mortality of juveniles, such as bottom trawl, continue to be permitted access.

Sectors Affected: Directed commercial Pacific halibut fishery in Alaska.

Options the Commission may wish to consider include:

OPTION 1: Remove the IPHC Closed Area via a phased approach in concert with NPFMC and NMFS.

OPTION 2: Agree that the Closed Area is not currently meeting its intended objective of protecting juvenile Pacific halibut, and direct the IPHC Secretariat to examine alternative management regimes for the Closed Area, and for these to be presented at the 95th Annual Meeting in 2019.

OPTION 3: Retain the IPHC Closed Area and request that the NPFMC consider also closing the area to trawl fisheries in order to protect juvenile Pacific halibut.

SUGGESTED REGULATORY LANGUAGE

If the decision is made to remove the IPHC Closed Area, the following change to the IPHC Regulations text would be required:

Regulation 10: Remove IPHC Regulation 10, Closed Area, in its entirety:

~~*10. Closed Area*~~

~~*All waters in the Bering Sea north of 55°00´00´´ N. latitude in Isanotski Strait that are enclosed by a line from Cape Sarichef Light (54°36´00´´ N. latitude, 164°55´42´´ W. longitude) to a point at 56°20´00´´ N. latitude, 168°30´00´´ W. longitude; thence to a point at 58°21´25´´ N. latitude, 163°00´00´´ W. longitude; thence to Strogonof Point (56°53´18´´ N. latitude, 158°50´37´´ W. longitude); and then along the northern coasts of the Alaska Peninsula and Unimak Island to the point of origin at Cape Sarichef Light are closed to halibut fishing and no person shall fish for halibut therein or have halibut in his/her possession while in those waters except in the course of a continuous transit across those waters. All waters in Isanotski Strait between 55°00´00´´ N. latitude and 54°49´00´´ N. latitude are closed to halibut fishing.*~~

Subsequent Regulations would then need to be re-numbered accordingly.

Reference to the IPHC Closed Area would also need to be removed from IPHC **Regulation 6**, paragraphs 6, 8 and 10. IPHC **Regulation 6** would require additional changes in the descriptions of boundaries depending on how the former IPHC Closed Area is included among IPHC Regulatory Areas.

APPENDICES

Appendix I: Supporting Documentation regarding the IPHC Closed Area

APPENDIX I

Supporting Documentation regarding the IPHC Closed Area

This appendix is an updated version of information provided originally at AM093. Contents:

1) Past considerations
2) History of boundaries
3) Bycatch
4) Areas of high juvenile abundance
5) Other nearby closed areas
6) Impact of allowing directed Pacific halibut fishing

1) PAST CONSIDERATIONS BY IPHC AND THE NPFMC

The IPHC has closed areas in the past to protect Pacific halibut in areas of juvenile abundance and subsequently reopened them. As described in Trumble 1998 (Annex I), the IPHC closed two areas in 1932 in Canadian and Southeast Alaskan waters and reopened them in 1960 after surveys showed an accumulation of older and larger fish in the areas.

The current IPHC Closed Area was initially created to protect juvenile Pacific halibut in a nursery ground from foreign fishing effort, including Japanese and Soviet trawl fisheries and longline fisheries (Technical Report 15 [p.13-14] and Annex II). The Closed Area provided protection for juvenile Pacific halibut in the 1960s and 1970s when these fleets were excluded from the area, and bycatch mortality dropped to a low of 4.21Mlb in 1985 (IPHC unpublished [Annex III]). After Americanization of the fishing fleet in the 1980s, foreign fishing fleets were excluded from fishing in US waters and US vessels were again allowed to fish in the Closed Area. With this development, the IPHC Closed Area no longer served its intended purpose to protect small, immature Pacific halibut. The North Pacific Fishery Management Council (NPFMC) chose other measures to reduce bycatch of Pacific halibut, including fishery-specific bycatch limits and other fishery-specific closed areas within the IPHC Closed Area. The only fishery that remains completely excluded from the IPHC Closed Area is the directed commercial longline Pacific halibut fishery.

In 1990, the IPHC Closed Area in the Bering Sea was reduced in size because IPHC survey data suggested that while the abundance of large Pacific halibut was low, relatively few juveniles would be vulnerable to capture with longlines (see IPHC Technical Report 27 [p.26] and Annex II). More recently, in 2015, the IPHC survey fished with longline gear in the IPHC Closed Area and found 32% (683 lb) of the catch was under 32 inches total length (U32, a proxy for juvenile halibut) out of a total catch in the closed area of 2,107 lb (19 stations). The rest of the Area 4CDE survey in that year caught 28% (8,360 lb) of U32 out of a total catch of 30,010 lb (143 stations). For comparison, 97% of the Pacific halibut bycatch from the groundfish trawl fishery in Area 4CDE, including that taken within the IPHC Closed Area, was U32 in 2015 (see section 3 below on bycatch from fisheries currently in the area).

After the IPHC Closed Area was reduced in size in 1990, the Commission requested a review of the Closed Area in the late 1990s (Trumble 1998, Annex I). Trumble states that the IPHC Closed Area:

a) Does not reduce Pacific halibut bycatch mortality,

b) Provides little biological benefit to the Pacific halibut resource, and
c) Does not protect nursery grounds because fisheries that catch juvenile halibut are fishing in the area.

Trumble also refers to the IPHC Closed Area as a possible buffer for uncertainty in the stock assessment and management of Pacific halibut. However, as noted in IPHC unpublished (Annex III):

> "*Since 1998, the Commission has accumulated sufficient data and has been able to generate stock assessments for the Bering Sea with considerably greater confidence than was possible in 1998. Therefore, the staff no longer sees a purpose for the Closed Area as such a guard against uncertainty*."

Between 2011 and 2013, the Commission reviewed the purpose of the IPHC Closed Area and considered removing it or, conversely, allowing directed commercial longline Pacific halibut fishing in the area. The series of events from this consideration were as follows:

a) The status and effect of the IPHC Closed Area was discussed at the IPHC's 2011 Interim Meeting and the 2012 Annual Meeting. During the 2012 Annual Meeting, the Commission

> "*briefly discussed the current use of the closed area. Dr. Leaman iterated that the staff position is that there is no compelling reason to exclude only halibut fishers when other harvesters are allowed to exploit the area. It was noted that the process of opening the area and allocating catch would require actions by the NPFMC. The Commission decided to write a letter to the NPFMC stating that the IPHC is considering opening the area as soon as 2013, and requires guidance on how to approach it*."

b) IPHC sent a letter to the NPFMC on 9 August 2012 noting that the IPHC was reviewing the purpose of the Closed Area and was contemplating potential action to no longer prohibit directed commercial halibut longline fishing in the area. (Annex IV)

c) NPFMC responded in a letter, dated 19 October 2012, stating the NPFMC

> "*did not identify any allocative impacts of such an action on its Area 4CDE Catch Sharing Plan and supports incorporating the closed area into Area 4E, should the IPHC choose to do so, with the understanding that such an action would not result in an increase in the commercial catch limit for that expanded area.*" (Annex V)

d) At the IPHC's 2012 Interim Meeting, the Commissioners discussed the IPHC staff proposal to remove the IPHC Closed Area.

e) IPHC staff presented the proposal at the December 2012 NPFMC meeting.

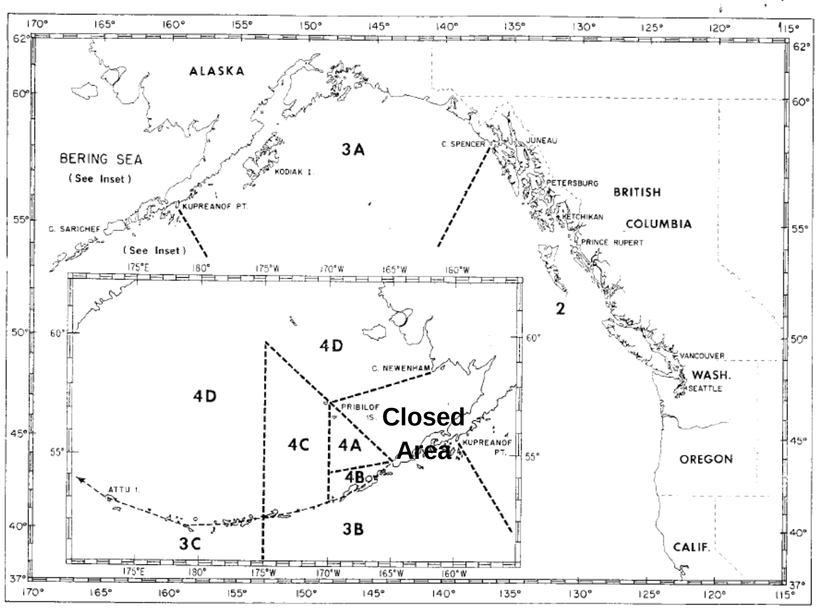
f) At the IPHC's 2013 Annual Meeting, the Commissioners did not approve the proposal to remove the IPHC Closed Area, noting

> "*The letter to the Commission from the NPFMC that described impacts to current programs in the event that the IPHC Closed Area was opened, was reviewed. Following some discussion, the Commission decided that although this may be considered in the future, opening this area is not a high priority issue at this time*."

2) HISTORY OF BOUNDARIES FOR AREA 4CDE AND IPHC CLOSED AREA

Annex VI includes maps and regulations of the boundary changes for the IPHC Closed Area in the Bering Sea before and after the 1967 and 1990 changes, as well as the current 2016 boundary (which is the same as 1990 and is included for reference). IPHC Technical Report 27 also provides a summary of boundary changes. The 1967 and 2016 maps are displayed here as a summary.

1967



Pacific Coast of North America showing the 1967 regulatory areas as defined by the International Pacific Halibut Commission

2016

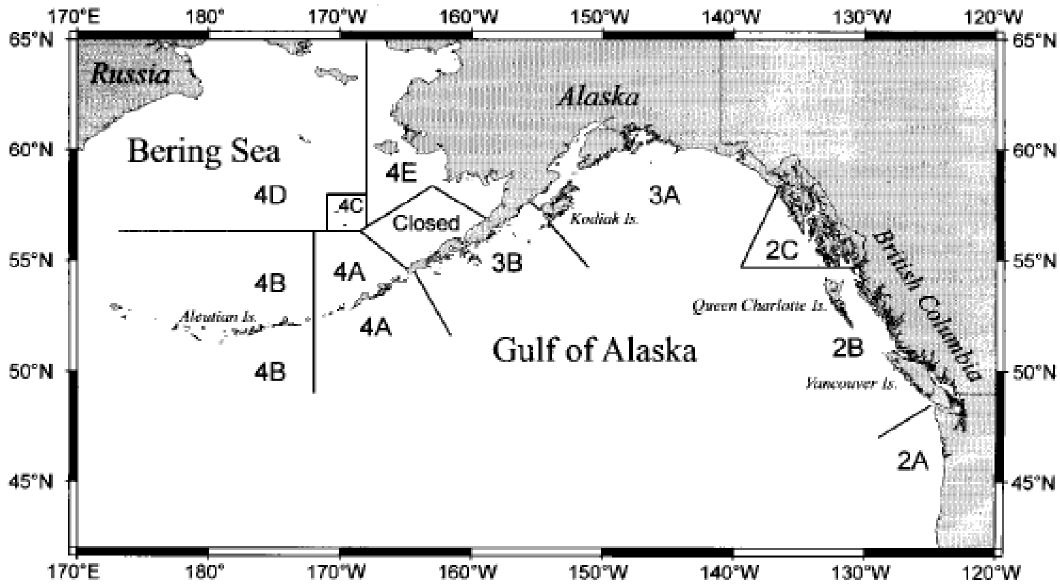


Figure 1. Regulatory areas for the Pacific halibut fishery.

3) AREAS OF HIGH JUVENILE ABUNDANCE

Concentrations of young Pacific halibut exist throughout much of the range of the population from the Bering Sea to at least as far south as British Columbia. A “nursery ground” may be defined broadly as any habitat in which “a juvenile fish or invertebrate species grows at higher densities, avoids predation more successfully, or grows faster there than in a different habitat” (Beck et al. 2001). The IPHC considers Pacific halibut nurseries to be those nearshore habitats where young halibut reside until emigrating to the offshore areas more commonly occupied by adult fish. The age and length range definitions have differed by study and have included halibut < 65 cm fork length (Best 1969, 1974), halibut through age-1 (Loher and Wischniowski 2008), and halibut through age-2 (Best and Hardman 1982). It appears that the majority of halibut settlement and rearing occurs west of Cape St. Alias in the central Gulf of Alaska (Best 1974, Best and Hardman 1982) and throughout the southeastern Bering Sea (Best 1977). Evidence of this larger range of nursery grounds comes from:

Best, E. A. 1974. Juvenile halibut in the Gulf of Alaska: trawl surveys, 1970-1972. Int. Pac. Halibut Comm. Tech. Rep. 12. These data demonstrate nursery-age halibut from Unimak through Shelikof Bay (off Sitka). The lack of any age-1 or even age-2 halibut at Dixon entrance was the first indication that 2C represented the farthest-south settlement and true recruitment potential for halibut.

Best, E.A. 1974. Juvenile halibut in the eastern Bering Sea: trawl surveys, 1970-1972. Int. Pac. Halibut Comm. Tech. Rep. 11. Noting that all sampling was conducted in the Bristol Bay region; that is, didn't extend west to the Pribilofs or North to Nunivak-and-beyond. And, for all of these surveys, the age-1 captures are the best indication of nursery area; age-2 can be useful if the gear wasn't good enough to catch the smaller fish, but isn't really ideal.

Best, E.A. 1977. Distribution and abundance of juvenile halibut in the southeastern Bering Sea. Int. Pac. Halibut Comm. Sci. Rep. 62. This paper captures age-1 halibut off Cape Navarin (Russia, just across IPHC's 4D Edge border) suggesting spawning and nursery ranges as far west as the Russian border.

Best, E. A. and Hardman, W. H. 1982. Juvenile halibut surveys, 1973-1980. Int. Pac. Halibut Comm. Tech. Rep. 20.

Loher, T. and Wischniowski, S. 2007. Using otolith chemistry to determine halibut nursery origin. Int. Pac. Halibut. Comm. Report of Assessment and Research Activities 2006:201-204. See Table 1 and Figure 1 noting age-0 and -1 halibut at every Area 2C location sampled.

Loher, T. and Wischniowski, S. 2008. Using otolith chemistry to determine halibut nursery origin: progress in 2007. Int. Pac. Halibut. Comm. Report of Assessment and Research Activities 2007: 555-562. Figure 1 (pg. 562) shows age-0 halibut caught off of British Columbia (Dogfish Banks area) [Note: Until the 2000s, IPHC researchers did not use a net designed to catch age-0 fish, which is what should be used to help identify nursery grounds.]

References for nursery ground definition:

Best, E.A. 1969. Recruitment investigations: Trawl catch records Bering Sea, 1967. Int. Pac. Halibut Comm. Tech. Rep. 1. 23 p.

Best, E. A. 1974. Juvenile halibut in the eastern Bering Sea: Trawl surveys, 1970-1972. Int. Pac. Halibut Comm. Tech. Rep. 11. 32 p.

Beck, M.W., Heck, K.L. Jr., Able, K.W., Childers, D.L., Eggleston, D.B., Gillanders, B.M., Halpern, B., Hays, CG., Hoshino, K., Minello, T.J., Orth, R.J., Sheridan, P.F., and Weinstein, M.P. 2001. The identification, conservation, and management of estuarine and marine nurseries for fish and invertebrates. BioScience 51(8):633-641.

Loher, T. and Wischniowski, S. 2007. Using otolith chemistry to determine halibut nursery origin: progress in 2007. Int. Pac. Halibut. Comm. Report of Assessment and Research Activities 2007:555-562.

4) Other nearby closed areas

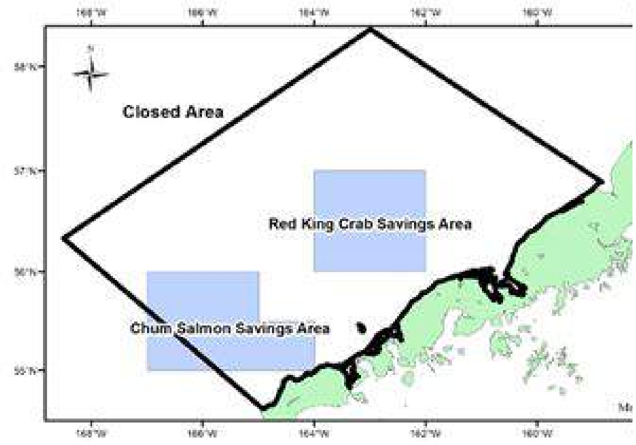
There are several closed areas for other non-halibut fisheries that are located within or near the IPHC's Closed Area. An initial review shows the following nearby closed areas:

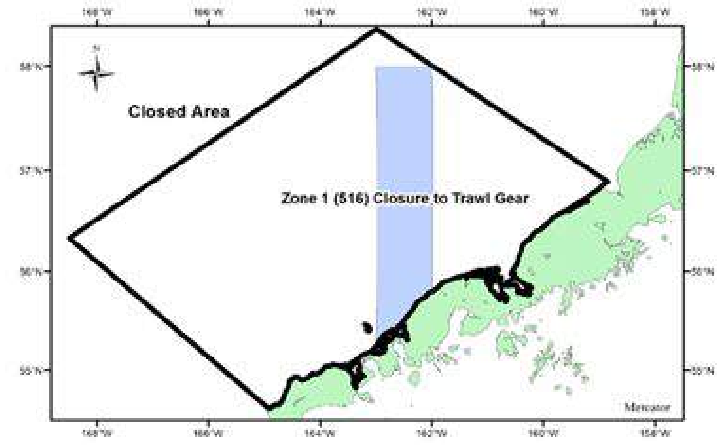
- Chum Salmon Savings Area
- Red King Crab Savings Area
- Steller Sea Lion Protection Areas, Bering Sea Subarea - Pollock Restriction Area (SSLPA, Bering Sea Subarea - Pollock RA)
- Zone 1 (516) Closure to Trawl Gear
- Scallop Closed Areas - Eastern Bering Sea
- Trawl Gear Restricted Area - Bristol Bay (TGRA - Bristol Bay)
- Zone 1 (512) Closure to Trawl Gear
- Steller Sea Lion Protection Areas, Bering Sea Subarea - Groundfish, Pollock, Pacific Cod, and Atka Mackerel Closures (SSLPA, Bering Sea Subarea)
- Alaska Maritime National Wildlife Refuge (AK Maritime NWR)
- Nearshore Bristol Bay Trawl Closure
- Catcher Vessel Operational Area (CVOA)

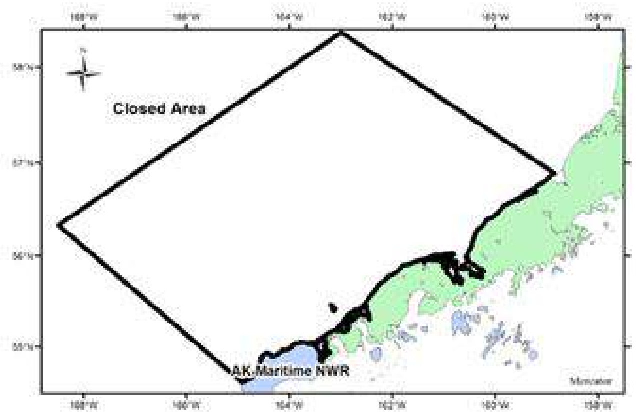
The figures[1] below show the location of these other nearby closed areas.

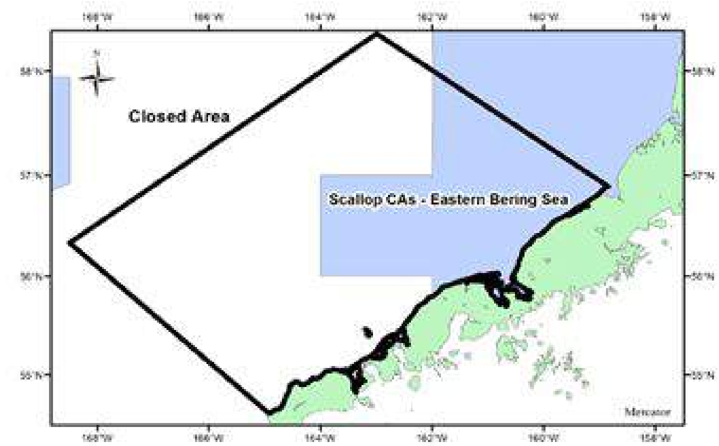
While more information needs to be collected on which fisheries are restricted from these other nearby closed areas and when, we know that groundfish trawl (bottom and pelagic), groundfish hook-and-line, and groundfish pot gear all fish in the IPHC's Closed Area because we have bycatch data from those fisheries in the area (See section 5 on bycatch below).

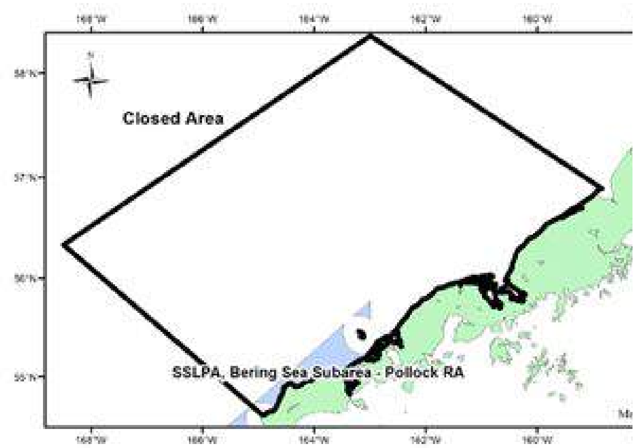
[1] Data from http://marineprotectedareas.noaa.gov/dataanalysis/mpainventory/

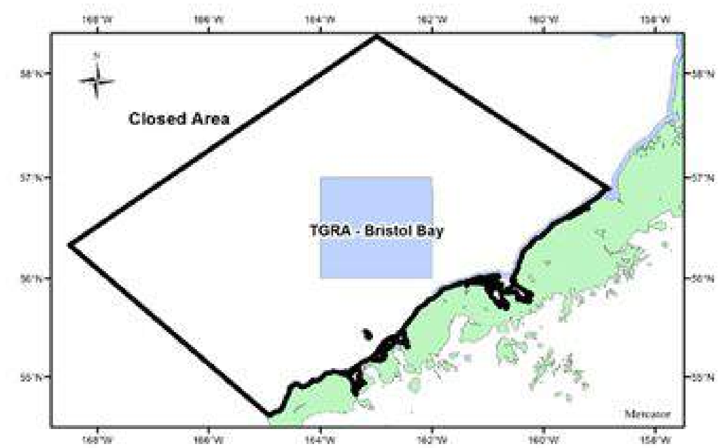

Closed Area
Red King Crab Savings Area
Chum Salmon Savings Area

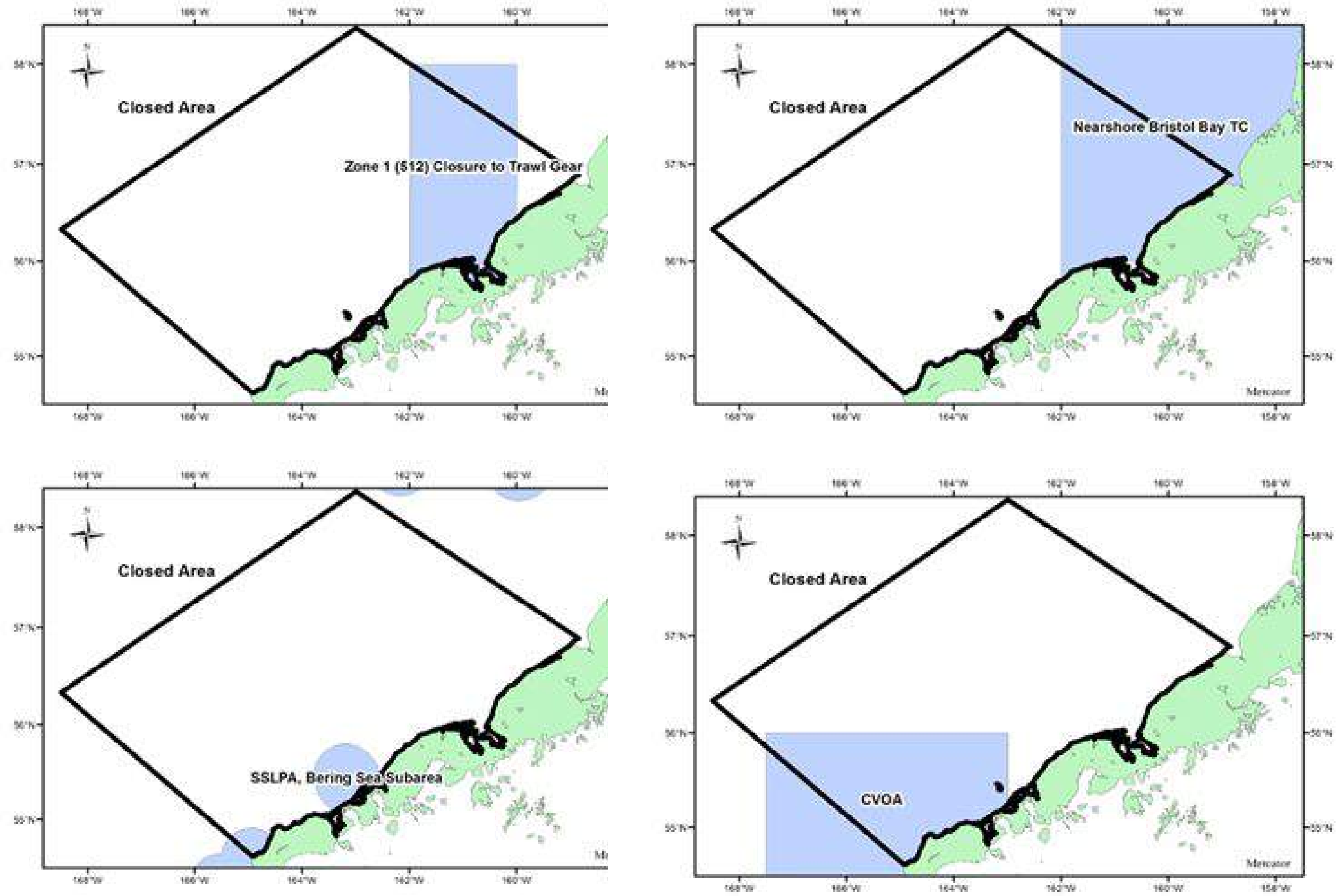

Closed Area
Zone 1 (516) Closure to Trawl Gear
Mercator


Closed Area
AK Maritime NWR
Mercator


Closed Area
Scallop CAs - Eastern Bering Sea
Mercator


Closed Area
SSLPA, Bering Sea Subarea - Pollock RA


Closed Area
TGRA - Bristol Bay
Mercator



5) BYCATCH FROM FISHERIES CURRENTLY IN THE IPHC CLOSED AREA

Several fisheries operate in the IPHC Closed Area, including groundfish trawl (bottom and pelagic), groundfish hook-and-line, and groundfish pot gear. Most of these fisheries catch Pacific halibut (adults and juveniles) as bycatch, and they are required by regulation to discard any Pacific halibut caught (except that full-retention fisheries may retain halibut). The amount of bycatch by gear type from the IPHC Closed Area compared to that from Area 4CDE from 2015 and 2016 is shown in Table 1. When looking at all gears combined in 2015 and 2016, over half of the bycatch in Area 4CDE (including the Closed Area) was from the Closed Area and was primarily from groundfish trawl. In addition, data from 2015 shows that for Area 4CDE including the Closed Area, 97% of the Pacific halibut bycatch is under U32.

Table 1. Bycatch in the IPHC Closed Area (CA) in 2015-2016 (net weight, lbs)

Year	Area	Trawl	% of Annual Total	H&L	% of Annual Total	POT	% of Annual Total	All Gear	% of Annual Total
2015	4CDE	1,349,227	40%	269,515	8%	-		1,618,742	48%
	CA	1,653,465	49%	114,089	3%	1,653		1,769,208	52%
	4CDE+CA	3,002,692	89%	383,604	11%	1,653	0%	3,387,950	
2016	4CDE	1,321,119	41%	201,723	6%	-		1,522,842	47%
	CA	1,574,099	49%	109,129	3%	1,653		1,684,881	53%
	4CDE+CA	2,895,218	90%	310,852	10%	1,653	0%	3,207,723	

6) Impact of allowing directed Pacific halibut fishery access

Removing the IPHC Closed Area would make no “new fish” available to the directed fishery. The Pacific halibut stock in the IPHC Closed Area is already included in the IPHC stock assessment, which treats Regulatory Areas 4CDE and the IPHC Closed Area as a single unit for assessment purposes. The overall harvest advice for Area 4CDE includes the current Closed Area, meaning there would be no change in total catch available to the directed fishery by opening this area.

Based on survey results, the IPHC Secretariat expects that fishing in this area will encounter similar numbers and sizes of Pacific halibut as are found in nearby areas of Area 4E with comparable ocean and bottom characteristics.

The primary impact of this change on the directed fishery revolves around who from Area 4CDE would be permitted to fish in the former area designated as the IPHC Closed Area if it were opened. Domestic allocation is a matter for the NPFMC.

Additional Documentation / References

IPHC Technical Report 27, 1993. “Regulations of the Pacific Halibut Fishery, 1977-1992.” Stephen H. Hoag, Gordon J. Peltonen, and Lauri L. Sadorus. 50 p.

IPHC Technical Report 15, 1977. “Regulations of the Pacific Halibut Fishery, 1924-1976.” Bernard E. Skud. 47 p.

Leaman unpublished. Updated Review of the IPHC Bering Sea Closed Area. Int. Pac. Halibut. Comm. 2 p.

Trumble, 1998. Evaluation of Maintaining the IPHC Closed Area in the Bering Sea. Int. Pac. Halibut. Comm. Report of Assessment and Research Activities 1998: 243-248.

APPENDICES

Annex I: Trumble, 1998. Evaluation of Maintaining the IPHC Closed Area in the Bering Sea.

Annex II: Excerpts on closed area changes from IPHC Technical Reports 15 and 27.

Annex III: IPHC, unpublished. Updated Review of the IPHC Bering Sea Closed Area.

Annex IV: IPHC letter to NPFMC dated 9 August 2012.

Annex V: NPFMC letter responding to IPHC dated 19 October 2012.

Annex VI: Maps and regulations showing closed area changes between 1966 -1967 and 1989-1990. 2016 remains the same as 1990 and is displayed for reference.

ANNEX I

Trumble, 1998. Evaluation of Maintaining the IPHC Closed Area in the Bering Sea. Int. Pac. Halibut. Comm. Report of Assessment and Research Activities 1998: 243-248.

Evaluation of Maintaining the IPHC Closed Area in the Bering Sea

by

Robert J. Trumble

ABSTRACT

The existing IPHC closed area in the Bering Sea provides little biological benefit to the halibut resource or fishery. In spite of the weak Bering Sea data set, the very low directed fishery exploitation on legal-sized fish has little effect on halibut abundance. Except for bycatch mortality from groundfish fisheries, which is substantial, the nearly unfished Bering Sea shelf may function as a reserve. Marine reserves may be appropriate for areas of high exploitation or high data uncertainty. At this time, only data uncertainty provides justification for a reserve in the Bering Sea. Should circumstances make a reserve potentially desirable, a special project to develop a purpose and criteria for a reserve should occur.

INTRODUCTION

Over the years, the International Pacific Halibut Commission (IPHC) has closed and reopened areas to halibut fishing, and worked with the U.S. and foreign governments to close areas to groundfish fishing (Skud 1977). Halibut nursery areas in Canadian waters closed and reopened to halibut fishing, and a nursery area established in 1967 in the eastern Bering Sea (Fig. 1) remains closed to the present. Other areas of the Bering Sea-Aleutian Islands and Gulf of Alaska with high halibut bycatch had closed to groundfish fisheries, at least seasonally, to foreign groundfish fisheries. All of the Bering Sea and Gulf of Alaska halibut bycatch closed areas subsequently reopened as the groundfish fisheries converted to American fleets.

During development of the groundfish fisheries of the Bering Sea by foreign and U.S. vessels, bycatch of halibut occurred throughout the Bering Sea, including the Bering Sea closed area. During the five years that preceded the closure, the commercial halibut fishery caught a total of 103,000 pounds from what became the closed area, and 97,000 pounds occurred in 1962 (IPHC 1967). No commercial harvest occurred in the area during 1966, the last year before the closure. Commercial halibut fishing on the continental shelf in the Bering Sea adjacent to the closed area is now about 300,000 pounds. An additional 1.6 million pounds of harvest occurs around the Pribilof Islands, an area of relief northwest of the closed area. Given the large halibut mortality caused by bycatch and the apparent lack of interest in commercial fishing in the closed area, the IPHC staff proposed in 1998 to review the purpose and need for the closed area. The IPHC asked the staff to prepare a report on the consequences of eliminating the closed area.

BACKGROUND

Among its earliest actions to reverse a perceived decline in halibut stocks, the IPHC in 1932 established permanent closures of two areas in Canadian waters defined as halibut nursery grounds.

On these grounds, small halibut dominated, and larger halibut occurred only as strays (Babcock et al. 1931). The IPHC considered the closures superior to minimum size limits and prohibitions on small hooks. The closure was intended as a reserve with total protection of small halibut, by eliminating culling of undesirable, small fish during the fishery. Small fish in the closed areas could grow to more desirable sizes, but no restrictions would be placed on small halibut captured outside of the closed areas. Economic inefficiencies of prohibiting small hooks would not occur. The IPHC considered the nursery closures as economic, but not biological, measures. Overfishing of larger halibut in open areas was viewed as the chief threat to the productivity of the resource.

The nursery area closures remained until reopened in 1960. Surveys during the late 1950s demonstrated an "accumulation of old and large fish" such that the closed areas "do not currently qualify for closure as nursery grounds" (IPHC 1960).

During the early 1960s, directed halibut fishing by foreign fleets and heavy fishing by fishermen of the U.S. and Canada caused a significant decline in abundance of halibut in the Bering Sea-Aleutian Islands. In 1966, the IPHC staff recommended management measures for the halibut fishery in the Bering Sea that included a proposal to close an area of the eastern Bering Sea to all halibut fishing (IPHC 1967). A "closed nursery ground would aid in the protection of the large population of small, immature halibut in that area" (IPHC 1997). The IPHC implemented the Bering Sea closed area in 1967, and it has remained in place since with small modifications. The IPHC also recommended closures to foreign groundfish fishing in areas of high abundance of halibut. As a result of negotiations through the International North Pacific Fisheries Commission and bilateral meetings with foreign governments, Japan and Russia agreed to closures for groundfish fisheries that included the IPHC closed area (Skud 1977)

The intent of the IPHC for the Bering Sea closed area, to protect small, immature halibut, was violated when the area opened to U.S. groundfish fisheries, which catch large numbers of these small halibut as bycatch. A large component of the halibut bycatch mortality in the Bering Sea-Aleutian Islands region comes from the IPHC closed area. Since the early 1990s when the Americanization of the groundfish fisheries occurred, bycatch mortality documented by samples from observers in the IPHC closed area has increased from about 20 percent to about 40 percent of the Bering Sea-Aleutian Islands total (NMFS unpublished data). Of the groundfish catch monitored by observers, catch in the IPHC closed area during this period increased from about 10 percent to about 40-50 percent of the total.

MARINE PROTECTED AREAS

Marine protected areas (MPA), which encompass such terms as reserves, sanctuaries, and closed areas, are gaining international favor as a mechanism for ecosystem and fishery management (Attwood et al 1997a). In many cases, insufficient information precludes proper management under the pressure of intense fishing or attempts to modify the environment of an area. Under the Precautionary Principle, MPAs offer an opportunity to maintain marine environments intact while further study occurs. Attwood et al. (1997a) further suggest that MPAs may enhance fish yield, if substantial spill-over of fish occurs from the MPA. They note that evidence for such enhancement comes from conceptual arguments and theoretical models, rather than from direct observations.

Attwood et al. (1997b) summarized the role of MPAs in fisheries management with "recognition of:

(i) the failure of conventional single-species management to control bycatch and habitat destruction;
(ii) the failure of conventional fishery control methods for fish with certain types of life-history characteristics;
(iii) the importance of conserving ecosystem structure as the context for stable fishery production;
(iv) the value of undisturbed ecosystems for comparative study."

Lauck et al. (1998) extended the concept of MPAs (or marine reserves in their terminology) to fisheries management. They noted the widespread failure of stock assessment models to provide accurate and timely advice and the failure of management to prevent stock collapse, as a result of irreducible scientific uncertainty and inability to control catches. These authors liken a marine reserve for fisheries to an insurance policy, in which a premium paid (lower overall harvest because of the closed area) minimizes the risk of a fishery collapse. In rough terms, they recommended that the size of the reserve should include on the order of 50 percent of the fish stock abundance. As exploitation rates decline, the necessary size of the reserve becomes smaller. The proportion of harvest lost because of a marine reserve is less than the proportion closed, because exploitation in the remaining open area can increase.

RELEVANCE OF MPA/RESERVES TO THE BERING SEA CLOSED AREA

MPAs are an attractive concept for many situations in fishery management, especially those with limited or insufficient information. However, evaluation of the concept is generally lacking, and criteria for selecting MPAs are generally vague. Even so, the IPHC closed area meets few of the justifications for an MPA.

The closed area does not reduce halibut bycatch mortality. Bycatch is managed with bycatch mortality limits through the North Pacific Fishery Management Council, and with quota reductions and harvest rate reductions by the IPHC.

Ecosystem effects from the IPHC closed area have little benefit. The fishing by other gear types throughout the Bering Sea-Aleutian Island area, especially on the Bering Sea shelf, preclude an undisturbed ecosystem. A small no-trawl zone occurs on the eastern edge of the IPHC closed area. Evaluation of ecosystem stability in the Bering Sea must include the other fisheries, both in and out of the IPHC closed area and the no-trawl zone.

Of the issues favoring development of MPAs, only uncertainty of the stock assessment and concomitant management program apply to Pacific halibut. Stock assessment results in the Bering Sea are currently inadequate because of insufficient time series of catch and survey data (Sullivan and Parma 1998), and because exploitation rates are low. Questions still remain on stock assessment issues in the Gulf of Alaska.

Uncertainty

In the Gulf of Alaska, two estimates of exploitable biomass occur for Area 3B. The stock assessment model (Sullivan and Parma 1998) gives a value of exploitable biomass about half that estimated from CPUE ratios scaled with biomass of areas with good data (Trumble and Hoag 1998). Retrospective analysis of halibut abundance demonstrated that the age-based model formerly used for halibut stock assessment underestimated exploitable biomass (Parma 1993), and helped document the need for length-age-based model. Clearly, a degree of uncertainty exists for stock assessment in all or part of the IPHC management areas.

Exploitation rates

Halibut fishing mortality contributes very little to total mortality in the Bering Sea (W. G. Clark, IPHC, pers. comm.). Estimates of total mortality (fishing plus natural) exceed the estimate of natural mortality currently used.

Data available from the Bering Sea are the weakest of any IPHC regulatory area, but exploitation is so low that the effect hardly registers. Exploitation is higher in the Gulf of Alaska, but the strongest data set occurs there. The present IPHC closed area is insufficient to offer the degree of insurance suggested by Lauck et al. (1998). The closed area is far too small and accounts for too few halibut to offer significant benefits. However, it costs the fishery virtually nothing because of little of no interest in fishing there. The Bering Sea shelf functions as a closed area to halibut fishing, because the density is so low that halibut fishermen have little interest in fishing in any but a few spots. Yet because of the large surface area, the halibut abundance on the shelf amounts to about a third of the total abundance in the Bering Sea (Clark 1998). Lauck et al. demonstrated that the need for a reserve diminishes as exploitation decreases. The existing closed area in the Bering Sea provides little biological benefit to the halibut resource or fishery.

ALTERNATIVE ACTIONS

The IPHC staff has several options concerning the closed area and the MPA concept.

1. Status quo. Leave the closed area as it is. This action requires no further evaluations.
2. Push for expansion of the closed area/no-trawl zone to make a reserve of a meaningful size. This action would require substantial evaluation.
3. Develop an alternate closed area. This action would require substantial evaluation.
4. Eliminate the IPHC closed area. This action would require substantial evaluation.

We cannot develop a justification for any specific MPA/Reserve in the Bering Sea or Gulf of Alaska at this time. Should circumstances develop that make an MPA/Reserve potentially desirable, then a special project to establish objectives and criteria for a halibut-specific MPA should occur.

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Babcock, J. P., W. A Found, M. Freeman, and H. O'Malley. 1931. Report of the International Fisheries Commission. Int. Fish. Comm. Rep. No. 1. 31.pp.

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Sullivan, P. J. and A. Parma. 1998. Population Assessment, 1997. Int. Pac. Halibut Comm. Report of Assessment and Research Activities. pp. 83-99.

Trumble, R. J. and S. H. Hoag. 1998. A proposed method for setting Area 4 and Area 3B catch limits. Int. Pac. Halibut Comm. Report of Assessment and Research Activities. pp. 203-210.

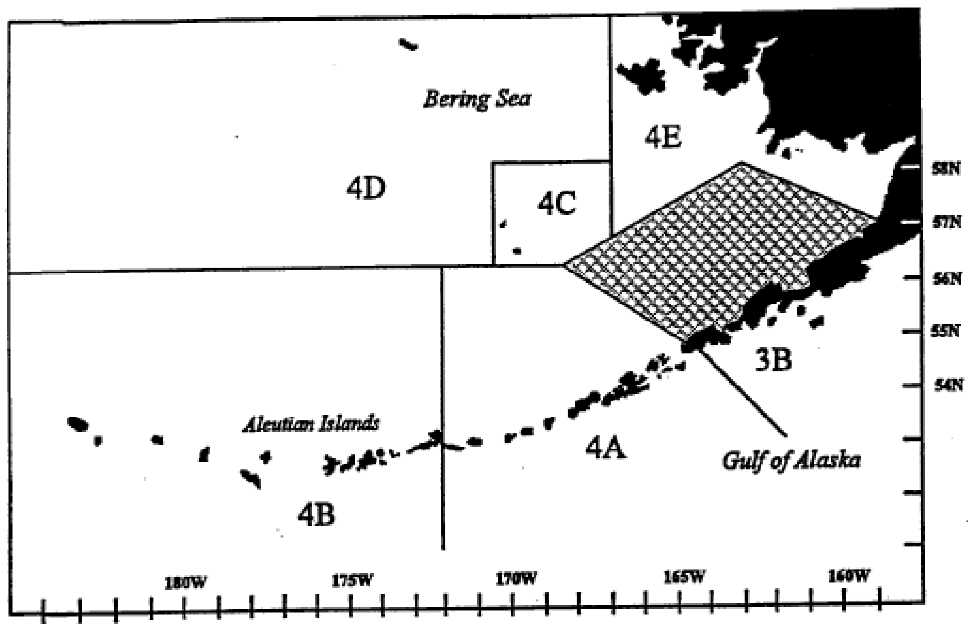

Figure 1. **Area closed by IPHC to longline fishing for Pacific halibut.**

ANNEX II

Excerpts on closed area changes from IPHC Technical Reports 15 and 27

IPHC Technical Report 15, p.13-14

"Regulations of the Pacific Halibut Fishery, 1924-1976." Bernard E. Skud. 47 p. (1977)

Closed Areas

In 1932, a year-round closure to halibut fishing was established in two "nursery areas" to protect young halibut. One of these areas was in the vicinity of Noyes Island and Timbered Islet in southeastern Alaska and the other was the Masset grounds, off the north coast of Graham Island in British Columbia. These closures were retained until 1960, when the areas were opened to fishing during the regular season in Regulatory Area 2. Studies during the late 1950's had shown an "accumulation of old and large fish" in these nursery areas which "do not currently qualify for closure as nursery grounds under the provisions of the Convention" (IPHC 1960). In 1967, Area 4E in the southeastern Bering Sea was declared a nursery area and a year-round closure was instituted that still is in effect.

Although not a part of IPHC regulations, certain areas are closed to foreign trawlers to reduce the incidental catch of halibut. As explained below, these closures were established even though IPHC has no authority to regulate domestic fishing for species other than halibut and has no control over foreign vessels. Bell (1970), Skud (1973), and Hoag (1976) described the effects of Japanese and Soviet trawl fisheries on the North American longline fishery. Although targeting on other species, e.g., pollock (*Theragra chalcogrammus*) and yellowfin sole (*Limanda aspera*), the foreign fleets annually caught millions of pounds of halibut. In 1973, realizing the importance of these productive trawl fisheries and recognizing that foreign trawling likely would continue even if national fishery zones were extended, IPHC proposed that foreign trawling be prohibited in certain areas of the Bering Sea when the incidence of halibut was high. Through the International North Pacific Fisheries Commission (INPFC) and bilateral meetings, Canada and the United States successfully negotiated with Japan and the U.S.S.R. to establish the closures which, in recent years, have been expanded in both time and area and include closures in the Gulf of Alaska (Figure 3).

IPHC Technical Report 15, p.13-14 (con't)

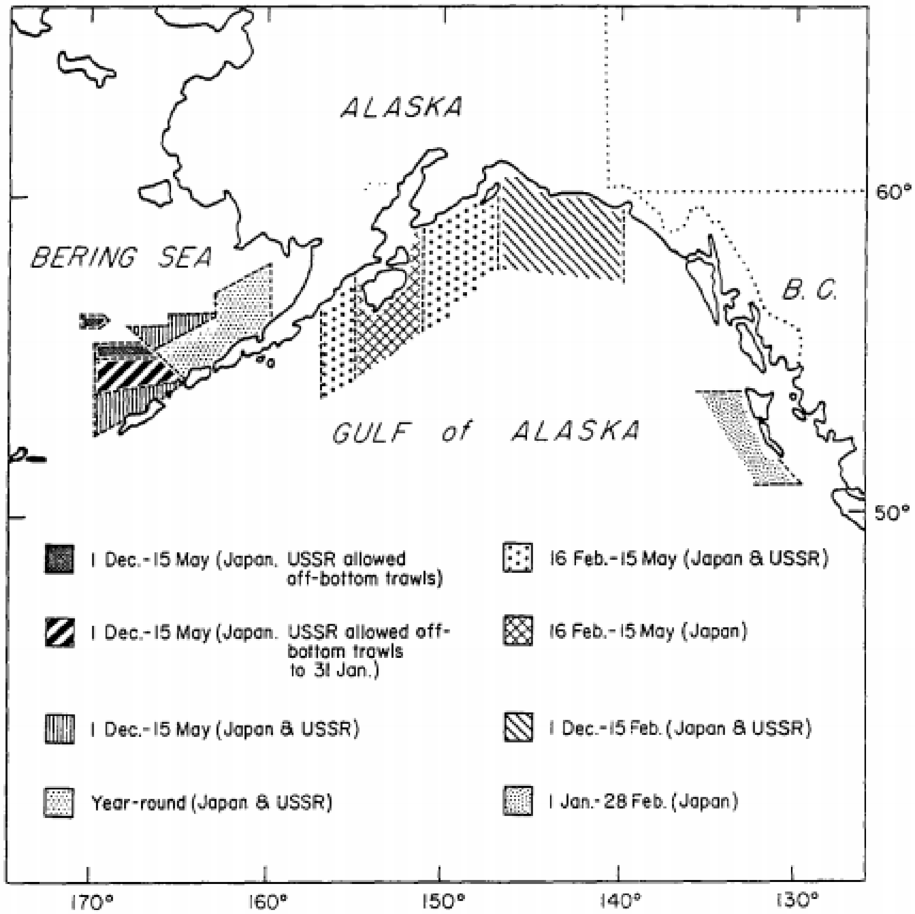

Figure 3. Foreign trawl closures pertaining to halibut in the Bering Sea and the Gulf of Alaska.

IPHC Technical Report 27, p.17

"Regulations of the Pacific Halibut Fishery, 1977-1992." Stephen H. Hoag, Gordon J. Peltonen, and Lauri L. Sadorus. 50 p. (1993)

Only minor changes in regulatory areas have occurred since 1984 when Area 4E was introduced in the Bering Sea to provide a separate catch limit and season in an area that previously experienced little fishing. In 1990, Area 4E was expanded to include part of Bristol Bay that previously had been closed to halibut fishing because of concern for juvenile halibut. A 1987 IPHC survey with longline gear (Gilroy and Hoag 1993) suggested that while the abundance of large halibut was low, relatively few juveniles would be vulnerable to capture with longlines. The U.S. government divided the Area 4E catch limit into two components; providing 70% to a northwest portion (the original Area 4E) and 30% to a southeastern portion (the Bristol Bay addition). This division was implemented to assure that fishing in Bristol Bay would not prevent local communities in the northwest portion from participating in the fishery.

ANNEX III

Leaman unpublished. Updated Review of the IPHC Bering Sea Closed Area. Int. Pac. Halibut. Comm. 2 p.

Updated Review of the IPHC Bering Sea Closed Area

Bruce M. Leaman

Background

The IPHC Bering Sea Closed Area (Fig. 1) was created by the Commission in 1967 to protect a nursery area for juvenile halibut, in response to severe declines in halibut abundance. The current Closed Area is slightly smaller than the original definition due to reductions that occurred when Areas 4C and 4E were created. The Closed Area had historically accounted for a relatively small percentage (<10%) of the directed halibut landings in the Bering Sea but was a source of significant halibut mortality from foreign vessel bottom trawling. The Commission recommended the closure to both directed halibut fishing, which was under Commission jurisdiction, and to bottom trawling, which was not under Commission jurisdiction. However, through negotiations within the International North Pacific Fisheries Commission and bilateral agreements with foreign governments, the Closed Area was also closed to foreign bottom trawling. Throughout the late 1960s until the early 1970s, the Closed Area provided significant protection for juvenile halibut, with bycatch mortality dropping to an estimated low of 4.21 Mlb in 1985. Coincidentally, halibut abundance improved dramatically, fuelled in part by strong year classes of the mid 1970s.

However, as Americanization of the Bering Sea trawl fisheries occurred in the early 1980s, following promulgation of the U.S. Extended Economic Zone, the protection to juvenile halibut afforded by the Closed Area diminished for domestic fisheries under exclusive U.S. jurisdiction. The North Pacific Fishery Management Council did attempt to control bycatch mortality by instituting gear and fishery-specific limits and closures within the Closed Area, throughout the 1980s. However, mortality on halibut again increased substantially in the 1985-1991 period, reaching a peak of 10.72 Mlb in 1992. Bottom trawling within the Closed Area accounts for a significant proportion of the halibut mortality in the Bering Sea. The Closed Area remains open to all fishing except directed halibut longline fishing.

The Commission requested a review of the Closed Area in 1998 (Trumble 1999). That review examined the purpose of the Closed Area and its value to halibut management. The summary of that review is reproduced below:

> The closed area does not reduce halibut bycatch mortality. Bycatch is managed with bycatch mortality limits through the North Pacific Fishery Management Council, and with quota reductions and harvest rate reductions by the IPHC.
>
> Ecosystem effects from the IPHC closed area have little benefit. The fishing by other gear types throughout the Bering Sea-Aleutian Island area, especially on the Bering Sea shelf, preclude an undisturbed ecosystem. A small no-trawl zone occurs on the eastern edge of the IPHC closed area. Evaluation of ecosystem stability in the Bering Sea must include the other fisheries, both in and out of the IPHC closed area and the no-trawl zone.
>
> Of the issues favoring development of MPAs, only uncertainty of the stock assessment and concomitant management program apply to Pacific halibut. Stock assessment results in the Bering Sea are currently inadequate because of insufficient time series of catch and survey data (Sullivan and Parma 1998), and because exploitation rates are low. Questions still remain on stock assessment issues in the Gulf of Alaska.

Evaluation

As noted in the 1998 review, the sole perceived purpose of the Closed Area was as a hedge against uncertainty concerning assessment and management of halibut in the Bering Sea. Since 1998, the Commission has accumulated sufficient data and has been able to generate stock assessments for the Bering Sea with considerably greater confidence than was possible in 1998. Therefore, the staff no longer sees a purpose for the Closed Area as such a guard against uncertainty.

Halibut bycatch mortality is currently managed through Prohibited Species Caps for various directed fisheries, often with particular time and area specificity, and the IPHC Closed Area plays no role in the management of bycatch. Therefore, from a halibut assessment and management perspective, the staff perceives no continued purpose in maintaining the current Closed Area in the eastern Bering Sea.

Should the Commission choose to open the Closed Area, the staff recommends it be incorporated as part of Area 4E and, since the data from the Closed Area are already included in the assessment, that there be no changes to the catch limit assigned to Area 4CDE. This would also not require any action on the North Pacific Fishery Management Council's Catch Sharing Plan for Area 4CDE.

Reference

Trumble, R.J. 2009. Evaluation of the maintaining the IPHC Closed Area in the Bering Sea. Int. Pac. Halibut Comm. Report of Assessment and Research Activities 2008: 243-248.

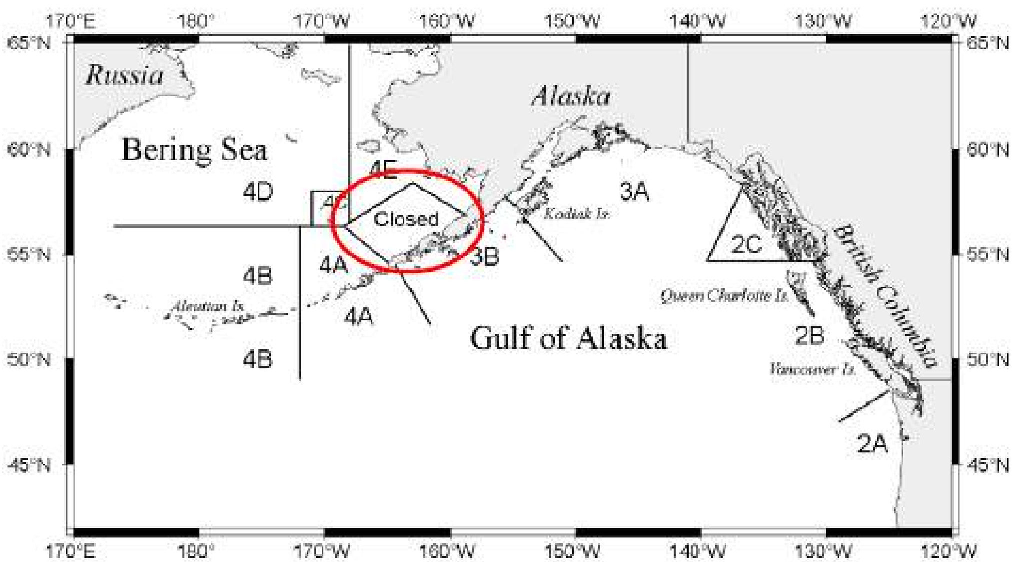

Figure 1. Eastern Bering Sea Area currently closed to halibut fishing.

ANNEX IV

INTERNATIONAL PACIFIC HALIBUT COMMISSION

ESTABLISHED BY A CONVENTION BETWEEN CANADA

AND THE UNITED STATES OF AMERICA

DIRECTOR
BRUCE M. LEAMAN

2320 W. COMMODORE WY, STE 300
SEATTLE, WA 98199-1287

TELEPHONE:
(206) 634-1838

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(206) 632-2983

August 9, 2012

Mr. Eric Olson, Chair
North Pacific Fishery Management Council
605 West 4th Avenue, Suite 306
Anchorage, AK 99501-2252

Dear Eric,

The Commission has been contemplating potential actions on the Closed Area (CA) on the Bering Sea shelf. The CA was created by the Commission in 1967 to protect a nursery area for juvenile halibut from mortality arising through bottom trawling by foreign fishing vessels. Bilateral agreements between the U.S. and foreign governments led to fishery closures which included the IPHC CA. Throughout the late 1960s until the early 1970s, the CA provided significant protection for juvenile halibut, with bycatch mortality dropping to an estimated low of approximately 4.2 Mlb in 1985. However, with the Americanization of the fishery after extension of fisheries jurisdiction in 1977, the bilaterally-based closed areas were reopened and the IPHC's intent of protection for juvenile halibut afforded by the IPHC CA was lost. Mortality on halibut again increased substantially in the 1985-1991 period, reaching a peak of approximately 10.7 Mlb in 1992. Bottom trawling within the CA accounts for a significant proportion of the halibut mortality in the Bering Sea. The CA currently remains open to all fishing except directed commercial halibut longline fishing.

Halibut bycatch mortality is currently managed through Prohibited Species Caps for various directed fisheries, often with time and area specificity, and the IPHC CA plays no meaningful role in the management of bycatch mortality. Therefore, from a halibut assessment and management perspective, the Commission is reviewing the continued purpose in maintaining the current CA in the eastern Bering Sea. As part of this discussion, the Commission is considering how directed commercial halibut fishing within the area of the current CA would be managed under the Council's IQ framework.

Although the Commission has treated Area 4CDE as a single management unit since 1998, the Council uses a Catch Sharing Plan to divide the IPHC catch limit for Area 4CDE into individual catch limits for Areas 4C, 4D, and 4E, for domestic allocation purposes. Should the Commission choose to open the CA, the IPHC staff has recommended it be incorporated as part of Area 4E and, since the data from the CA are already included in the stock assessment and catch limit determination, that there be no changes to the catch limit assigned to Area 4CDE. However, the Commission seeks the Council's comments on whether it perceives a requirement for any action to the Council's Catch Sharing Plan for Area 4CDE, should the CA be opened. The Commission would be grateful to receive your commentary on this issue prior to its Interim Meeting, scheduled for November 28-29, 2012.

Sincerely,

Bruce

Bruce M. Leaman, Ph.D.
Executive Director

cc: IPHC Commissioners

ANNEX V

North Pacific Fishery Management Council

Eric A. Olson, Chairman
Chris Oliver, Executive Director

Telephone (907) 271-2809

605 W. 4th Avenue, Suite 306
Anchorage, AK 99501-2252

Fax (907) 271-2817

Visit our website: http://www.fakr.noaa.gov/npfmc

October 19, 2012

Dr. Bruce Leaman, Executive Director
International Pacific Halibut Commission
2320 West Commodore Way, Suite 300
Seattle, Washington 98199-1287

Dear Bruce:

At its October 2012 meeting the North Pacific Council reviewed your letter of August 9, 2012, in which you requested comments on potential IPHC action to open the closed area on the Bering Sea shelf to halibut fishing. The Council acknowledged several points in your letter, specifically that the closed area no longer provides the intended benefits to the halibut stock because of other management measures in place to limit halibut prohibited species catch (or bycatch) in the area and only prohibits the directed commercial halibut longline fishery from fishing in the area. The Council did not identify any allocative impacts of such an action on its Area 4CDE Catch Sharing Plan and supports incorporating the closed area into Area 4E, should the IPHC choose to do so, with the understanding that such an action would not result in an increase in the commercial catch limit for that expanded area. The Council noted that if the IPHC identifies allocative impacts when it reviews the proposal during its Interim Meeting, then the Council would consider those identified by the IPHC during its December 2012 Council meeting. This timeline would allow for additional Council comments prior to any action by the IPHC at is January 2013 Annual Meeting.

Jane DiCosimo will represent the Council at the 2012 IPHC Interim Meeting to provide additional details as requested on the status of this and other Council actions.

Sincerely,

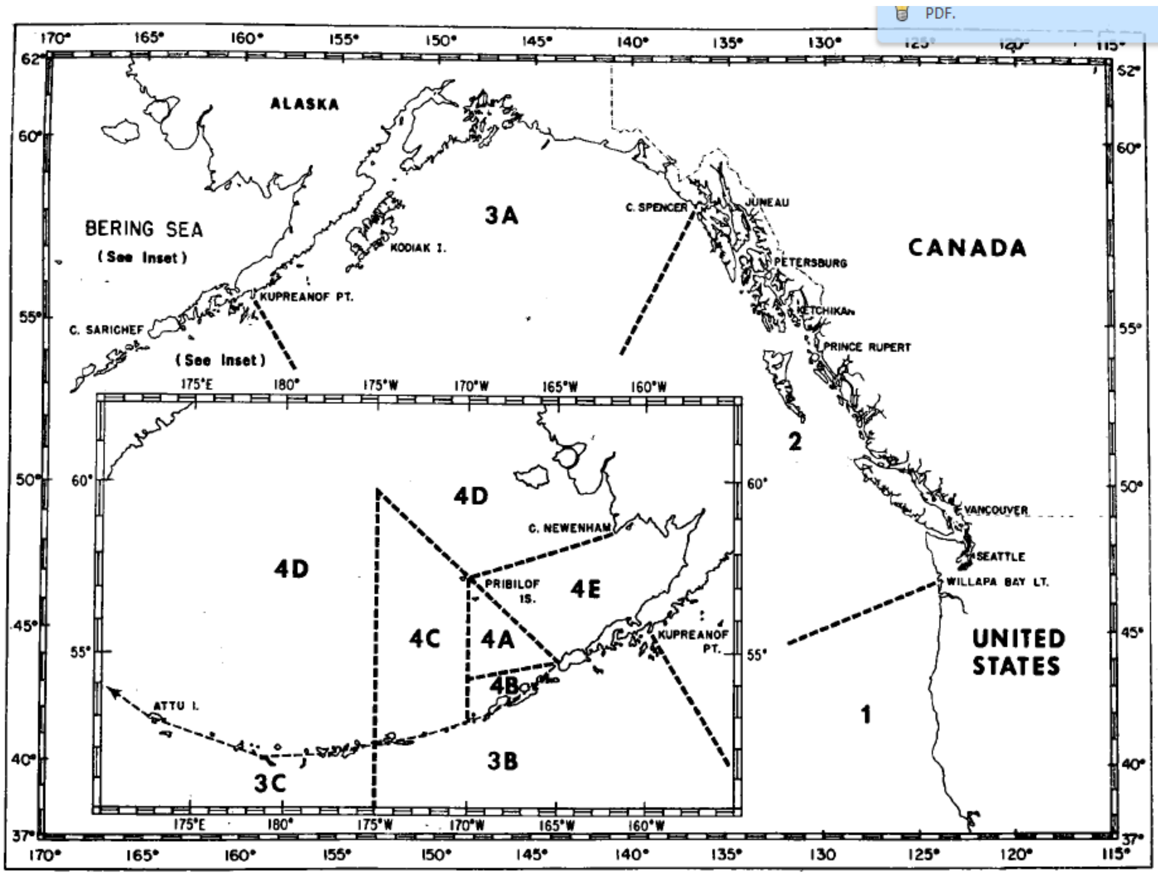
Chris Oliver

Chris Oliver
Executive Director

ANNEX VI

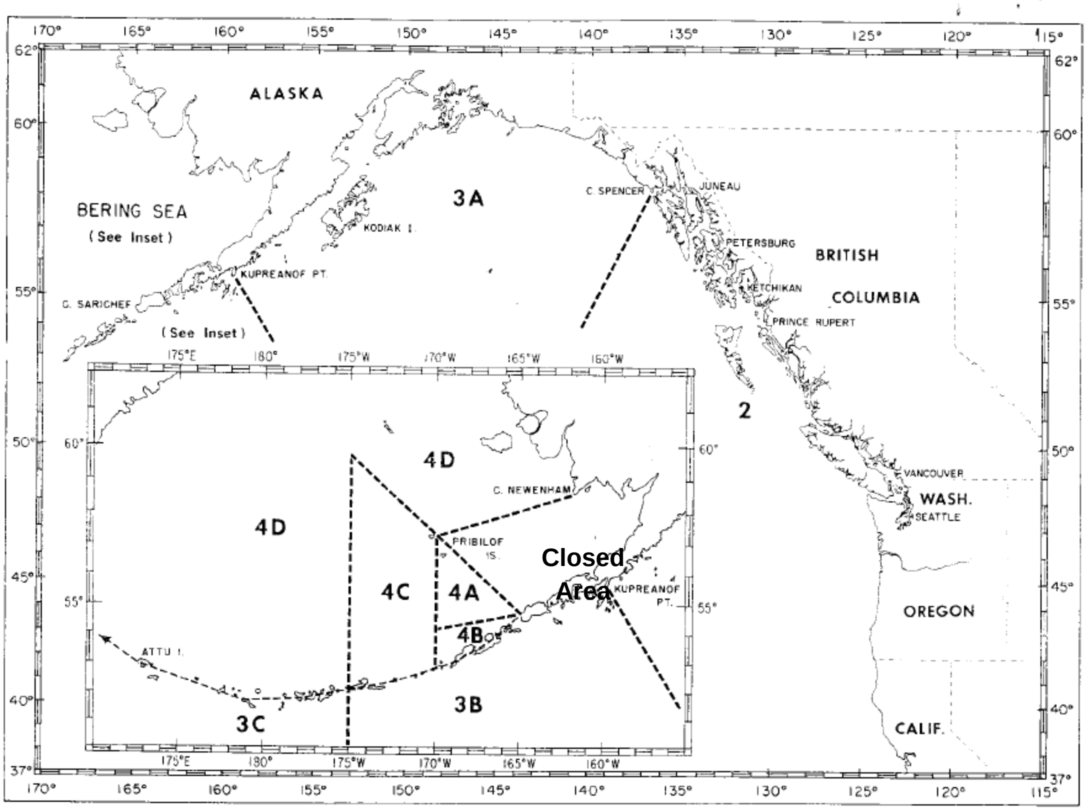
Maps and regulations showing closed area changes between 1966 -1967 and 1989-1990. 2016 remains the same as 1990 and is displayed for reference.

1966



Pacific Coast of North America showing the 1966 regulatory areas as defined by the International Pacific Halibut Commission

1967



Pacific Coast of North America showing the 1967 regulatory areas as defined by the International Pacific Halibut Commission

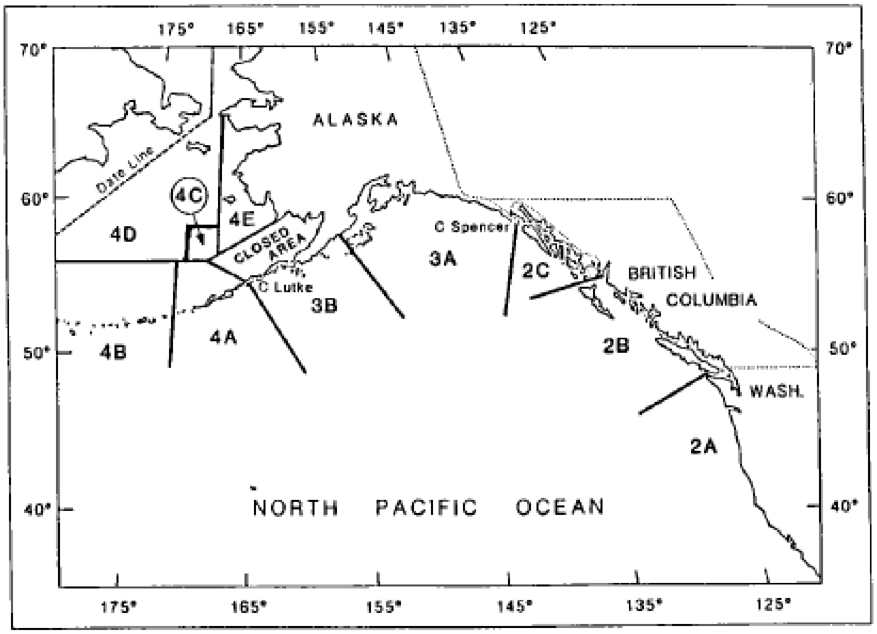
1967 IPHC Regulations

Section 4. Closed Nursery Grounds

(a) The following area in southeastern Bering Sea has been found to be populated by small, immature halibut and is designated as a nursery ground and closed to halibut fishing, and no person shall fish for halibut in such area, or shall have halibut in his possession while fishing for other species therein, or shall have halibut in his possession therein except in the course of a continuous transit across such area.

(b) The southeastern flats in Bering Sea shall include all the waters within the following boundary: from Cape Sarichef Light at the western end of Unimak Island, which light is approximately latitude 54° 36′ 00″ N., longitude 164° 55′ 42″ W.; thence to a point northeast of St. Paul Island, approximately latitude 57° 15′ 00″ N., longitude 170° 00′ 00″ W.; thence to Cape Newenham, which cape is approximately latitude 58° 39′ 00″ N., longitude 162° 10′ 25″ W.; thence easterly and southerly along the Alaska coastline to Cape Kabuch Light at the head of Ikatan Bay, which light is approximately latitude 54° 49′ 00″ N., longitude 163° 21′ 36″ W.; thence to the point of origin at Cape Sarichef Light.

1989



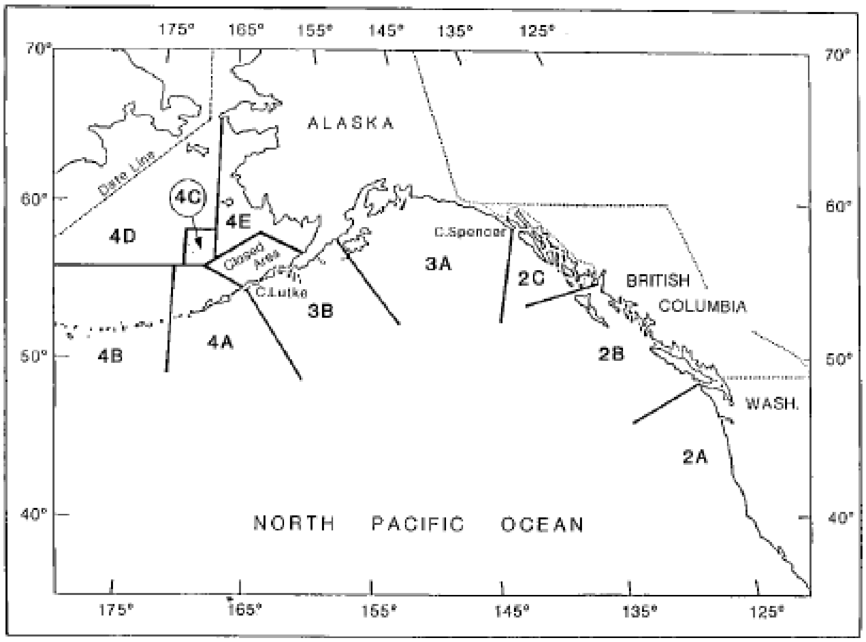
Regulatory areas for the Pacific halibut fishery.

1989 IPHC Regulations

Closed Area

8. All waters in the Bering Sea that are east of a line from Cape Sarichef Light (latitude 54°36′00″ N., longitude 164°55′42″ W.) to a point at latitude 56°20′00″ N., longitude 168°30′00″ W., south of a line from the latter point to Cape Newenham (latitude 58°39′00″ N., longitude 162°10′25″ W.) and north of latitude 54°49′00″ N. in Isanotski Pass are closed to halibut fishing and no person shall fish for halibut therein or have halibut in his possession while in those waters except in the course of a continuous transit across those waters.

1990



Regulatory areas for the Pacific halibut fishery.

1990 IPHC Regulations

Closed Area

8. All waters in the Bering Sea north of latitude 54°49′00″ N. in Isanotski Strait that are enclosed by a line from Cape Sarichef Light (latitude 54°36′00″ N., longtitude 164°55′42″ W.) to a point at latitude 56°20′00″ N., longitude 168°30′00″ W.; thence to a point at latitude 58°21′25″ N., longitude 163°00′00″ W.; thence to Strogonof Point (latitude 56°53′18″ N., longitude 158°50′37″ W.); and then along the northern coasts of the Alaska Peninsula and Unimak Island to the point of origin at Cape Sarichef Light are closed to halibut fishing and no person shall fish for halibut therein or have halibut in his possession while in those waters except in the course of a continuous transit across those waters.

2016

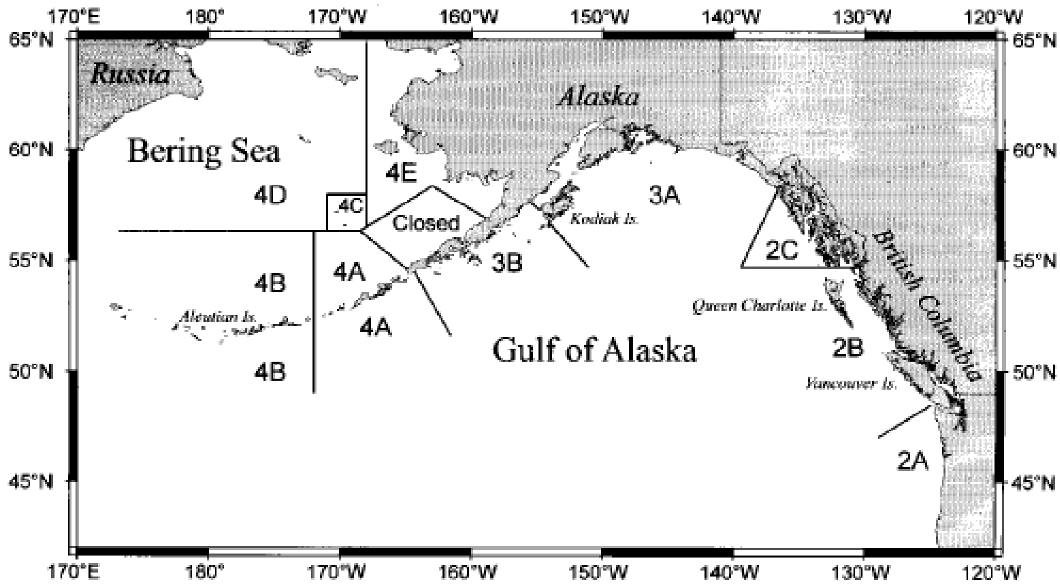


Figure 1. Regulatory areas for the Pacific halibut fishery.

2016 IPHC Regulations

10. Closed Area

All waters in the Bering Sea north of 55°00′00′′ N. latitude in Isanotski Strait that are enclosed by a line from Cape Sarichef Light (54°36′00′′ N. latitude, 164°55′42′′ W. longitude) to a point at 56°20′00′′ N. latitude, 168°30′00′′ W. longitude; thence to a point at 58°21′25′′ N. latitude, 163°00′00′′ W. longitude; thence to Strogonof Point (56°53′18′′ N. latitude, 158°50′37′′ W. longitude); and then along the northern coasts of the Alaska Peninsula and Unimak Island to the point of origin at Cape Sarichef Light are closed to halibut fishing and no person shall fish for halibut therein or have halibut in his/her possession while in those waters except in the course of a continuous transit across those waters. All waters in Isanotski Strait between 55°00′00′′ N. latitude and 54°49′00′′ N. latitude are closed to halibut fishing.

INTERNATIONAL PACIFIC HALIBUT COMMISSION

Commercial Fishing Periods (Sect. 8)

PREPARED BY: IPHC SECRETARIAT (26 OCTOBER 2017)

PURPOSE

To establish fixed fishing periods for the commercial Pacific halibut fisheries.

BACKGROUND

Each year the International Pacific Halibut Commission (IPHC) selects fishing period dates for the commercial Pacific halibut fisheries in each of the IPHC Regulatory Areas. The IPHC's practice is to use the same overall fishing period dates for all IPHC Regulatory Areas. These dates vary from year to year, but in recent years have allowed commercial fishing to begin sometime in March and end sometime in November for the British Columbia and Alaska IPHC Regulatory Areas (2B through 4E). More restricted fishing periods are established for IPHC Regulatory Area 2A, and all commercial fishing in that Regulatory Area is required to take place within the same overall fishing period defined for the other Regulatory Areas.

DISCUSSION

The Commission typically receives advice at the IPHC Annual Meeting from the Conference Board (CB) and the Processor Advisory Board (PAB) regarding commercial fishing period dates. Historically, biological factors relevant to setting the dates included protection of Pacific halibut spawning, which primarily takes place from September through early May (IPHC Sci Rpt 70 (p.32) and Loher (2011)), maintaining correspondence between observed distribution in the summer and actual encounter rates in the fishery relative to spawning and migrating fish; typical weather patterns and predicted tides in fishing areas and business considerations for both fishers and processors have also been historically important.

The IPHC Secretariat proposes that fixed fishing periods be established in order to reduce the planning uncertainty for future fishing effort. With fixed dates, fishers and processors would not need to wait until after the Annual Meeting to completed planning for the coming fishing season.

The IPHC Secretariat proposes that the fishing period be fixed to run from 15 March to 1 November each year. Fixed starting dates later than 15 March could also be considered.

Sectors Affected: Commercial Pacific halibut fisheries in all IPHC Regulatory Areas.

SUGGESTED REGULATORY LANGUAGE

8. Commercial Fishing Periods

(1) …

(2) …

(3) Notwithstanding paragraph (7) of section 11, an incidental catch fishery is authorized during the sablefish seasons in Area 2A in accordance with regulations promulgated by NMFS. This fishery will occur between 1200 hours local time on 15 March and 1200 hours local time on 1 November.

(4) Notwithstanding paragraph (2), and paragraph (7) of section 11, an incidental catch fishery is authorized during salmon troll seasons in Area 2A in accordance with regulations promulgated by NMFS. This fishery will occur between 1200 hours local time on 15 March and 1200 hours local time on 1 November.

(5) The fishing period in Areas 2B, 2C, 3A, 3B, 4A, 4B, 4C, 4D, and 4E shall begin at 1200 hours local time on 15 March and terminate at 1200 hours local time on 1 November, unless the Commission specifies otherwise.

(6) All commercial fishing for halibut in Areas 2A, 2B, 2C, 3A, 3B, 4A, 4B, 4C, 4D, and 4E shall cease at 1200 hours local time on 1 November.

ADDITIONAL DOCUMENTATION / REFERENCES

IPHC Sci Rpt 70. Spawning Locations and Season for Pacific Halibut. St-Pierre. 1984.

Loher, T. 2011. Analysis of match-mismatch between commercial fishing periods and spawning ecology of Pacific halibut (*Hippoglossus stenolepis*), based on winter surveys and behavioural data from electronic archival tags. ICES J. of Mar. Sci. 68(10): 2240-2251.

APPENDICES

None.

Vessel Monitoring System requirement for IPHC Regulatory Area 4 clearances (Sect. 15)

PREPARED BY: IPHC SECRETARIAT (01 DECEMBER 2017)

PURPOSE

To streamline regulatory requirements and improve monitoring for IPHC Regulatory Area 4 by requiring vessel monitoring systems (VMS) instead of an IPHC Clearance.

BACKGROUND

In an effort to discourage out-of-area fishing, non-local vessels fishing in IPHC Regulatory Area 4 (Area 4) are required to obtain clearance from the IPHC. Vessels are required to clear in at specific ports prior to fishing, and to clear out prior to unloading. Vessel clearance regulations, which have been in place since the 1960s, have been modified over the years (Hoag et al. 1993) to reflect changes in clearance procedures and clearance locations.

The IPHC's clearance regulations underwent comprehensive modifications in 1995, when the quota share system began in Alaska with clearances still required for Regulatory Areas 4A, 4B, 4C, and 4D, although some areas were able to be cleared via VHF radio. Additionally, in 1996, provisions for fishing in multiple Bering Sea Regulatory Areas were added. A vessel only had to clear in once at any of the clearance ports prior to fishing multiple regulatory areas, provided the vessel followed the regulations governing multiple-area fishing: a NMFS-certified observer had to be aboard and fish in the hold had to be distinguishable by area.

Beginning in 2003, vessels were exempted from Regulatory Area 4 clearance regulations if they were equipped with a VMS transmitter, complied with NMFS VMS regulations, notified the National Oceanic and Atmospheric Administration (NOAA) Office of Law Enforcement 72 hours prior to fishing for Pacific halibut, and only fished in one Regulatory Area. The VMS transmitter automatically determines a vessel's position and transmits it to a NMFS-approved communication service provider.

Vessels that were fishing with a transmitting VMS and met all VMS regulations were allowed to fish in multiple IPHC Regulatory Areas in 2008 provided that the vessel did not have more Pacific halibut on board than the IFQ poundage of the area currently being fished. This regulation pertaining to VMS and multiple Regulatory Area fishing was reworded in 2009 and 2017 to more accurately reflect intent.

Vessel clearances are currently required only within IPHC Regulatory Area 4 due to the remoteness and the inability of enforcement to cover the vast area. Clearances are not likely to be required in other areas although it has been discussed at different times. It was thought that domestic VMS requirements would more likely be expanded to new areas and fisheries. In B.C., domestic regulations require at-sea video monitoring which incorporate VMS systems. These requirements are part of the Groundfish Integrated Fisheries Management Plan (IFMP) implemented in 2006.

Current regulations allow for a VMS exemption for Regulatory Area 4 clearances. Making this a VMS requirement would allow for prompter compliance. This would also allow for reimbursement of the VMS system through the Pacific States Marine Fisheries Commission (PSMFC).

DISCUSSION

1) Installing a VMS unit incurs a cost:
    a. Unit cost is estimated at $3,100.
    b. Installation cost is estimated at $250
    c. Service cost is estimated at $55/month.
2) Reimbursement of the unit cost is possible through the PSMFC reimbursement program when VMS is a regulation requirement.
3) Requirement of a VMS unit allows the fleet the flexibility to get clearance to fish and to unload for the current season for Area 4 with a single phone call.
4) Requirement of a VMS unit eliminates the burden on the fleet to obtain a clearance through a particular agent (typically processing plant personnel) prior to fishing or offloading.
5) Requirement of a VMS unit reduces the burden to agency staff to properly support, track, and enforce the intent of the clearance requirement.
6) An estimated 10 vessels will be affected as all other vessels have a VMS unit.
7) A side benefit of the VMS requirement is greater safety for the crew of the affected vessels.

Conclusion: Retaining the clearance requirement in its current form, whereby reimbursement of a VMS unit is not possible, is cumbersome for industry and agency staff alike and limits safety and flexibility for the fleet.

Sectors Affected: Directed commercial Pacific halibut fishery in IPHC Regulatory Area 4, in Alaska, U.S.A.

SUGGESTED REGULATORY LANGUAGE

This proposal would require Section 15 of the IPHC Fishery Regulations to be revised as follows:

15. Vessel Clearance in Area 4

(1) The operator of any vessel that fishes for Pacific halibut in Areas 4A, 4B, 4C, or 4D must carry a transmitting VMS transmitter while fishing for Pacific halibut in Area 4A, 4B, 4C, or 4D and until all Pacific halibut caught in any of these areas is landed ~~obtain a vessel clearance before fishing in any of these areas, and before the landing of any Pacific halibut caught in any of these areas~~, unless specifically exempted in paragraphs ~~(10),~~ (~~1~~3), (~~1~~4), ~~(15),~~ or (~~16~~5). The clearance requirement is met, provided that:

(a) the operator of the vessel complies with NMFS' vessel monitoring system regulations published at 50 CFR 679.28(f)(3), (4) and (5); and

(b) the operator of the vessel notifies NOAA Fisheries Office for Law Enforcement at 800-304-4846 (select option 1 to speak to an Enforcement Data Clerk) between the hours of 0600 and 0000 (midnight) local time within 72 hours before fishing for Pacific halibut in Area 4A, 4B, 4C, or 4D and receives a VMS confirmation number.

~~(2) An operator obtaining a vessel clearance required by paragraph (1) must obtain the clearance in person from the authorized clearance personnel and sign the IPHC form documenting that a clearance was obtained, except that when the clearance is obtained via VHF radio referred to in paragraphs (5), (8), and (9), the authorized clearance personnel must sign the IPHC form documenting that the clearance was obtained.~~

~~(3) The vessel clearance required under paragraph (1) prior to fishing in Area 4A may be obtained only at Nazan Bay on Atka Island, Dutch Harbor or Akutan, Alaska, from an authorized officer of the United States, a representative of the Commission, or a designated fish processor.~~

~~(4) The vessel clearance required under paragraph (1) prior to fishing in Area 4B may only be obtained at Nazan Bay on Atka Island or Adak, Alaska, from an authorized officer of the United States, a representative of the Commission, or a designated fish processor.~~

~~(5) The vessel clearance required under paragraph (1) prior to fishing in Area 4C or 4D may be obtained only at St. Paul or St. George, Alaska, from an authorized officer of the United States, a representative of the Commission, or a designated fish processor by VHF radio and allowing the person contacted to confirm visually the identity of the vessel.~~

~~(6) The vessel operator shall specify the specific regulatory area in which fishing will take place.~~

~~(7) Before unloading any Pacific halibut caught in Area 4A, a vessel operator may obtain the clearance required under paragraph (1) only in Dutch Harbor or Akutan, Alaska, by contacting an authorized officer of the United States, a representative of the Commission, or a designated fish processor.~~

~~(8) Before unloading any Pacific halibut caught in Area 4B, a vessel operator may obtain the clearance required under paragraph (1) only in Nazan Bay on Atka Island or Adak, by contacting an authorized officer of the United States, a representative of the Commission, or a designated fish processor by VHF radio or in person.~~

~~(9) Before unloading any Pacific halibut caught in Area 4C and 4D, a vessel operator may obtain the clearance required under paragraph (1) only in St. Paul, St. George, Dutch Harbor, or Akutan, Alaska, either in person or by contacting an authorized officer of the United States, a representative of the Commission, or a designated fish processor. The clearances obtained in St. Paul or St. George, Alaska, can be obtained by VHF radio and allowing the person contacted to confirm visually the identity of the vessel.~~

~~(10) Any vessel operator who complies with the requirements in section 18 for possessing Pacific halibut on board a vessel that was caught in more than one regulatory area in Area 4 is exempt from the clearance requirements of paragraph (1) of this section, provided that:~~

~~(a) the operator of the vessel obtains a vessel clearance prior to fishing in Area 4 in either Dutch Harbor, Akutan, St. Paul, St. George, Adak, or Nazan Bay on Atka Island by contacting an authorized officer of the United States, a representative of the Commission, or a designated fish processor. The clearance obtained in St. Paul, St. George, Adak, or Nazan Bay on Atka Island can be obtained by VHF radio and allowing the person contacted to confirm visually the identity of the vessel. This clearance will list the areas in which the vessel will fish; and~~

~~(b) before unloading any Pacific halibut from Area 4, the vessel operator obtains a vessel clearance from Dutch Harbor, Akutan, St. Paul, St. George, Adak, or Nazan Bay on Atka Island by contacting an authorized officer of the United States, a representative of the Commission, or a designated fish processor. The clearance obtained in St. Paul or St. George can be obtained by VHF radio and allowing the person contacted to confirm visually the identity of the vessel. The clearance obtained in Adak or Nazan Bay on Atka Island can be obtained by VHF radio.~~

~~(11) Vessel clearances shall be obtained between 0600 and 1800 hours, local time.~~

(~~1~~2) No Pacific halibut shall be on board the vessel at the time of the clearances required prior to fishing in Area 4.

(~~1~~3) Any vessel that is used to fish for Pacific halibut only in Area 4A and lands its total annual Pacific halibut catch at a port within Area 4A is exempt from the clearance requirements of paragraph (1).

(~~1~~4) Any vessel that is used to fish for Pacific halibut only in Area 4B and lands its total annual Pacific halibut catch at a port within Area 4B is exempt from the clearance requirements of paragraph (1).

(~~1~~5) Any vessel that is used to fish for Pacific halibut only in Area 4C or 4D or 4E and lands its total annual Pacific halibut catch at a port within Area 4C, 4D, 4E, or the closed area defined in section 10, is exempt from the clearance requirements of paragraph (1).

~~(16) Any vessel that carries a transmitting VMS transmitter while fishing for Pacific halibut in Area 4A, 4B, 4C, or 4D and until all Pacific halibut caught in any of these areas is landed, is exempt from the clearance requirements of paragraph (1) of this section, provided that:~~

~~(a) the operator of the vessel complies with NMFS' vessel monitoring system regulations published at 50 CFR 679.28(f)(3), (4) and (5); and~~

~~(b) the operator of the vessel notifies NOAA Fisheries Office for Law Enforcement at 800-304-4846 (select option 1 to speak to an Enforcement Data Clerk) between the hours of 0600 and 0000 (midnight) local time within 72 hours before fishing for Pacific halibut in Area 4A, 4B, 4C, or 4D and receives a VMS confirmation number.~~

Additional Documentation / References

https://www.psmfc.org/program/vessel-monitoring-system-reimbursement-program-vms

Appendices

None.

IPHC Fishery Regulations: minor amendments

PREPARED BY: IPHC SECRETARIAT (27 OCTOBER 2017)

PURPOSE

To improve clarity and consistency in the IPHC Fishery Regulations.

BACKGROUND

This proposal would standardize terminology, and make minor amendments and clarifications to the IPHC Regulations. These revisions to the regulations would include:

- Clarifying terminology;
- Reordering regulations for clarity and emphasis;
- Clarifying the head-on requirement;
- Using international standards for reporting time and date; and
- Updating fishery regulations.

DISCUSSION

Periodically, regulations should be reviewed to ensure they are clear, consistent, and up-to-date as a whole. These revisions to the IPHC Fishery Regulations are a result of a holistic review. The types of minor revisions and standardizations are described in more detail below, followed by a sample of the proposed regulatory language.

- Clarifying terminology
    - In Section 3 (Definitions),
        - Propose adding a definition of “halibut” to mean Pacific halibut (*Hippoglossus stenolepis*). Pacific would be added before halibut for further clarity.
        - Propose adding a definition of “*subsistence*” to mean:
            - Non-commercial, customary, and traditional use of Pacific halibut for direct personal, family, or community consumption or sharing as food, or customary trade. Subsistence fishing includes: i) ceremonial and subsistence removals in the Regulatory Area 2A treaty Indian fishery, ii) the sanctioned First Nations Food, Social, and Ceremonial (FSC) fishery conducted in British Columbia, iii) federal subsistence fishery in Alaska, and iv) U32 (i.e. less than 32 in or 81.3 cm) Pacific halibut retained in Regulatory Areas 4D and 4E by the Community Development Quota fishery for personal use.
- Reordering regulations for clarity and emphasis
    - Regulations would be revised to create a new section early in the regulations to provide the total fishery limits adopted by the IPHC. Previously, the commercial

catch limits were reported in Section 11 of the regulations, the U.S. Treaty Indian Tribes in Section 22, and the U.S. sport limits in Sections 26 and 28. However, the limits for the entire Pacific halibut fishery, including sport, subsistence, and incidental mortality were not reported. This new section would report all limits by IPHC Regulatory Area adopted by the IPHC Commissioners. For example, the new section would report the following:

	Limit	
Regulatory Area	**(pounds)**	**(t)**
Area 2A (California, Oregon, and Washington)		
Non-treaty directed commercial (south of Pt. Chehalis)		
Non-treaty incidental catch in salmon troll fishery		
Non-treaty incidental catch in sablefish fishery (north of Pt. Chehalis)		
Treaty Indian commercial		
Treaty Indian ceremonial and subsistence (year-round)		
Sport – Washington		
Sport – Oregon		
Sport – California		
Area 2B (British Columbia) (includes sport catch allocation)		
Area 2C (southeastern Alaska) (combined commercial/guided sport)		
Commercial fishery		
Guided sport fishery		
Area 3A (central Gulf of Alaska) (combined commercial/guided sport)		
Commercial fishery		
Guided sport fishery		
Area 3B (western Gulf of Alaska)		
Area 4A (eastern Aleutians)		
Area 4B (central/western Aleutians)		
Areas 4CDE		
Area 4C (Pribilof Islands)		
Area 4D (northwestern Bering Sea)		
Area 4E (Bering Sea flats)		
Total		

- If a new fishery limits section is created and section references are updated, the IPHC Secretariat suggests moving some sections earlier in the order to reflect their broad application. For example, Sect. 6 (Regulatory Areas) would immediately follow Sect. 3 (Definitions), followed by the new fishery limits section. Sect.4 (Licensing Vessel for Area 2A) would move further back in the document. For 2017, the sections that apply to all Pacific halibut fishing were ordered as follows:

    1. Short Title
    2. Application
    3. Definitions
    4. Licensing Vessels for Area 2A
    5. In-Season Actions
    6. Regulatory Areas

- Clarifying the head-on requirement
  - All IPHC Regulatory Areas are subject to the head-on requirement, including IPHC Regulatory Area 2A. IPHC Regulatory Area 2A has required Pacific halibut to be landed with the head intact since 1991 to assist in collecting data on length and age (from otoliths) from an area where most fish were previously landed head-off and where assessment data needs were not being met (see IPHC Technical Report 27 (p.26). In 2017, the IPHC expanded the requirement coastwide (with an exception for product frozen at sea in all IPHC Regulatory Areas, except IPHC Regulatory Area 2A). Based on the new regulatory language, some IPHC Regulatory Area 2A stakeholders questioned whether the head-on requirement still applied to them. The following proposed revisions would clarify that the head-on requirement applies to all IPHC Regulatory Areas, including IPHC Regulatory Area 2A:

    a. Revise the head-on requirement language at Sect. 13(2) to address uncertainty heard from IPHC Regulatory Area 2A processors whether this applies in their area, as follows:

       (2) No person on board a vessel fishing for, or tendering, halibut in any IPHC Regulatory Area shall possess any halibut that has had its head removed, except that halibut frozen at sea with its head removed may be possessed on board a vessel by persons in Areas 2B, 2C, 3A, 3B, 4A, 4B, 4C, 4D, and 4E if authorized by Federal regulations.

    b. Remove the option for head-off reporting on the State fish ticket in IPHC Regulatory Area 2A (Sect. 17(7)). This is confusing and unnecessary as the weight of the Pacific halibut must be recorded at the time of the offload with the head intact.

       ~~*(7) The individual completing the State fish tickets for the Area 2A fisheries as referred to in paragraph (6) must additionally record whether the halibut weight is of head-on or head-off fish.*~~

- Clarify the reporting section of the IPHC Fishery Regulations to state that the scale weight obtained at the time of offloading and reported on the fish ticket should reflect the condition landed (e.g. head-on and either washed or unwashed). This clarification would be applied to Sect. 17 (Receipt and Possession of halibut), paragraphs (5), (6), and (9). For example, Sect. 17(5) would be revised as follows:

  (5) A registered buyer (as that term is defined in regulations promulgated by NMFS and codified at 50 CFR Part 679) who receives halibut harvested in IFQ and CDQ fisheries in Areas 2C, 3A, 3B, 4A, 4B, 4C, 4D, and 4E, directly from the vessel operator that harvested such halibut must weigh all the halibut received and record the following information on Federal catch reports: date of offload; name of vessel; vessel number (State, Tribal or Federal, not IPHC vessel number); scale weight obtained at the time of offloading and in the condition offloaded, including the scale weight (in pounds) of halibut purchased by the registered buyer, the scale weight (in pounds) of halibut offloaded in excess of the IFQ or CDQ, the scale weight of halibut (in pounds) retained for personal use or for future sale, and the scale weight (in pounds) of halibut discarded as unfit for human consumption.

- Using international standards for reporting time and date
  - As an international organization, the time and date format in IPHC Fishery Regulations. For time, all references would be in a 24-hour format (e.g., 11:59 pm would be 2359 hours). For some time references, this proposal would add "local time" for additional clarity. For dates, all references would be in a "DD Month YYYY" format (e.g., January 25, 2017 would be 25 January 2017).
- Updating Fishery Regulations
  - IPHC Regulatory Area 2B sport regulations (Sect. 27(3)) would be updated to reflect current possession limits. The possession limit for Pacific halibut changed from three to two fish sometime before 2013.

    (3) The possession limit for halibut in the waters off the coast of British Columbia is ~~three~~ two halibut.

Benefits/Drawbacks: The benefit is more clear and consistent regulations. No known drawback.

Sectors Affected: This proposal affects all sectors of the Pacific halibut fishery.

ADDITIONAL DOCUMENTATION / REFERENCES

None

APPENDICES

None

Discussion paper: Frozen-at-sea exemption for head-on requirement (Sect. 13)

PREPARED BY: IPHC SECRETARIAT (27 OCTOBER 2017)

PURPOSE

To discuss the exemption to the requirement to land, weight, and report all Pacific halibut with the head-on.

BACKGROUND

Beginning in 2017, IPHC Fishery Regulations required Pacific halibut to be landed, weighed, and reported with the head intact and entrails removed (i.e. head-on (gutted)), with an exception for Pacific halibut frozen-at-sea. The exception allows Pacific halibut frozen-at-sea to be landed head-off.

DISCUSSION

The IPHC Secretariat would like to discuss the exemption that allows Pacific halibut frozen at sea to be landed head-off. Removing the exemption would further improve the Pacific halibut removal estimates by removing the bias introduced from varying head cuts. In addition, it would allow biological sampling, such as total length.

While the move in 2017 to requiring Pacific halibut to be landed, weighed, and reported in the head-on condition has improved IPHC's estimate of total removals, the exemption for Pacific halibut frozen-at-sea keeps the bias introduced from varying head cuts. The IPHC studied the relationship of head-on weight to head-off weight between 2013-16 and found a range from 9-18% among different ports and IPHC Regulatory Areas (see IPHC RARA Report 2015, and 2016). The range comes from variations in where the head is separated from the body. Cutting larger portions of the heads than the assumed value, on average, and reporting weights after these cuts have management implications. This practice reduces the estimated net weight, potentially allowing more individual fish to be harvested within the catch limits.

To date, only Canadian vessels have landed frozen, head-off Pacific halibut in 2017, and only in Canadian ports. As of October 2017, 56 landings (70,272 net lbs; ~31.9 t) have been of frozen-at-sea head-off product from 28 vessels.

Removing the exemption would further improve the Pacific halibut removal estimates by removing the bias introduced from varying head cuts. The IPHC is seeking further discussion and feedback on whether this exemption should be maintained or removed.

Sectors Affected: Commercial fishery for Pacific halibut in all Regulatory Areas.

RECOMMENDATION/S

That the Commission:

1) **NOTE** paper IPHC-2018-AM094-PropA5 which proposes a discussion on retaining or removing the frozen-at-sea head-on exemption into the future.

SUGGESTED REGULATORY LANGUAGE

Because this is an item for discussion, there is no suggested regulatory language at this time.

ADDITIONAL DOCUMENTATION / REFERENCES

IPHC RARA Report, 2015. "Analysis of length-weight data from commercial sampling in 2015." http://iphc.int/publications/rara/2015/RARA2015_09Lengthweight.pdf

IPHC RARA Report, 2016. Webster and Erikson. “Analysis of length-weight data from commercial sampling in 2016.” http://iphc.int/publications/rara/2016/IPHC-2016-RARA-26-R-2.8_Analysis_of_length_weight_data.pdf

IPHC-2017-AM093-PropA , Jan 2017. IPHC Head-on Landed Weight Requirement for Commercial Fishery, including Removal of 24” Head-off Minimum Size Limit

APPENDICES

Nil.

Received: 23 December 2017

INTERNATIONAL PACIFIC HALIBUT COMMISSION

REGULATORY PROPOSAL 2018

TITLE: LEASING IFQ TO CDQ GROUPS IN IPHC REGULATORY AREA 4

SUBMITTED BY:
UNITED STATES OF AMERICA
(GLENN MERRILL; NOAA-FISHERIES
AFFILIATION: NMFS, ALASKA REGION
USA

Explanatory Memorandum

A description, including relevant background, on why this proposal is being presented for the Commission's consideration.

- Indicate which IPHC Regulatory Areas may be affected.
- If it aims to revise an existing IPHC Regulation, then highlight the key changes and justify each.
- Provide a description of which sectors you expect this proposal will affect (positive and negative).
- Indicate which, if any, section of the IPHC Regulations would require modification (provide language under "Suggested Regulatory Language" section below).

All Regulatory Areas ☐ All Alaska Regulatory Areas ☐ All U.S. Regulatory Areas ☐

2A ☐ 2B ☐ 2C ☐ 3A ☐ 3B ☐ 4A ☐ 4B ☒ 4C ☒ 4D ☒ 4E ☒

In June 2017, the North Pacific Fishery Management Council (Council) took final action to allow Western Alaska Community Development Quota (CDQ) groups to lease (to receive by transfer) halibut catcher vessel individual fishing quota (IFQ) in regulatory areas 4B, 4C, and 4D in years of low halibut catch limits. This action would provide additional harvest opportunities to CDQ groups and provide IFQ holders with the opportunity to receive value for their IFQ when the halibut catch limits may not be large enough to provide for an economically viable fishery for IFQ holders. Under current NMFS regulations, CDQ groups cannot receive by transfer any IFQ derived from catcher vessel quota share. These restrictions limit the options for CDQ groups to expand opportunities for halibut fishing for residents in times of low halibut abundance. The Council's action would authorize CDQ groups to receive IFQ by transfer in IPHC Regulatory Areas 4B, 4C, and 4D in years of low Pacific halibut catch limits in IPHC Regulatory Areas 4B and 4CDE, consistent with Council's final motion in June 2017 under Agenda Item C3 and listed in Attachment 1.

Low Pacific halibut catch limits triggering this provision would be:

- Area 4B – 1M pounds (453.59 t)
- Area 4CDE – 1.5M pounds (680.39 t)

A CDQ group may lease catcher vessel IFQ only in areas it is allocated Pacific halibut CDQ. Only vessels equal to or under 51 feet length overall would be eligible to harvest the leased IFQ. Vessels must comply with IFQ use restrictions for all IFQ received by transfer.

Additional information is included in the Council's analysis on the action available here: Halibut IFQ Leasing by CDQ Groups (June 2017).

The Council's recommendation will be implemented in federal regulation by the National Marine Fisheries Service (NMFS) and international regulation by the IPHC. As part of its action, the Council recommended that any Area 4D IFQ transferred to a CDQ group may be fished in Area 4E by vessels less than or equal to 51 feet in LOA when the low catch limit threshold in Area 4CDE is triggered. The Council recommended this provision to provide additional harvest opportunities for CDQ residents to use Area 4D IFQ in Area 4E consistent with regulations that allow Area 4D CDQ to be used in Area 4E. Based on the Council's motion, the proposed IPHC Regulation revisions are listed in the section below.

Suggested Regulatory Language

Use this section to place new or revised IPHC Regulation text. For revised text, please include the current IPHC Regulation text (email us for the original, if needed: Regproposal@iphc.int) and indicate modifications. On the website is an example showing a proposed modification to the Fishing Periods (season dates), Section 8 of IPHC Regulations, to commence on 1st April and close on 1st November.

7. Fishing in Regulatory Area 4E and 4D

(1) Section 7 applies only to any person fishing for, or any vessel that is used to fish for, Area 4E Community Development Quota (CDQ) halibut, ~~or~~ Area 4D CDQ halibut, or Area 4D IFQ received by transfer by a CDQ organization provided that the total annual halibut catch of that person or vessel is landed at a port within Area 4E or 4D.

(2) A person may retain halibut taken with setline gear ~~in Area 4E CDQ and 4D CDQ fishery~~ that are smaller than the size limit specified in section 13, provided that no person may sell or barter such halibut.

(3) The manager of a CDQ organization that authorizes persons to harvest halibut in the Area 4E or 4D CDQ fisheries or IFQ received by transfer by a CDQ organization must report to the Commission the total number and weight of undersized halibut taken and retained by such persons pursuant to section 7, paragraph (2). This report, which shall include data and methodology used to collect the data, must be received by the Commission prior to 1 November of the year in which such halibut were harvested.

…

11. Commercial Catch Limits

(8) Notwithstanding paragraph (1), the total allowable catch of halibut that may be taken in the Area 4E directed commercial fishery is equal to the combined annual catch limits specified for the Area 4D and Area 4E CDQ fisheries and any Area 4D IFQ received by transfer by a CDQ organization. The annual Area 4D ~~CDQ~~ catch limit will decrease by the equivalent amount of ~~halibut~~ CDQ and IFQ received by transfer by a CDQ organization taken in Area 4E in excess of the annual Area 4E ~~CDQ~~ catch limit.

…

Attachment 1

C-3 Area 4 Halibut IFQ Leasing by CDQ Groups
June 9, 2017
Council motion

The Council recommends Alternative 2, with the following options, as its preferred alternative. Changes from Preliminary Preferred Alternative: new language in **bold and underlined**, deleted language in ~~strikethrough~~.

Alternative 2. Allow CDQ groups to lease halibut IFQ in Areas 4B, 4C and 4D in years of low halibut catch limits in regulatory Areas 4B and 4CDE. **A CDQ group may lease IFQ only in areas it is allocated halibut CDQ**. Any IFQ transferred to a CDQ group under this provision would be added to their available halibut CDQ~~, intended to be leased from non-residents for use only by residents of a CDQ community with a halibut CDQ permit and a CDQ hired master permit~~. No vessel over 51 feet LOA would be eligible to harvest the leased IFQ and vessels would have to comply with IFQ use restrictions.

Option 1. Defining 'low catch limits' for the purpose of allowing leases. Designation of low catch limits is independently determined for Areas 4B and 4CDE. The threshold for designating a year of low halibut catch limit in each area is less than:
Sub-option 1. 1 million pounds for area 4B
Sub-option 3. 1.5 million pounds for area 4CDE

Option 2. Leased Area 4D IFQ, may be fished in Area 4E.
Sub-option 2. Any **CDQ owned or non-CDQ owned Area** 4D A Class IFQ leased by a CDQ group may be fished in Area 4E **by vessels less than or equal to 51 feet** when the ~~abundance~~ **catch limit** threshold in Area 4CDE is reached.

Option 3. Any Area 4B, 4C, or 4D catcher vessel QS transferred after December 14, 2015 may not be leased as IFQ to CDQ groups under this action for a period of:
Sub-option 1. 3 years

Option 4. No individual halibut QS holder may lease catcher vessel halibut IFQ to any CDQ group, on a consecutive basis, for more than:
Sub-option 1. 2 years

Option 5. Limit the ability to lease Area 4B catcher vessel halibut IFQ to CDQ groups under this action to quota holders that own less than the following total area 4B holdings, inclusive of all class and blocked or unblocked categories:
Sub-option 3. 7,500 lbs
Sub-option 4. **Convert** Sub-option~~s 1 through~~ 3 ~~using the~~ **to** 2016 QS ~~pool~~ **units**

Option 6. Require CDQ groups **to submit a** report **for each year the group leases IFQ. The report must specify** the criteria used to select IFQ holders leasing to a CDQ group, the criteria used to determine who can receive leased IFQ, and the amount and type of IFQ leased. **A CDQ group will not be eligible to lease halibut IFQ until a timely and complete report is submitted.**

The Council intends for IFQ to be leased from non-residents for use only by residents of a CDQ community.

REGULATORY PROPOSAL 2018
Clarify Alaska Sport Fishery Regulations

SUBMITTED BY: UNITED STATES OF AMERICA

(Glenn Merrill, NOAA Fisheries, Alaska Region)

29 OCTOBER 2017

EXPLANATORY MEMORANDUM

For IPHC Regulatory Area(s): 2C 3A

Section 28(1)(f) of IPHC Regulations could be interpreted to require anglers to retain the carcasses of all halibut caught and filleted on a charter vessel in Convention waters in and off Alaska. This reading is based on the word "All" at the beginning of paragraph (f):

(f) All halibut harvested on a charter vessel fishing trip in Area 2C or Area 3A must be retained on board the charter vessel on which the halibut was caught until the end of the charter vessel fishing trip as defined at 50 CFR 300.61.

The term “all” is often used to denote the whole quantity of a particular thing. It was not the intent of section 28(1)(f) to require retention of a whole halibut when no carcass retention requirement applied. The carcass retention requirement applies to size-restricted halibut only and is located in NMFS regulations at 50 CFR 300.65(d)(5):

(5) *Carcass retention requirement for size-restricted halibut*. If a size-restricted halibut is filleted on board the charter vessel, the entire carcass, with head and tail connected as a single piece, must be retained on board the charter vessel on which it was caught until all fillets are offloaded.

Section 28(1)(f) was added to IPHC Regulations in 2015 for consistency with NMFS' implementation of a North Pacific Fishery Management Council action to remove the requirement that a charter vessel guide be on board the same vessel as a charter vessel angler to meet the definition of providing sport fishing guide services (80 FR 35195, June 19, 2015). NMFS intended for section 28(1)(f) to prevent charter vessel anglers without a guide on board the vessel from transferring their catch to another vessel for processing in order to facilitate enforcement of charter angler harvest limits. Therefore, NMFS proposes revising section 28(1)(f) of IPHC regulations to remove the word “all” to clarify that halibut harvested on a charter vessel fishing trip in Area 2C or Area 3A must be retained on board the charter vessel on which the halibut was caught until the end of the charter vessel fishing trip as defined at 50 CFR 300.61.

INTERNATIONAL PACIFIC HALIBUT COMMISSION

SUGGESTED REGULATORY LANGUAGE

28. Sport Fishing for Halibut—Areas 2C, 3A, 3B, 4A, 4B, 4C, 4D, 4E

(1) In Convention waters in and off Alaska:

…

(f) ~~All h~~Halibut harvested on a charter vessel fishing trip in Area 2C or Area 3A must be retained on board the charter vessel on which the halibut was caught until the end of the charter vessel fishing trip as defined at 50 CFR 300.61.

…

REGULATORY PROPOSAL 2018
Clarify Head-On Weight Requirement in Alaska Commercial Fisheries

SUBMITTED BY: UNITED STATES OF AMERICA

(Glenn Merrill, NOAA Fisheries, Alaska Region)

29 OCTOBER 2017

EXPLANATORY MEMORANDUM

For IPHC Regulatory Area(s): All AK Regulatory Areas

Beginning in 2017, all commercial Pacific halibut must be landed and weighed with their heads attached (head-on) for data reporting purposes. The head-on requirement is intended to improve the estimates of the weight of landed halibut. In 2017, section 13 of IPHC regulations were modified to require that halibut be landed head-on. Section 13 also specified that those head-on halibut will be subject to a 32-inch minimum size limit, with an exception for vessels that freeze halibut at sea. Those vessels may deliver their frozen, head-off halibut shoreside with a 24- inch minimum size limit.

While section 13 of IPHC regulations clearly requires all commercial halibut to be landed with the head on, IPHC regulations could be clarified to specify the head-on weighing and reporting requirements for persons that purchase or receive halibut directly from a vessel operator. Therefore, the NMFS Alaska Region proposes that section 17 of IPHC Regulations be clarified to specify that 1) all commercial halibut landed in Alaska regulatory areas must be weighed with the head on, and 2) the head-on weight must be reported in the applicable catch report.

SUGGESTED REGULATORY LANGUAGE

17. Receipt and Possession of Halibut

…

(5) A registered buyer (as that term is defined in regulations promulgated by NMFS and codified at 50 CFR part 679) who receives halibut harvested in IFQ and CDQ fisheries in Areas 2C, 3A, 3B, 4A, 4B, 4C, 4D, and 4E, directly from the vessel operator that harvested such halibut must weigh all the halibut received <u>with the head on</u> and record the following information on Federal catch reports: Date of offload; name of vessel; vessel number

(State, Tribal or Federal, not IPHC vessel number); scale weight with the head on obtained at the time of offloading, including the scale weight (in pounds) of halibut purchased by the registered buyer, the scale weight (in pounds) of halibut offloaded in excess of the IFQ or CDQ, the scale weight of halibut (in pounds) retained for personal use or for future sale, and the scale weight (in pounds) of halibut discarded as unfit for human consumption.

(6) The first recipient, commercial fish processor, or buyer in the United States who purchases or receives halibut directly from the vessel operator that harvested such halibut must weigh and record all halibut received and record the following information on State fish tickets: The date of offload; vessel number (State or Federal, not IPHC vessel number) or Tribal ID number; total weight obtained at the time of offload including the weight (in pounds) of halibut purchased; the weight (in pounds) of halibut offloaded in excess of the IFQ, CDQ, or fishing period limits; the weight of halibut (in pounds) retained for personal use or for future sale; and the weight (in pounds) of halibut discarded as unfit for human consumption. All halibut harvested in IFQ and CDQ fisheries in Areas 2C, 3A, 3B, 4A, 4B, 4C, 4D, and 4E, must be weighed with the head on and the head-on weight must be recorded on State fish tickets as specified in this paragraph.

…

INTERNATIONAL PACIFIC HALIBUT COMMISSION

IPHC-2018-AM094-PropC1

Commercial Catch Limits (Sect. 11): Proposals

SUBMITTED BY: (NONE AS OF: 01 DECEMBER 2017)

EXPLANATORY MEMORANDUM

For IPHC Regulatory Area(s): All

Catch limit proposals received from stakeholders are presented together in the table below. Entries in the table reflect the individual proposals, and unless otherwise noted, proposals are expressed as TCEY (with values in millions of pounds) for particular IPHC Regulatory Areas or as a total for the whole coast.

As proposals are received prior to the 94th Session of the IPHC Annual Meeting (AM094) they will be added to the table.

	TCEY for Individual IPHC Regulatory Areas								Coast-wide TCEY
Name of proponent	2A	2B	2C	3A	3B	4A	4B	4CDE	Total

SUGGESTED REGULATORY LANGUAGE

Catch limits adopted by the Commission will be incorporated into the appropriate section of the IPHC Fishery Regulations, currently Section 11. *Commerical Catch Limits*.

INTERNATIONAL PACIFIC HALIBUT COMMISSION

IPHC-2018-AM094-PropC2

REGULATORY PROPOSAL 2018
Preserving Catch on Private Live-Aboard Vessels

SUBMITTED BY:
ANDREW COOPER
PRIVATE SPORT FISHERMAN
UNITED STATES OF AMERICA
16 AUGUST 2017

EXPLANATORY MEMORANDUM

For IPHC Regulatory Area(s): 2C

Current regulations assume that sport fishing vessels return to port each day for processing of their catch. Live-aboard vessels are often operating and fishing in remote areas or where limited port facilities offer no options for proper preservation or shipment of their catch.

The result of these requirements is that any surplus fish caught and not immediately consumed must be wasted and not kept on board to satisfy the regulations. The current regulations (specifically the Pacific Halibut Fishery Regulations 2017 section 28d) do not allow for proper processing and preservation of the catch. This applies even if the halibut in question is caught as by-catch while fishing for other species.

It is understood that the current requirements for keeping fish intact or in whole fillets is to aid in verification and enforcement of catch limits. This need could be easily met through proper record keeping to include logging of fish caught with location information, measurements, and photographs prior to processing.

SUGGESTED REGULATORY LANGUAGE

Amend the current 2017 regulations to allow proper preservation of the catch on private live-aboard vessels as follows in Section 28 with a new paragraph.

For private sport fishing vessels that do not utilize port facilities daily it is acceptable to properly preserve halibut caught on-board provided additional records are kept. This is to include logging each catch with location caught, measuring each fish (length or weight), state issued license information of the angler, and photographing of each fish prior to processing. Once processing has begun on-board all fishing activity for halibut must cease for the remainder of the calendar day.

REGULATORY PROPOSAL 2018
For Unguided Sport Fishing

SUBMITTED BY:
PATRICIA PHILLIPS
PACIFIC FISHING, INC.
UNITED STATES OF AMERICA
14 SEPTEMBER 2017

EXPLANATORY MEMORANDUM

For IPHC Regulatory Area(s): All AK Regulatory Areas

Require logbook-style record keeping and reporting requirements for certain unguided anglers in Alaska. It is a widespread practice of lodges or other businesses to equip unguided anglers with boats, gear, and local knowledge, so that the unguided angler can fish without the assistance of a licensed guide. There currently is no requirement for unguided anglers to report their sport fishing effort and harvest of halibut, thus it is difficult to assess any trends in effort and harvest.

SUGGESTED REGULATORY LANGUAGE

Section 3. Definitions

(u) "unguided angler" with respect to a person sport fishing for halibut, means an angler or anglers sport fishing from a vessel provided by a lodge or other business equipping angler(s) with boats, gear, and local knowledge for the angler to sport fish without the assistance of a licensed guide.

Section 28. Sport Fishing for Halibut – Areas 2C, 3A, 3B, 4A, 4B, 4C, 4D, 4E

(4) For unguided angler sport fishing from a vessel provided by a sport fishing lodge or other business:

(a) Each unguided angler shall carry a harvest record on his or her person while fishing for halibut. Such harvest record must include:

(b) Name of unguided angler;

(c) State sport fishing license number;

(d) The vessel's license number or registration number;

(e) The date(s) of sport fishing effort;

(f) Location;

(g) Catch per day;

(h) Number of halibut and total estimated weight retained;

(i) Number of halibut released.

(j) The harvest record must be returned to the Alaska Department of Fish & Game within 10 days upon completion of angler fishing effort.

(k) No person shall make a false entry on the harvest record referred to in this section.

INTERNATIONAL PACIFIC HALIBUT COMMISSION

IPHC-2018-AM094-PropC4

REGULATORY PROPOSAL 2018
Sport Fishing for Halibut - Cleaning Regulations

SUBMITTED BY:
STEVE RIEHEMANN
CAPTAIN/PRIVATE VESSEL OWNER
UNITED STATES OF AMERICA
22 SEPTEMBER 2017

EXPLANATORY MEMORANDUM

For IPHC Regulatory Area(s): All Regulatory Areas

IPHC management measures Section 28. (1) (d) reads: "no person shall possess on board a vessel, including charter vessels and pleasure craft used for fishing, halibut that have been filleted, mutilated, or otherwise disfigured in any manner, except that each piece maybe cut into no more than 2 ventral pieces, 2 dorsal pieces, and 2 cheek pieces, with skin on all pieces."

Sport fisherman should be given options to this regulation. It contradicts ADF&G regulations by promoting waste and it discriminates against citizens that live on their vessels. This law assumes that all fisherman go out fishing for the day and return to port every night. Those of us that live on our vessels are not even allowed to cut off a portion of a fletch and have it for dinner unless we eat the entire fletch or throw half of it away. We cannot even buy halibut in town and take it with us on a cruising trip unless we can find someone that sells whole fletches with skin on.

I suggest the IPHC should do the right thing and remove this idiotic law from the books. Enforcement officers do not like it nor does the general public. It has been bad law from the day it was written. There are no negative aspects to eliminating this law. Please do the right thing and give private vessel owners the ability to preserve our fish properly by eliminating this law or giving us an option to it.

SUGGESTED REGULATORY LANGUAGE

Once again,current law reads; No person shall possess on board a vessel, including charter vessels and pleasure craft used for fishing, halibut that have been filleted, mutilated, or otherwise disfigured in any manner, except that each halibut may be cut into no more than 2 ventral pieces, 2 dorsal pieces, and 2 cheek pieces, with skin on all pieces.

Simply add "unless preserved" or "unless preservation facilities are aboard" to the end of this regulation.

INTERNATIONAL PACIFIC HALIBUT COMMISSION

IPHC-2018-AM094-PropC5

REGULATORY PROPOSAL 2018
Elimination of Law Requiring Skin to Be Left on Halibut Fillets

SUBMITTED BY:
JAMES SHIRK
RECREATIONAL FISHERMAN
UNITED STATES OF AMERICA
13 OCTOBER 2017

EXPLANATORY MEMORANDUM

For IPHC Regulatory Area(s): All AK Regulatory Areas

I wish to change Regulation 28 d which removes the requirement for skin being left on fillet. Leaving the skin on fillet halibut degrades the quality of the meat . I am a recreational fisherman that goes out for 3 or 4 days and leave my halibut fillets on ice, if the skin is left on it slims the whole cooler and degrades the meat. I was given a ticket and 4 fish (16 fillets) were taken. The District Attorney dismissed the case. I was told by the trooper the skin requirement was to determine if it was a whole fish. I had 16 fillets 4 fish with no skin on them. I asked, "What if I were eat a fresh fillet on the boat, and no longer posses a whole fish?" the Trooper could not answer my question. I do not see why the skin requirement for recreational fishing is even in the regulations. What does this law accomplish?

SUGGESTED REGULATORY LANGUAGE

Insert suggested regulatory language No person shall possess on board a vessel, including charter vessels and pleasure craft used for fishing, halibut that have been filleted, mutilated, or otherwise disfigured in any manner, except that each halibut may be cut into no more than 2 ventral pieces, 2 dorsal pieces, and 2 cheek pieces.

INTERNATIONAL PACIFIC HALIBUT COMMISSION

IPHC-2018-AM094-PropC6

REGULATORY PROPOSAL 2018
Recreational Pacific Halibut Processing and Possession Exemption for Pleasure Vessels with Live-Aboard Accommodations and Processing Facilities

SUBMITTED BY:
DAVID ROBERTSON
RECREATIONAL FISHERMAN
UNITED STATES OF AMERICA
16 OCTOBER 2017

EXPLANATORY MEMORANDUM

For IPHC Regulatory Area(s): All AK Regulatory Areas

My wife and I spend 3 months in the summer on our boat in SE Alaska (Area 2C). While there, we live on the boat ,usually away from a marina or town. We also participate in some of the fishing opportunities while there. We have facilities onboard to process, pack and freeze fish for preservation for our personal use.

The current IPHC regulation prevents personal use of halibut on the boat, even though we are living there, and prevents the proper preservation of the catch for future use.

To comply with the current regulations, we must maintain halibut in 4 filets and 2 cheeks with skin on. This prevents removing a portion of a filet for personal consumption while on the boat. It further prevents proper processing for future use (skin on tends to taint the flesh over time) and "meal size" is approximately 1 lb. We are currently at home trying to process halibut, frozen in 4 filets/fish into "meal size", skinned packages. I'm sure the partial thawing/refreezing of this process will degrade the halibut.

SUGGESTED REGULATORY LANGUAGE

In the interest of conservation, proper use and preservation of the halibut, I ask that Section 28(1)(d) be revised to read:

"No person shall possess on board a vessel, including charter vessels and pleasure craft used for fishing, halibut that have been filleted, mutilated or otherwise disfigured in any manner except that each halibut may be cut into no more than 2 ventral pieces, 2 dorsal pieces and 2 cheek pieces, with skin on all pieces. *Except pleasure vessels with live aboard accommodations and processing facilities, may process, preserve, maintain and transport halibut on board.*"

INTERNATIONAL PACIFIC HALIBUT COMMISSION

IPHC-2018-AM094-PropC7

REGULATORY PROPOSAL 2018
Eliminate the requirement for a CHARTER Halibut Permit

SUBMITTED BY:
STEVE RIEHEMANN
PRIVATE VESSEL CAPTAIN
UNITED STATES OF AMERICA
18 OCTOBER 2017

EXPLANATORY MEMORANDUM

For IPHC Regulatory Area(s): 2C

Eliminate the requirement for a CHARTER Halibut Permit (CHP) for private crewed vessels not available for CHARTER. 50 CFR 300.67. The language speaks for itself, but in Feb 2011 the CHLAP was put into effect. Charter vessels were required to have CHP's. At that time enforcement officers for NOAA told private vessel owners that a CHP was not required aboard private vessels not available for charter and we could not even apply for a CHP. Fast forward a few years and NOAA and ADF&G got together and decided to write their own version of the American Heritage Dictionary and re-define "for hire". Now, CHP's are required on private vessels not available for charter, and since the 2011 deadline to apply for one is past, we have to pay thousands of dollars per year to lease a permit or tens of thousands of dollars to purchase one. We could have gotten one for free in 2011 when we asked about the CHLAP. Although private vessels not available for charter should not need a CHP, if this regulation is going to stay on the books, at a minimum, we should be given the same opportunity to apply for a free CHP as charter vessels were given in 2011.

SUGGESTED REGULATORY LANGUAGE

Simply change the definition of "compensation" to specifically exclude private documented recreational vessels not available for charter, or give those vessels the opportunity to apply for a CHP for free so that we can spend a few days each summer halibut fishing with our owners without having to spend thousands of dollars to lease or purchase CHP's that are becoming more and more difficult to find.

IPHC-2018-AM094-PropC8

REGULATORY PROPOSAL 2018
Allow Shellfish Pots on Commercial Halibut Vessels

SUBMITTED BY:
ALASKA LONGLINE FISHERMEN'S ASSOCIATION
ALFA
UNITED STATES OF AMERICA
22 OCTOBER 2017

EXPLANATORY MEMORANDUM

For IPHC Regulatory Area(s): All AK Regulatory Areas

Commercial Halibut Vessels in Alaska should be allowed to have aboard and deploy shellfish pots during the commercial Halibut Season as long as those pots have rigid perimeter openings that do not exceed 36 inches (91.45cm). This proposal does not alter or supersede any other shellfish regulations in place for the area the pots are deployed. Note: The 36-inch rigid perimeter limit is the legal definition used in the State of Alaska and NMFS Pacific Cod Pot regulations to disallow halibut capture in those pots.

This proposal would require a change to IPHC Regulation 19(3), Fishing Gear, which prohibits possession of halibut on board a vessel carrying fishing pots capable of catching halibut.

SUGGESTED REGULATORY LANGUAGE

19. Fishing Gear

(3) No person shall possess halibut while on board a vessel carrying any trawl nets or fishing pots capable of catching halibut,

(a) except that in Areas 2C, 3A, 3B, 4A, 4B, 4C, 4D, or 4E, halibut heads, skin, entrails, bones or fins for use as bait may be possessed on board a vessel carrying pots capable of catching halibut, provided that a receipt documenting purchase or transfer of these halibut parts is on board the vessel; or

(b) except that in Areas 2C, 3A, 3B, 4A, 4B, 4C, 4D, or 4E, halibut may be possessed on board a vessel carrying pots capable of catching halibut, provided such possession is authorized by NMFS regulations published at 50 CFR Part 679 as referenced in paragraphs (1) and (2) of this section; or

(c) except that in Areas 2C, 3A, 3B, 4A, 4B, 4C, 4D, or 4E, halibut may be possessed on board a vessel carrying shellfish pots capable of catching halibut, provided the pots have a rigid perimeter opening that does not exceed 36 inches (91.45cm) and are consistent with State of Alaska and NMFS Pacific cod pot regulations published at 50 CFR Part 679; or

(~~c~~d) except that in Area 2B, halibut may be possessed on board a vessel carrying sablefish trap gear, provided such possession is authorized by the Condition of License regulations promulgated by DFO as referenced in paragraphs (1) and (2) of this section.

IPHC-2018-AM094-PropC9

REGULATORY PROPOSAL 2018
Processing Halibut into Greater Than Four Filets

SUBMITTED BY:
MARK COWART
SPORTS FISHERMAN
UNITED STATES OF AMERICA
24 OCTOBER 2017

EXPLANATORY MEMORANDUM

For IPHC Regulatory Area(s): All AK Regulatory Areas

Please amend regulations to allow proper preservation of catch on private live aboard vessels. It is stated that no fish should be wasted but given the current regulations of allowing only 4 fletches of filets per fish. This practice is being wasteful because fish is not in consumable portion sizes. The result of these requirements is that any surplus fish caught and not immediately consumed must be wasted and not kept on board to satisfy the regulations. To properly store halibut for long term preservation one needs to cut filets into more than 4 pieces.

I understood that the current requirements for keeping fish intact or in whole fillets is to aid law enforcement of catch limits. This requirement should be amended so private live aboard vessels can process fish for proper long-term storage and eliminate waste by additional record keeping and documentation measurements on info and photographs prior to processing.

SUGGESTED REGULATORY LANGUAGE

Private live aboard vessels would be allowed to process halibut into multiple pieces greater then 4 filets by following additional record keeping including logging catch record, date stamp photos prior to processing and labeling of processed packages.

REGULATORY PROPOSAL 2018
Revision to the Method Used to Measure Length of Halibut

SUBMITTED BY:
RICHARD YAMADA
ALASKA CHARTER ASSOCIATION
UNITED STATES OF AMERICA
25 OCTOBER 2017

EXPLANATORY MEMORANDUM

For IPHC Regulatory Area(s): All Regulatory Areas

Regulation 25 (and elsewhere in the regulations that describe how the length of a halibut should be measured) states, "(2) Any size limit promulgated under IPHC or NMFS regulations shall be measured in a straight line passing over the pectoral fin from the tip of the lower jaw with the mouth closed, to the extreme end of the middle of the tail". It is a common practice for a boat captain to slide a halibut over a ridged metal ruler or between a pair of measured markings on the vessel or ice chest to determine whether a halibut is within the current regulations for retention. The need for a flexible measuring device that can measure over the body of a halibut, as current regulations imply, is cumbersome as it would not only need to be durable, but also easy to clean, which most consumer tape measures are not. With current maximum size restrictions, the difference between a measurement over the body and a flat measurement under the body could be the basis for a violation. A measurement taken under the body, where a halibut could be quickly slid over the measuring device up to a stop coinciding with the beginning of the measuring device would provide less harm to a halibut if it had to be released. This practice is also a common protocol when measuring halibut lengths for scientific research purposes as well as a common practice in the commercial halibut fishery.

SUGGESTED REGULATORY LANGUAGE

Amend current regulations replacing "over the pectoral fin" with "under the fish". This would then read, "Any size limit promulgated under IPHC or NMFS regulations shall be measured in a straight line under the fish from the tip of the lower jaw with the mouth closed, to the extreme end of the middle of the tail".

INTERNATIONAL PACIFIC HALIBUT COMMISSION

IPHC-2018-AM094-PropC11

REGULATORY PROPOSAL 2018
Long Term Storage of Halibut Aboard Pleasure Vessels

SUBMITTED BY:
LEE THOMPSON
PRIVATE SPORT FISHERMAN
UNITED STATES OF AMERICA
25 OCTOBER 2017

EXPLANATORY MEMORANDUM

For IPHC Regulatory Area(s): All Regulatory Areas

The current halibut regulations do not allow for long term preservation and storage of halibut for personal use aboard pleasure vessels. The inability to package and preserve fish in serving size portions will result in waste and therefore increase the number of halibut required to supplement a family's diet. The first change suggested below is more in line with the state regulations for other sport caught fish in Alaska. By adding the word ***halibut***, the second suggested change would permit larger vessels to meet the requirements so long as all halibut fishing gear is offloaded onto a smaller fishing vessel even if shrimp and crab pots are stored on the larger vessel. This suggestion seems to meet the spirit of the regulations. Particularly since the IPHC does not regulate shrimp and crab sport fishing.

SUGGESTED REGULATORY LANGUAGE

At Section 28 (1) (d)

(d) No person shall possess on board a vessel, including charter vessels and pleasure craft used for fishing, halibut that have been filleted, mutilated, or otherwise disfigured in any manner, except that each halibut may be cut into no more than 2 ventral pieces, 2 dorsal pieces, and 2 cheek pieces, with skin on all pieces. ***Possession does not include Preserved fish.***

Preserved fish means fish prepared in such a manner, and in an existing state of preservation, as to be fit for human consumption after a 15-day period, and does not include unfrozen fish temporarily stored in coolers that contain ice, dry ice, or fish that are lightly salted.

INTERNATIONAL PACIFIC HALIBUT COMMISSION

IPHC Regulations at Section 28(1)(e) for unguided sport fisheries in Alaska should read.

(e) Halibut in excess of the possession limit in paragraph (1)(c) of this section may be possessed

on a vessel that does not contain ***halibut*** sport fishing gear, fishing rods, hand lines, or gaffs.

REGULATORY PROPOSAL 2018
Long Term Storage of Halibut on Full Time Cruising Vessels

SUBMITTED BY:
WAYNE CORNELL
PRIVATE SPORT FISHERMAN
UNITED STATES OF AMERICA
25 OCTOBER 2017

EXPLANATORY MEMORANDUM

For IPHC Regulatory Area(s): All Regulatory Areas

My wife and I live on a boat in Southeast Alaska and cruise west coast waters from California to Alaska (primarily SE Alaska). We have no home or storage facilities other than the vessel we live on. The boat is our domicile. During the summer months we catch, clean, and freeze our halibut to supplement our diet throughout the year. The current regulations require the halibut to be cut into quarters and the skin left on the flesh. While this may make sense for the day fisherman who brings their catch back to port for processing and storage at their home ashore, it is impractical for the long term or full time cruiser. To minimize waste the current regulation below should be revised to permit processing and storage aboard the vessel in usable portion sizes with the skin removed.

SUGGESTED REGULATORY LANGUAGE

At Section 28 (1) (e)

(e) Halibut in excess of the possession limit in paragraph (1)(c) of this section may be ***processed (frozen or canned) and*** possessed ***on vessels containing processing and full time living facilities that is used as the angler's "Primary Domicile"*** or vessels that do not contain ***halibut*** gear, fishing rods, hand lines, or gaffs. ***The processed portion of halibut on vessels meeting either of these criteria is exempt from the requirements in section (1) (d).***

If necessary the following could also be added or worked into section (1) (e);

A running log must be updated as each fish is caught and maintained on board the vessel with;

Date & Time Caught - Location caught - Overall length of fish - State issued license information of the angler - Corresponding photograph of each fish prior to

processing with date/time stamp – processed fish packages must be marked to correspond to log and photograph.

Once processing has begun on-board all fishing activity for halibut must cease for the remainder of the calendar day.

Proof of “Primary Domicile”, “Live-Aboard”, or “Extended Cruising” status (which every term you would like to use) could be verified by enforcement officials by accessing license holders mailing address or contacting their homeport marina manager.

Another option would be for the angler to keep a letter prepared by an enforcement officer stating that he or she has reviewed the individual’s information (Proof of address, ships log, and or contacted the angler’s homeport marina) verifying that he or she meets the decided on requirements for “Primary Domicile” status.

INTERNATIONAL PACIFIC HALIBUT COMMISSION

IPHC-2018-AM094-PropC13

REGULATORY PROPOSAL 2018
Allowing Retention of Halibut in Pot Gear in the Bering Sea

SUBMITTED BY:
JEFF KAUFFMAN
ST. PAUL FISHING COMPANY
UNITED STATES OF AMERICA
27 OCTOBER 2017

EXPLANATORY MEMORANDUM

For IPHC Regulatory Area(s): 4A 4B 4C 4D 4E

Key changes to an existing IPHC Regulation:

The purpose of this proposal is to mitigate the longstanding and detrimental losses resulting from whale depredation on longline gear in the directed halibut fishery in Areas 4A, 4B, 4C, 4D and 4E.

This proposal suggests two changes to IPHC Regulations, Section 19, on allowable fishing gear for halibut.

Currently, this regulation allows fishing for halibut, in (1), and possession of halibut, in (2), <u>only</u> with the use of hook and line gear, with a couple of exceptions. One exception, described in (1)(b) and (2)(b), allows the retention of halibut taken with longline pot gear in the sablefish IFQ fishery, as authorized by NMFS regulations. This action was taken to reduce wastage of halibut caught incidentally in sablefish pots, discarded and potentially lost to killer whale predation. NMFS regulations cited currently allow this retention of halibut only in the Gulf of Alaska.

The North Pacific Fishery Management Council (NPFMC) in October 2017 initiated an analysis of an action to extend this halibut retention allowance to the Bering Sea, and to apply it to single as well as longline pots. (Summary attached.) The preliminary analysis is coming back to the Council in April 2018 and the action is likely to be finalized by the end of 2018, for implementation in 2019.

Change A: The proposed change to (1)(b) and (2)(b) would allow halibut retention in single as well as longline pots, if authorized by NMFS regulations that spring from the Council action now underway. For some smaller vessels that might fish for sablefish and retain halibut, longline pot gear is too large and heavy, while single pot gear is more usable.

Change B: Harvesters of halibut with hook and line gear in both the Gulf of Alaska and the Bering Sea have severe problems with whale predation on their gear, reducing efficiency and increasing wastage. Use of pot gear would prevent whale predation.

The current analysis underway at the NPFMC, mentioned above, is for an action to allow retention of halibut in pots used in the IFQ sablefish fishery, but does not directly address retention of halibut in pots NOT being used in the IFQ sablefish fishery, more specifically, to allow the use of pots in the directed halibut fishery. The action – or a separate action – could potentially address, and result in, the direct retention of halibut in single and longline pots in the Bering Sea, as requested by stakeholders to combat whale predation. See the attached summary of the action from the Council Newsletter.

The proposed change to the first sentence of (1) and (2) would allow for direct use of pot gear for halibut fishing in the Bering Sea, when it is authorized by NMFS regulations.

Sectors affected:

The commercial halibut harvesting sector would be positively affected by the proposed changes in regulation, made to prevent whale predation, reduce wastage and increase fishing efficiency.

Concerns from the commercial sector include potential gear conflict between hook and line gear and pot gear.

There are no known negative effects on other sectors.

SUGGESTED REGULATORY LANGUAGE

The IPHC Regulations published in the Federal Register, Section 19, Fishing Gear, is amended as indicated, with the addition in (1) and (2) of the language underlined and in bold. The language change for gear marking requirements in (4) is indicated by strikethrough of the language to be removed, and bold and underlined language to be added.

(1) No person shall fish for halibut using any gear other than hook and line gear, **<u>and longline and single pot gear, as authorized for Areas 4A, 4B, 4C, 4D and 4E, by NMFS regulations published at 50 CFR part 679.</u>**

> (a) except that vessels licensed to catch sablefish in Area 2B using sablefish trap gear as defined in the Condition of License can retain halibut caught as bycatch under regulations promulgated by DFO; or

(b) except that a person may retain halibut taken with longline **and single** pot gear in the sablefish IFQ fishery if such retention is authorized by NMFS regulations published at 50 CFR part 679.

(2) No person shall possess halibut taken with any gear other than hook and line gear, **and longline and single pot gear, as authorized for Areas 4A, 4B, 4C, 4D and 4E, by NMFS regulations published at 50 CFR part 679.**

(a) except that vessels licensed to catch sablefish in Area 2B using sablefish trap gear as defined by the Condition of License can retain halibut caught as bycatch under regulations promulgated by DFO; or

(b) except that a person may possess halibut taken with longline **and single pot** gear in the sablefish IFQ fishery if such possession is authorized by NMFS regulations published at 50 CFR part 679.

(3) No person shall possess halibut while on board a vessel carrying any trawl nets or fishing pots capable of catching halibut,

(a) except that in Areas 2C, 3A, 3B, 4A, 4B, 4C, 4D, or 4E, halibut heads, skin, entrails, bones or fins for use as bait may be possessed on board a vessel carrying pots capable of catching halibut, provided that a receipt documenting purchase or transfer of these halibut parts is on board the vessel; or

(b) except that in Areas 2C, 3A, 3B, 4A, 4B, 4C, 4D, or 4E, halibut may be possessed on board a vessel carrying pots capable of catching halibut, provided such possession is authorized by NMFS regulations published at 50 CFE part 679 as referenced in paragraphs (1) and (2) of this section; or (c) except that in Area 2B, halibut may be possessed on board a vessel carrying sablefish trap gear, provided such possession is authorized by the Condition of License regulations promulgated by DFO as referenced in paragraphs (1) and (2) of this section.

(4) All ~~setline or skate~~ **gear** marker buoys carried on board or used by any United States vessel used for halibut fishing shall be marked with one of the following:

(a) The vessel's State license number; or

(b) the vessel's registration number.

(5) The markings specified in paragraph (4) shall be in characters at least four inches in height and one-half inch in width in a contrasting color visible above the water and shall be maintained in legible condition.

(6) All setline or skate marker buoys carried on board or used by a Canadian vessel used for halibut fishing shall be:

(a) Floating and visible on the surface of the water; and

(b) legibly marked with the identification plate number of the vessel engaged in commercial fishing from which that setline is being operated.

(7) No person on board a vessel used to fish for any species of fish anywhere in Area 2A during the 72-hour period immediately before the fishing period for the directed commercial fishery shall catch or possess halibut anywhere in those waters during that halibut fishing period unless, prior to the start of the halibut fishing period, the vessel has removed its gear from the water and has either:

(a) Made a landing and completely offloaded its catch of other fish; or

(b) submitted to a hold inspection by an authorized officer.

(8) No vessel used to fish for any species of fish anywhere in Area 2A during the 72-hour period immediately before the fishing period for the directed commercial fishery may be used to catch or possess halibut anywhere in those waters during that halibut fishing period unless, prior to the start of the halibut fishing period, the vessel has removed its gear from the water and has either:

(a) Made a landing and completely offloaded its catch of other fish; or

(b) submitted to a hold inspection by an authorized officer.

(9) No person on board a vessel from which setline gear was used to fish for any species of fish anywhere in Areas 2B, 2C, 3A, 3B, 4A, 4B, 4C, 4D, or 4E during the 72-hour period immediately before the opening of the halibut fishing season shall catch or possess halibut anywhere in those areas until the vessel has removed all of its setline gear from the water and has either:

(a) Made a landing and completely offloaded its entire catch of other fish; or

(b) submitted to a hold inspection by an authorized officer.

(10) No vessel from which setline gear was used to fish for any species of fish anywhere in Areas 2B, 2C, 3A, 3B, 4A, 4B, 4C, 4D, or 4E during the 72-hour period immediately before the opening of the halibut fishing season may be used to catch or possess halibut anywhere in those areas until the vessel has removed all of its setline gear from the water and has either:

(a) Made a landing and completely offloaded its entire catch of other fish; or

(b) submitted to a hold inspection by an authorized officer.

(11) Notwithstanding any other provision in these Regulations, a person may retain, possess and dispose of halibut taken with trawl gear only as authorized by Prohibited Species Donation regulations of NMFS.

Attachment

From the NPFMC October Newsletter

Halibut Retention in Pot Gear

October 17, 2017

After reviewing a staff discussion paper, the Council initiated an analysis to allow vessels using pot gear in the BSAI to retain legal-size halibut if they possess the appropriate IFQ. The Council established a purpose and need statement that recognizes the challenge of whale depredation on longline gear and on halibut that must be discarded in the presence of whales because regulations do not allow them to be retained. Whale depredation causes unaccounted mortality on the sablefish and halibut resource, and hinders the ability of IFQ holders to prosecute the fishery in an effective manner. Noting that the IPHC recently revised its regulations to allow halibut retention in pot gear and that retention is currently allowed in the GOA, the Council seeks to align Federal retention regulations with the IPHC and apply them consistently throughout Alaska waters.

The Council will review analysis of a 'no action' alternative and one action alternative. The action alternative contains an element that would allow fishermen to deploy pots with a wider opening, which could lead to more effective harvest of legal-size halibut. The action alternative does not frame the catching of halibut with pot gear as "targeted/directed" or "incidental." Rather, the Council will analyze a measure that provides the fishery latitude to fish for IFQ in the manner that is most effective in the presence of depredating whales, and would review the effects of allowing halibut retention three years after implementation in accordance with the NPFMC and IPHC commitment to review retention in GOA longline pot gear subsequent to implementation of GOA Amendment 101. The Council will consider whether regulations that make pots a more effective gear for the harvest of halibut would introduce pots to new areas and increase the chance of gear conflict. To that effect, the action alternative includes an option that would require vessels that are participating in the fishery to tend their gear at least every five to ten days, and requires vessels fishing pot gear to complete logbooks and utilize VMS.

Staff contact is Sam Cunningham

INTERNATIONAL PACIFIC HALIBUT COMMISSION

IPHC-2018-AM094-PropC14

REGULATORY PROPOSAL 2018
Status Quo Harvest Measures for Guided Anglers in Area 3A

SUBMITTED BY:
RICHARD YAMADA
ALASKA CHARTER ASSOCIATION
UNITED STATES OF AMERICA
27 OCTOBER 2017

EXPLANATORY MEMORANDUM

For IPHC Regulatory Area(s): 3A

The guided recreational fishery in Alaska came under the management of a Catch Sharing Plan (CSP) in 2014. The previous ten years were managed under a GHL (Guideline Harvest Level). The GHL had a suite of harvest measures regulators could use to control guided angler harvest, however the US regulatory process was lengthy, resulting in a delay of harvest measure implementation. This resulted in Area 2C overharvesting its GHL allocation from the very first year of implementation and every year thereafter. In comparison, Area 3A left over four million pounds of un-harvested fish in the water and rarely went over its allocation. Under the CSP, with the IPHC involved in adopting harvest measures, Area 2C has remained very close to its annual allocation, while Area 3A has been over its allocation from the beginning. One may argue that initial allocations were insufficient, but a contributing factor may also have been an inadequate harvest history under certain management measures to accurately estimate harvest removals. Analysts had a history of angler behavior in Area 2C under a one fish of a maximum size limit before the CSP and could estimate projected harvest for Area 2C with relative accuracy. However, Area 3A never experienced a restrictive harvest measure until the implementation of the CSP. A harvest result that falls within plus-or-minus 10% of a harvest projection should be considered sufficiently accurate, given the variables with which these estimates have to be made. Analysts had no history on what angler effort and fishing selectivity would be on a second fish of only 28 inches, or an annual limit of four fish. Added to this has been days of the week closures and possibly a reverse slot limit on the first fish. This array of harvest measures makes it difficult to determine exactly which harvest measure did or did not reduce harvest. The recreational fishery, which is difficult to manage to a pound of fish, needs flexibility in achieving its harvest goals. In Area 3A, more time is needed to determine the full impact of current harvest measures before adding more variables.

SUGGESTED REGULATORY LANGUAGE

Regulation 28 (3) For guided sport fishing (as referred to in 50 CFR 300.65) in Regulatory Area 3A:

(a) To be established at IPHC 2018 Annual Meeting

(b) – (g) Status Quo (Remain the same as 2017 regulations)

REGULATORY PROPOSAL 2018

TITLE: Trawler Halibut Bycatch Tender boat program

SUBMITTED BY:

NAME: James Kearns
AFFILIATION: Alaska Halibut Forever
COUNTRY: USA
DATE: 22-Dec-2017

Explanatory Memorandum

All Regulatory Areas☐ All Alaska Regulatory Areas☐ All U.S. Regulatory Areas☐

2A☐ 2B☐ 2C☒ 3A☒ 3B☐ 4A☐ 4B☐ 4C☐ 4D☐ 4E☐

I am writing to re-introduce the proposal previously sent in by Kent Huff regarding a Trawler Halibut Bycatch Tender boat program. It would reduce the total poundage of halibut harvested by the commercial halibut fleet each year by the amount of halibut caught by the trawler fleet as halibut bycatch. This would allow the halibut biomass in areas 2A, 2B, 2C, 3A, 3B, 4A, 4B and 4CDE to increase back to normal levels at a faster rate than they currently are and increase the total harvest for both commercial halibut and charter halibut fishermen in the near future. How the Process Would Work: A tender boat, similar to the boats that tender the salmon commercial fleet, would tender the trawler fleet to transport all non-releasable halibut bycatch to a processing plant. The total pounds processed by the processing plant would be put into a pool. The commercial shareholders from Alaska and Canada could turn in their quota in exchange for an equal amount from the pool and be paid for their turned in quota minus the cost of the tender transport without having to actually fish for their turned in quota. This would reduce halibut wastage, increase the total percentage of catch that is used, and reduce the pressure on the stocks for the other regulatory areas, thus allowing them to rebuild. Shareholders could trade in any percentage of quota they have. And if the total bycatch does not exceed the demand by the shareholders, then each shareholder could trade in a percentage based on quota held and available pounds in the halibut pool.

If the demand is less than the THBTBP, then the following year that percentage of quota would be equally divided among all quota shareholders prior to quota allocation. The total pounds allocated would be reduced by the bycatch left in the pool, and compensation would be based on a percentage of quota held by each shareholder. Example: Shareholder allocation 10,000,000 pounds Trawler halibut bycatch 3,000,000 pounds Shareholder THBTBP quota turned in (3,000,000) pounds Total harvest after THBTBP 10,000,000 pounds Example: Shareholder Allocation 10,000,000 pounds Trawler halibut bycatch 3,000,000 pounds Shareholder THBTBP quota turned in (2,000,000) pounds Total harvest after THBTBP 11,000,000 pound Example: Shareholder allocation 10,000,000 pounds Previous year overharvest compensation to shareholders (1,000,000) pounds Total shareholder harvest after THBTBP 9,000,000 ponds Example: Shareholder allocation 10,000,000 pounds Trawler halibut bycatch 3,000,000 pounds Shareholder quota turned in 4,000,000 pounds Percentage of compensation to each quota (75%) 3,000,000 pounds Total shareholder harvest after THBTBP 10,000,000 pounds.

Suggested Regulatory Language

There is no current language to change but please note that this proposal would not eliminate halibut bycatch, however it would eliminate halibut bycatch as wastage. Additionally, all methods that are currently being implemented to reduce bycatch should continue to be used. This was originally proposed by Kent Huff of Eagles Nest Lodge in Gustavus, Alaska. He is a member of the Charter Halibut Management Committee for NPFMC.

IPHC-2018-AM094-PropC16

REGULATORY PROPOSAL 2018
Reduce Daily Bag Limit for all Anglers in Area 2C and 3A in Times of Low Abundance

SUBMITTED BY: MELVIN GROVE
PRINCE WILLIAM SOUND CHARTER BOAT ASSOCIATION
UNITED STATES OF AMERICA
23 DECEMBER 2017

Explanatory Memorandum –Regulatory Areas 2C and 3A

The Prince William Sound Charter Boat Association representing charter operators, our clients, and local supporting businesses suggest regulatory changes in 2018. Alaska's recreational fishery was split into guided (charter) and unguided anglers in 2003. With recent declines in halibut stock abundance, the charter sector has bore the burden of conservation for recreational anglers. These have resulted in increasing restrictive harvest measures included days of the week closures, annual limits, and maximum fish sizes in Area 3A to a one fish a day of potentially 35" in 2018 for Area 2C. All this while the unguided sector continues to harvest two fish of any size per day. It is time for all recreational anglers to share the burden of conservation. PWSCBA proposes that the IPHC recommend to the US Secretary of Commerce and NMFS for 2018, along with its recommended guided angler regulations, a one halibut per day of any size bag limit for all anglers in Areas 2C and 3A. Serious consideration should also be given to a one fish per day of any size for all recreational anglers, as this would negate some of the issues that have arisen in the management of a divided recreational fishery.

Suggested Regulatory Language

Pacific Halibut Fishery Regulations

Sport Fishing for Halibut—Areas 2C, 3A

(4) For sport fishing in Regulatory Area 2C and 3A.
The daily bag limit shall be one fish of any size per day per person

INTERNATIONAL PACIFIC HALIBUT COMMISSION

INTERNATIONAL PACIFIC HALIBUT COMMISSION

IPHC-2018 Regulation Proposal TEMPLATE

REGULATORY PROPOSAL 2018

TITLE: Recreational Sportsfishing Only Allocation

SUBMITTED BY:

NAME: James Kearns
AFFILIATION: Alaska Halibut Forever
COUNTRY: USA
DATE: 22-Dec-2017

Explanatory Memorandum

A description, including relevant background, on why this proposal is being presented for the Commission's consideration.

- Indicate which IPHC Regulatory Areas may be affected.
- If it aims to revise an existing IPHC Regulation, then highlight the key changes and justify each.
- Provide a description of which sectors you expect this proposal will affect (positive and negative).
- Indicate which, if any, section of the IPHC Regulations would require modification (provide language under "Suggested Regulatory Language" section below).

All Regulatory Areas☐ All Alaska Regulatory Areas☐ All U.S. Regulatory Areas☐

2A☐ 2B☐ 2C☒ 3A☒ 3B☐ 4A☐ 4B☐ 4C☐ 4D☐ 4E☐

I am writing to propose that you implement a recreational sport fishing only halibut allocation that will put all recreational sport fishermen, guided and unguided, into one management group that is separate and distinct from the commercial allocation. It would reduce the bag limits for the unguided group of recreational sport fishermen, reduce the the confusion, cost, and difficulities of enforcement, and increase the opportunities to re-establish local use of charter boat operations. It would get rid of the unfair advantage that the unguided anglers have over guided anglers and thus it would control the expanding self guided industry by making all recreational sports fishermen have the same regulations.

Suggested Regulatory Language

Use this section to place new or revised IPHC Regulation text. For revised text, insert current IPHC Regulation text (email us for the original, if needed: Regproposal@iphc.int), then use track changes to indicate proposed modifications. On the website is an example showing a proposed modification to the Fishing Periods (season dates), Section 8 of IPHC Regulations, to commence on 1st April and close on 1st November.

The above proposed regulatory change would make changes to section 28 of the 2017 regulations in the following ways: 28(1) b would read ...1 halibut of any size...; 28(1) d...on board a vessel used for fishing...; 28(1) f and g would be deleted; and part 2 and 3 would only have additional recreational sport fishing requirements as well as any charter halibut permit, charter halibut vessel, and recreational sport fishing harvest record requirements

All regulatory proposals must be submitted via Regproposal@iphc.int

Report of the 10th Session of the IPHC Scientific Review Board (SRB10)

Seattle, Washington, U.S.A., 14-16 June 2017

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INTERNATIONAL PACIFIC HALIBUT COMMISSION

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ACRONYMS

CDN	Canada
CPUE	Catch-per-unit-effort
CV	Coefficient of Variation
DMR	Discard Mortality Rate
FCEY	Fishery Constant Exploitation Yield
F_{SPR}	The Fishing Intensity that results in an equilibrium Spawning Potential Ratio
IPHC	International Pacific Halibut Commission
LRP	Limit Reference Point
MSAB	Management Strategy Advisory Board
MSL	Minimum Size Limit
RSB	Relative Spawning Biomass
SRB	Scientific Review Board
SPR	Spawning Potential Ratio
TCEY	Total Constant Exploitation Yield
TRP	Threshold/Trigger Reference Point
U.S.A.	United States of America
WPUE	Weight-Per-Unit-Effort

HOW TO INTERPRET TERMINOLOGY CONTAINED IN THIS REPORT

The SRB10 Report has been written using the following terms and associated definitions so as to remove ambiguity surrounding how particular paragraphs should be interpreted.

Level 1: **RECOMMENDED**; **RECOMMENDATION** (formal); **REQUESTED** (informal): A conclusion for an action to be undertaken, by the Commission, a Contracting Party, a subsidiary (advisory) body of the Commission and/or the IPHC Secretariat. *Note*: Subsidiary (advisory) bodies of the Commission must have their Recommendations and Requests formally provided to the next level in the structure of the Commission for its consideration/endorsement (e.g. from an Advisory Board to the Commission). The intention is that the higher body will consider the action for endorsement under its own mandate, if the subsidiary body does not already have the required mandate. Ideally, this should be task-specific and contain a timeframe for completion.

Level 2: **AGREED**: Any point of discussion from a meeting, which the IPHC body considers to be an agreed course of action covered by its mandate, which has not already been dealt with under Level 1 above; a general point of agreement among delegations/participants of a meeting which does not need to be elevated in the Commission's reporting structure.

Level 3: **NOTED/NOTING**; **CONSIDERED**; **URGED**; **ACKNOWLEDGED**: General terms to be used for consistency. Any point of discussion from a meeting, which the SRB considers to be important enough to record in a meeting report for future reference. Any other term may be used to highlight to the reader of an IPHC report, the importance of the relevant paragraph. Other terms may be used but will be considered for explanatory/informational purposes only and shall have no higher rating within the reporting terminology hierarchy than Level 3.

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EXECUTIVE SUMMARY

The 10th Session of the International Pacific Halibut Commission (IPHC) Scientific Review Board (SRB10) was held in Seattle, Washington, U.S.A. from 14 to 16 June 2017. The meeting was opened by the Chairperson, Dr Sean Cox (Canada), who welcomed an ad-hoc SRB member, Dr Kim Scribner (Michigan State University, U.S.A.).

The following are a subset of the complete recommendations/requests arising from the SRB10, which are provided at Appendix IV.

RECOMMENDATIONS

(para. 2) **NOTING** that the core purpose of the SRB10 is to review progress on the IPHC scientific program, and to provide guidance for the delivery of products to the SRB11 in September 2017, the SRB **AGREED** that formal recommendations to the Commission would not be developed at the present meeting, but rather, these would be developed at the SRB11.

REQUESTS

Pacific halibut stock assessment development - Data source development

SRB10–Req.01 (para. 18) The SRB **REQUESTED** that a plot of non-tribal CPUE (y-axis) vs. tribal CPUE (x-axis) be created/presented as a supplement to the current time series plots to improve communication.

Size limit analysis for 2017

SRB10–Req.02 (para. 28) The SRB **REQUESTED** an evaluation of the potential to try different size limits in different regions given the diversity of impacts on Pacific halibut fishing sectors and areas. MSL changes may need an adaptive management experiment approach that considers the biological, economic, and sociological consequences MSL changes. Indeed, predictions of consequences in each IPHC Regulatory Area should be a pre-requisite to any proposed MSL changes.

Progress on ongoing IPHC-funded research projects

SRB10–Req.03 (para. 51) The SRB **REQUESTED** that prior to future SRB meetings, the IPHC Secretariat prepare a report that details topics associated with each research area and then limit the topics for presentation to those that they consider to be most crucial.

Genetics and genomics

SRB10–Req.04 (para. 73) The SRB **REQUESTED** that a future presentation on the overall research initiatives showing how stock assessment, biology, and policy are integrated.

1. OPENING OF THE SESSION

1. The 10th Session of the International Pacific Halibut Commission (IPHC) Scientific Review Board (SRB10) was held in Seattle, Washington, U.S.A. from 14 to 16 June 2017. The list of participants is provided at Appendix I. The meeting was opened by the Chairperson, Dr Sean Cox (Canada), who welcomed an ad-hoc SRB member, Dr Kim Scribner (Michigan State University, U.S.A.).

2. **NOTING** that the core purpose of the SRB10 is to review progress on the IPHC scientific program, and to provide guidance for the delivery of products to the SRB11 in September 2017, the SRB **AGREED** that formal recommendations to the Commission would not be developed at the present meeting, but rather, these would be developed at the SRB11.

2. ADOPTION OF THE AGENDA AND ARRANGEMENTS FOR THE SESSION

3. The SRB **ADOPTED** the Agenda as provided at Appendix II. The documents provided to the SRB are listed in Appendix III.

3. IPHC PROCESS

3.1 Update on the actions arising from the 9th Session of the SRB (SRB09)

4. The SRB **NOTED** paper IPHC-2017-SRB10-03, which provided an opportunity to consider the progress made during the inter-sessional period since the SRB09 meeting held in September 2016.

5. The SRB **AGREED** to consider and revise as necessary, the actions arising that are either in progress or pending, and for these to be combined with any new actions arising from the SRB10 into a consolidated list for future reporting.

6. The SRB **NOTED** and were pleased to see that four out of the 10 actions from the SRB09 had been completed. The three '*In Progress*' items were presented during the current Session of the SRB, and deemed to be completed. As for ongoing status projects, the following updates were advised:

    - SRB09.04 – Detailed mathematical specifications, flowcharts, and pseudocode as per below related to the survey space-time model and the proposed management procedures. Lacking these limits the contribution that we can make to technical discussion.
    - SRB09.05 – Draft completed and will be finalised for the Commission's Interim Meeting.
    - SRB09.06 – Carried forward to future SRB meetings where the spatial modelling is re-initiated.

3.2 Outcomes of the 93rd Session of the IPHC Annual Meeting (AM093)

7. The SRB **NOTED** paper IPHC-2017-SRB10-04 which outlined the main outcomes of the 93rd Session of the Commission, specifically related to the SRB, and **AGREED** to consider how best to provide the Commission with the information it has requested, throughout the course of the current SRB meeting.

8. The SRB **NOTED** that at its 93rd Session, the Commission adopted revised IPHC Rules of Procedure (2017) by consensus. The document is available for download from the IPHC website: http://iphc.int/basic-texts-of-the-commission.html and includes the Terms of Reference for the SRB as follows:

    Appendix VIII, Sect I, para 1. *The Scientific Review Board's (SRB) main objective is to provide an independent scientific review of Commission science products and programs, and to support and strengthen the stock assessment process. The SRB shall review modeling and evaluation used by the Management Strategy Advisory Board, and review research proposals from the Research Advisory Board and the IPHC Secretariat. The SRB will prepare reports to the Commission summarising findings, recommendations, and documentation of any divergent views for all of its reviews.*

4. METHODS FOR SPATIAL SURVEY MODELLING

9. The SRB **NOTED** paper IPHC-2017-SRB10-05, which provided preliminary results of an evaluation of the survey expansions in IPHC Regulatory Areas 2A and 4A, and sought guidance from the SRB on potential further spatial survey modelling.

4.1 Recap and proposed changes for 2017

10. The SRB **NOTED** space-time modelling changes and updates for 2017. See Comments and Suggestions under Section 5 paragraphs 12-15.

4.2 Evaluation of need for future survey expansions

11. The SRB **NOTED** that the addition of repeated survey expansions (3 years apart) played a smaller role in reducing variability than did a single effort where stations were added for IPHC Regulatory Area 2A.

5. DISCUSSION OF SPATIAL SURVEY MODELLING

SRB Comments and Suggestions

12. In response to questions regarding the frequency of repeating expansion experiments, the SRB **SUGGESTED** the following types of analyses and information that could inform decisions on when a future set of expansion stations is appropriate:
    - Expected revenue from surveys with and without expansion stations to determine impacts on survey cost-recovery;
    - A plot of the number of stations vs. grand relative error to assess the relative value of information gained from additional stations;
    - Assessment of the frequency of zeroes at traditionally fished stations to help interpret zeroes at expansion stations;
    - A precision goal stated as a realistic target CV on the coastwide biomass index to provide a benchmark for cost-benefit analysis;
    - Appropriate scale simulations or suitable alternative forecasting approach (e.g., a quadratic function of CV vs time) to determine when expected CV from lack of survey expansion stations might exceed the target (and considering costs);
13. **NOTING** paragraph 12, the SRB **AGREED** that there is little urgency for the IPHC Secretariat to make repeated survey expansions a high priority in the near term.
14. The SRB **NOTED** the utility in recalculating implied stock distribution for alternative expansion data sets and to evaluate the assessment model sensitivity with the selected expansion data sets included; this will allow the IPHC to assess the effect of survey expansion on stock biomass distribution.
15. The SRB **SUGGESTED** that for presentation purposes stations might be characterized as high density/low variability; high density/high variability; low density/low variability; or low density/high variability. From the perspective of the fishery, understanding what is happening at the high density/high variability stations may be the most important.

6. PACIFIC HALIBUT STOCK ASSESSMENT DEVELOPMENT

16. The SRB **NOTED** paper IPHC-2017-SRB10-07 which provided an overview of proposed improvements related to the stock assessment data and reporting of results for the 2017-18 annual process.

6.1 Data source development

17. The SRB **NOTED** the efforts concerning data, which include
    a) Updating historical bycatch data;

b) Obtaining the age data appropriately attributed from expansion stations;

c) Examining fishery CPUE for apportionment rather than survey WPUE in an MSE context as an alternative;

d) Reconciling tribal vs nontribal CPUE data; especially since this should improve communication between different fishing sectors within IPHC Regulatory Area 2A; and

e) Updating the effective number of skates calculation.

18. The SRB **REQUESTED** that a plot of non-tribal CPUE (y-axis) vs. tribal CPUE (x-axis) be created/presented as a supplement to the current time series plots to improve communication.

19. The SRB **CAUTIONED** that space-time modelling of fishery logbook data may not be worth the effort, mainly because fishery CPUE is used as a communication tool and the modelling output would appear dissociated from the raw fishery CPUE data that industry currently understands. However, the SRB **ACKNOWLEDGED** the work that has been underway and would be interested to see how it may compare and/or supplement stock distribution information.

20. The SRB **SUGGESTED** using the empirical length-weight allometry in the stock assessment models.

6.2 Model code update

21. The SRB **AGREED** with the IPHC Secretariat's plans to put off adopting the software update for Stock Synthesis (SS3) until next year. It will likely take time for bugs to be ironed out and the benefits at present are expected to be relatively minor.

22. The SRB **AGREED** with putting the development of the spatial model on hold for this year.

6.3 TCEY-based management

23. The SRB **AGREED** with the steady evolution towards TCEY management and that this has been consistently presented in the IPHC Harvest Decision Table and is an improvement over the FCEY values presented in the past. Importantly, retaining a fishing mortality metric based on Spawning biomass Per Recruit (SPR) can help with assessing potential fishing impacts, particularly as management measures such as the minimum size limit are re-evaluated.

6.4 Stock distribution estimation by region

24. The SRB **NOTED** the work on stock distribution by region.

7. SIZE LIMIT ANALYSIS FOR 2017

25. The SRB **NOTED** paper IPHC-2017-SRB10-08 that provided an evaluation of the current 32" (81.3 cm) Minimum Size Limit (MSL) in the directed commercial Pacific halibut fishery, and described likely changes to the Pacific halibut fishery under alternative minimum size limits.

26. The SRB **NOTED** the details of the history and current situation for the Pacific halibut fishery, for example the declining size at age, and some of the economic factors that have played a role.

27. The SRB **NOTED** that recovery rates may be lower for smaller Pacific halibut and that information on the socio-economic data on valuation is needed.

28. The SRB **REQUESTED** an evaluation of the potential to try different size limits in different regions given the diversity of impacts on Pacific halibut fishing sectors and areas. MSL changes may need an adaptive management experiment approach that considers the biological, economic, and sociological consequences MSL changes. Indeed, predictions of consequences in each IPHC Regulatory Area should be a pre-requisite to any proposed MSL changes.

8. UPDATE ON ABUNDANCE BASED MANAGEMENT OF PACIFIC HALIBUT PROTECTED SPECIES (BYCATCH) CATCH LIMITS

29. The SRB **NOTED** paper IPHC-2017-SRB10-INF01 which provided the NPFMC's latest report from its ABM Working Group, entitles '*Abundance-based management for Pacific halibut PSC*' and are delighted to see NPFMC pursue this.

30. The SRB **NOTED** that there are parallels between this work and that being done within the auspices of the MSAB and that the IPHC Secretariat staff and a member of the SRB are part of the inter-agency group organized by the NPFMC. The NPFMC's decision to evaluate several indices is appreciated, and since some are highly correlated the need for multiple indices may be reduced.

31. The SRB **AGREED** that a study of the correlation between potential indices will help elucidate the combination of indices that will provide the most information.

9. MANAGEMENT STRATEGY ADVISORY BOARD (MSAB): UPDATE

32. The SRB **NOTED** the Report of the 9th Session of the IPHC Management Strategy Advisory Board (MSAB09), held in Seattle, Washington, U.S.A., 9-11 May 2017 (IPHC-2017-MSAB09-R).

9.1 MSAB Program of Work and timeline for 2017

33. The SRB **NOTED** the MSAB Program of Work and time line for 2017.

9.2 Improved Harvest Policy and recommendations from AM093

34. The SRB **NOTED** the harvest policy and recommendations from AM093 and are supportive of moving towards SPR-based decisions and removal of the Blue Line.

9.3 Fishing intensity metrics and design of simulations to investigate them

35. **NOTING** the proposed metrics of fishing intensity and the design of simulations, the SRB **URGED** the IPHC Secretariat to continue to review the classic literature on MSE[1].

9.4 Presenting MSE results to MSAB members

36. Since objectives are critical for conducting an MSE and open fora may inhibit input from diverse groups, the SRB **URGED** the IPHC Secretariat staff to continue to coordinate informal meetings to review objectives and performance metrics individually instead of in a group-meeting format. This may allow for more frank discussions.

9.5 Addressing stock & catch distribution in the harvest policy and future simulations

37. The SRB **NOTED** paper IPHC-2017-SRB10-09 that provided an overview of the simulations to evaluate the fishing intensity and harvest control rules in the IPHC Harvest Strategy Policy, with the goal of finding management strategies that are robust to bycatch scenarios, recognizing that the IPHC Regulatory Areas are not necessarily the biologically relevant areas.

10. DISCUSSION OF MSAB TOPICS AND RECOMMENDATIONS FOR 2017

38. The SRB **CONSIDERED** the simulation framework and assumptions as described, including scenarios and distribution of the TCEY, and of particular note were the negative relationships between Pacific

[1] These are: de la Mare, W.K. 1998. Tidier fisheries management requires a new MOP (management-oriented paradigm). Reviews in Fish Biology and Fisheries 8:349-356; Smith, A.D.M, et al. 1999. Implementing effective fisheries-management systems – management strategy evaluation and the Australian partnership approach. ICES Journal of Marine Science 56:967-979; Sainsbury, K.J. et al. 2000. Design of operational management strategies for achieving fishery ecosystem objectives. ICES Journal of Marine Science 57:731-741; and Constable, A.H. 2005. A possible framework in which to consider plausible models of the Antarctic marine ecosystem for evaluating krill management procedures. CCAMLR Science 12:99-117

halibut sport fishing and total mortality, and also bycatch and total mortality (Fig. 4 of paper 09). This approach for simulating fisheries that are not under direct TCEY management seems reasonable.

39. The SRB **CONSIDERED** the fishing intensity metrics and associated levels to evaluate, **NOTING** that the IPHC Secretariat suggests only evaluating SPR-based fishing intensity metrics and using other metrics as evaluation tools (i.e. performance metrics) or as components of the control rule (e.g. ERSB).

40. The SRB **NOTED** that the control rules require a variety of decisions that can be explored in a MSE framework. These include threshold (trigger) and limit reference points (LRP), the measure of fishing intensity adjusted by the control rule, shape of the control rule, and whether the multiplier is zero when biomass is below the LRP.

41. The SRB **CONSIDERED** the use of dRSB for stock status in the control rule and its relation to ERSB and SPR. Although dRSB is based on sound principles, we cautioned that the approach is more complicated than a static unfished biomass and may be less transparent for stakeholders as a way to provide management advice.

42. The SRB **AGREED** that presenting scenario-by-scenario results may lead to misinterpretation, since the objective of MSE is to find a robust harvest strategy that does pretty well in all or virtually all of the scenarios.

43. The SRB **AGREED** that MSE can be used to ask a series of interlocking questions such as i) what is the best long-term policy, given the various uncertainties in the environment, Pacific halibut biology, and the Pacific halibut fishery? ii) what would be the short term consequences of applying the best long term policy in the current situation? and ii) how do we move from the current harvest policy to the best long term policy?

44. The SRB **AGREED** that a more informative description of the survey results would involve reporting both total survey catch and O32 catch (biomass by Regulatory Area).

45. The SRB **CONSIDERED** that focussing on four biologically relevant regions, with the possibility of distributing stock to IPHC Regulatory Areas within these biogeographic regions is a potentially useful approach that should be evaluated further.

11. BIOLOGICAL AND ECOSYSTEM SCIENCE PROGRAM RESEARCH UPDATES

11.1 Progress on ongoing IPHC-funded research projects

46. The SRB **NOTED** papers IPHC-2017-SRB10-INF02 and IPHC-2017-SRB10-11 which detailed current progress on research projects conducted by the IPHC Biological and Ecosystem Science Research Program. Because these programs are now more fully developed, this section will be longer than the previous ones in this report.

47. The SRB **APPRECIATED** the opportunity to see the overview of research program objectives and how the IPHC Secretariat envisioned new research initiatives that will help (a) fill in current knowledge gaps, (b) assess the effects of environmental conditions, and (c) reduce uncertainty in assessment models.

48. The SRB **CONSIDERED** that the portfolio of research projects proposed [reproduction, growth, DMR, and post catch survival, migration, e) genetics and genomics] could indeed support and/or direct IPHC activities in existing areas of strength in harvest evaluation and demographic modelling.

49. That said, the SRB **CONSIDERED** that while the overview of general research needs and applications was compelling, the data collected to date and proposed data collections could be better articulated relative to expected impacts to the resiliency of the fisheries and stock assessment needs. In addition, we would have appreciated additional background on methods used to obtain data. For example: Are IPHC Secretariat staff doing research in areas where there is the greatest need? What is/was the input that led to strategic research planning? How will progress and impact of ongoing or planned research be evaluated and at what interval(s)?

50. Although the SRB **APPRECIATED** the opportunity to see and comment on the overall program, we would have been better able to provide an assessment with presentation of fewer projects but greater detail concerning methods and results, and how they tie into assessment activities and management outcomes.
51. The SRB **REQUESTED** that prior to future SRB meetings, the IPHC Secretariat prepare a report that details topics associated with each research area and then limit the topics for presentation to those that they consider to be most crucial.
52. The SRB **NOTED** the desire of the IPHC Secretariat to scale management and assessment activities from reporting units to more biogeographically meaningful areas, and support this. The research program objectives could collectively serve to support and better refine spatial criteria for area delineation and could lead to greater potential to forecast physiological and demographic responses to environmental variables and to harvest.
53. The SRB **NOTED** the importance of emerging molecular techniques and the importance of resolving environmental and genetic bases of local adaptation. Similarly, for the IPHC Secretariat's recognition of the importance of greater understanding of Pacific halibut movement ecology, particularly related to effects of emigration and immigration on stock recruitment as local and regional scales.
54. The SRB **AGREED** that research that defines environmental and genetic components associated with maturation, fecundity, and reproductive periodicity are important.
55. The SRB **CONSIDERED** that preliminary evidence supporting the existence of sex-specific genetic markers linked to sex is compelling and that sexing data from tissue biopsy samples will be particularly important for DMR studies. It is not understood why proposed research focused on documenting evidence of environmental sex determination is needed if there are sex-specific fixed differences that are suggestive of a chromosomal basis for sex.
56. The SRB **NOTED** that environment and genotype are expected to contribute to physiological, phenotypic, and demographic responses over the species' range. Furthermore, information on effects of environmental variation on factors such as growth, size and age of sexual maturity would logically be obtained on individuals collected from multiple locations in order to be able to determine whether associations (e.g. gene expression at specific gene loci for members of the same or different region (or proposed management area) are concordant.
57. The SRB **CONSIDERED** that the IPHC Secretariat staff may have difficulty interpreting data collected on hormone levels endocrine profile patterns, or gene expression profiles (or gene regulatory networks) since these are likely influenced by capture methods.
58. The SRB **NOTED** that collection of data opportunistically via fisheries or in assessment fisheries would have to be developed carefully considering the influence of confounding factors such environmental covariates or handling method.
59. The SRB **NOTED** the use of ultrasound methods but were unsure about their success without a full vetting of sampling methods because of the lack of knowledge on confounding sources of variation. The lack of details concerning methodology precluded appraisal of the likelihood of success.
60. The SRB **NOTED** that development of gonadal-somatic-indices could be particularly useful if they can be tied to age/size, nutritional state and environmental covariates.
61. The SRB **CONSIDERED** that the study of gene expression networks based on gene co-expression patterns can be useful if the identification of suites of genes that are differentially expressed can help clarify meaningful biogeographic regions.
62. The SRB **NOTED** that changes in size at age could have significant implications for recruitment and management. However, similar concerns were raised regarding proposed research as with reproductive research in that the IPHC Secretariat did not articulate how growth markers could be used for field

studies, insufficient detail was provided about methods of sampling, and it was not clear how that work will inter-collate with stock assessment and management.

63. The SRB **NOTED** the preliminary data on temperature dependent growth. However, data collected from a few individuals from a single locale may not generalize to the entire species' range. For example, there could be environmental (e.g. temperature), genetic influences, and gene by environment effects on growth. Use of common garden experiments of greater complexity may be warranted, and the IPHC Secretariat should consider ontogenetic contingency in this work. How this work will inter-collate with stock assessment and management should also be considered.

11.1.1 Discard Mortality Rates (DMR)

64. In the DMR research area, the SRB **NOTED** that ongoing research has significant management implications. The research appeared well organized.

65. The SRB **SUGGESTED** that additional attention be given to empirical evaluation of the ultrasound methods before it is used widely and that the IPHC Secretariat staff consider evaluation of how long fish were exposed to capture (e.g. time on hook). For example, lethality of capture and release could be much greater for a fish on a hook for days rather than hours.

66. The SRB **NOTED** that the indirect effects of capture and release should focus on both direct (mortality) and indirect effects such as capture/release effects on growth and reproduction and probabilities of movements/seasonal migration. However, elucidation of indirect effects would necessitate considerable investment in telemetry so that a cost-benefit analysis is required.

11.1.2 Migration

67. In the planned research area of migration, the SRB **NOTED** that the focal area should be explicitly tied to all other areas. As per previous comments in other research areas, we received insufficient information on methodology and application/integration with other topics of research.

68. The SRB **AGREED** that collection and analyses of otoliths is valuable and encourage the IPHC Secretariat to consider laser ablation methods whereby different sections of the otolith could be interrogated to discern ontogenetic shifts in elemental signature. This could provide valuable information on regions occupied and diets at different life stages/ages.

69. The SRB **SUGGESTED** that otolith work will most profitably move forward to coincident work on diet and forage availability and in collection of baseline on environmental elemental signatures in different regions.

11.1.3 Genetics and genomics

70. In the planned research activities area of genetics and genomics, the SRB **NOTED** a pressing need for expertise in areas of population genetics and genomics particularly associated with methodology for demographic-genetic modelling and in areas associated with interpretation of gene expression/co-expression and gene regulator networks.

71. **NOTING** that it was not clear how existing sampling designs or collaborations could provide the necessary information or samples to allow more informed use of population genomic data, the SRB **SUGGESTED**:

    (a) There is a need for integration of 'seascape' features such as bathometry, depth, and currents on gene flow to better model spatial dynamics of stock structure and movements.

    (b) There is high likelihood for the existence of 'sources' and 'sink' areas in terms of net recruitment and emigration. There are numerous means of identification of these areas using genetics data.

(c) There is strong evidence that genomic data as collected using RADseq and similar methods can identify thousands of loci. "Outlier loci" can be identified that would provide far greater resolution of stock structure that existing data.

(d) Recent research has shown that genetics data can be combined with age data to estimate relative stock recruitment[2] and the IPHC Secretariat should consider using these methods.

(e) Coalescence methods could be profitably used to define demographic and migratory patterns from spatially explicit genetics data.

72. As above, the SRB **NOTED** that further explanations were needed to show how genomic data collected to identify patterns of gene expression that are tied to growth and reproduction.

73. The SRB **REQUESTED** that a future presentation on the overall research initiatives showing how stock assessment, biology, and policy are integrated.

11.2 Update on outcome of external funding applications

74. The SRB **NOTED** the outcomes on the external funding applications.

12. OTHER BUSINESS

12.1 Election of the SRB Chair for the next biennium

75. The SRB **NOTED** that the term of the current Chairperson, Dr Sean Cox is due to expire at the closing of the current Session, and in accordance with the IPHC Rules of Procedure (2017) (Rule 14, paragraph 7(e)), the SRB is required to elect a new Chairperson for the next biennium.

76. The SRB **CALLED** for nominations for the position of Chairperson of the IPHC SRB for the next biennium. Dr. Sean Cox was nominated, seconded and elected for the next biennium.

12.2 Election of a Vice-Chair for the next biennium

77. The SRB **NOTED** that the terms of the current Vice-Chairpersons, Drs. Jim Ianelli and Marc Mangel are due to expire at the closing of the current Session, and in accordance with the IPHC Rules of Procedure (2017) (Rule 14, paragraph 7(e)), the SRB may elect a new Vice-Chairperson for the next biennium.

78. The SRB **AGREED** that given the nature of the Board, there was no need for a Vice-Chairperson for the next biennium.

12.3 IPHC meetings calendar (2017-19): SRB

79. The SRB **NOTED** the annual IPHC meetings calendar (2017-19) adopted by the Commission at its 93rd Session in 2017.

13. THE PROCESS FOR 'REVIEW OF THE DRAFT AND ADOPTION OF THE REPORT OF THE 10TH SESSION OF THE IPHC SCIENTIFIC REVIEW BOARD (SRB10)

80. The report of the 10th Session of the IPHC Scientific Review Board (IPHC-2017-SRB10–R) was **ADOPTED** via correspondence on 11 July 2017, including the consolidated set of recommendations and/or requests arising from SRB10, provided at Appendix IV.

[2] Bravington, M. et al. 2016. Close-kin mark-recapture. Statistical Science 31:259-274

APPENDIX I
LIST OF PARTICIPANTS FOR THE 10TH SESSION OF THE IPHC SCIENTIFIC REVIEW BOARD (SRB10)

SRB Members

Dr Sean **Cox**:	spcox@sfu.ca; Associate Professor, School of Resource and Environmental Management, Simon Fraser University, 8888 University Dr., Burnaby, B.C., Canada V5A 1S6
Dr James **Ianelli**:	jim.ianelli@noaa.gov; Research Scientist, National Marine Fisheries Service-NOAA, 7600 Sand Pt Way NE, Seattle, WA, U.S.A., 98115
Dr Marc **Mangel**:	msmangel@ucsc.edu Distinguished Research Professor and Director, Center for Stock Assessment Research, University of California, Santa Cruz, CA, U.S.A., 95064
Dr Kim **Scribner**:	scribne3@msu.edu; Professor, Department of Fisheries and Wildlife, Michigan State University, 2E Natural Resources Building, East Lansing, MI, U.S.A., 48824

Observers

Canada	United States of America
Allen **Kronlund**: Allen.Kronlund@dfo-mpo.gc.ca	Carey **McGilliard**: carey.mcgillard@noaa.gov
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IPHC Secretariat

Name	Position and email
Dr David **Wilson**	Executive Director, david@iphc.int
Mr Stephen **Keith**	Assistant Director, steve@iphc.int
Dr Allan **Hicks**	Quantitative Scientist, allan@iphc.int
Dr Ian **Stewart**	Quantitative Scientist, ian@iphc.int
Dr Ray **Webster**	Quantitative Scientist, ray@iphc.int

APPENDIX II
AGENDA FOR THE 10TH SESSION OF THE IPHC SCIENTIFIC REVIEW BOARD (SRB10)

Date: 14–16 June 2017
Location: Seattle, Washington, U.S.A.
Venue: IPHC Office, Salmon Bay
Time: 09:00-17:00, 09:00-12:00 (the 16th)
Chairperson: Dr Sean Cox (Simon Fraser University)
Vice-Chairpersons: Drs. Marc Mangel and Jim Ianelli

1. **OPENING OF THE SESSION**
2. **ADOPTION OF THE AGENDA AND ARRANGEMENTS FOR THE SESSION**
3. **IPHC PROCESS**
   - 3.1 Update on the actions arising from the 9th Session of the SRB (SRB09) (S. Cox)
   - 3.2 Outcomes of the 93rd Session of the IPHC Annual Meeting (AM093) (D. Wilson)
4. **METHODS FOR SPATIAL SURVEY MODELLING** (R. Webster)
   - 4.1 Recap and proposed changes for 2017
   - 4.2 Evaluation of need for future survey expansions
5. **DISCUSSION OF SPATIAL SURVEY MODELLING** (Chairperson)
6. **PACIFIC HALIBUT STOCK ASSESSMENT DEVELOPMENT** (I. Stewart)
   - 6.1 Data source development
   - 6.2 Model code update
   - 6.3 TCEY-based management
   - 6.4 Stock distribution estimation by region
7. **SIZE LIMIT ANALYSIS FOR 2017** (I. Stewart)
8. **UPDATE ON ABUNDANCE BASED MANAGEMENT OF PACIFIC HALIBUT PROTECTED SPECIES (Bycatch) CATCH LIMITS** (A. Hicks)
9. **MANAGEMENT STRATEGY ADVISORY BOARD (MSAB): UPDATE** (A. Hicks)
   - 9.1 MSAB work plan and timeline for 2017
   - 9.2 Improved Harvest Policy and recommendations from AM093
   - 9.3 Fishing intensity metrics and design of simulations to investigate them
   - 9.4 Presenting MSE results to MSAB members
   - 9.5 Addressing stock & catch distribution in the harvest policy and future simulations
10. **DISCUSSION OF MSAB TOPICS AND RECOMMENDATIONS FOR 2017** (S. Cox)
11. **BIOLOGICAL AND ECOSYSTEM SCIENCE PROGRAM RESEARCH UPDATES** (J. Planas)
    - 11.1 Progress on ongoing IPHC-funded research projects
    - 11.2 Update on outcome of external funding applications
12. **OTHER BUSINESS** (S. Cox)
13. **THE PROCESS FOR 'REVIEW OF THE DRAFT AND ADOPTION OF THE REPORT OF THE 10th SESSION OF THE IPHC SCIENTIFIC REVIEW BOARD (SRB10)'**

APPENDIX III
LIST OF DOCUMENTS FOR THE 10TH SESSION OF THE IPHC SCIENTIFIC REVIEW BOARD (SRB10)

Document	Title	Availability
IPHC-2017-SRB10-01	DRAFT: Agenda & Schedule for the 10th Session of the Scientific Review Board (SRB10)	✓ 22 March 2017 ✓ 19 May 2017
IPHC-2017-SRB10-02	DRAFT: List of Documents for the 10th Session of the Scientific Review Board (SRB10)	✓ 19 May 2017 ✓ 1 June 2017
IPHC-2017-SRB10-03	Update on the actions arising from the 9th Session of the SRB (SRB09) (IPHC Secretariat)	✓ 22 May 2017
IPHC-2017-SRB10-04	Outcomes of the 93rd Session of the IPHC Annual Meeting (AM093) (IPHC Secretariat)	✓ 19 May 2017
IPHC-2017-SRB10-05	Evaluating the need for future survey expansions in Areas 2A and 4A and proposed changes to the space-time modelling in 2017 (R. Webster)	✓ 1 June 2017
IPHC-2017-SRB10-06	Withdrawn	Withdrawn
IPHC-2017-SRB10-07	Pacific halibut stock assessment development for 2017 (I. Stewart)	✓ 25 May 2017
IPHC-2017-SRB10-08	Evaluation of the IPHC's 32" minimum size limit (I. Stewart & A. Hicks)	✓ 19 May 2017
IPHC-2017-SRB10-09	Defining the simulations to evaluate fishing intensity (A. Hicks)	✓ 22 May 2017
IPHC-2017-SRB10-10	A discussion on estimating stock distribution and distributing catch for Pacific halibut fisheries (A. Hicks, I. Stewart & R. Webster)	✓ 1 June 2017
IPHC-2017-SRB10-11	Progress report on biological research activities at IPHC (J. Planas)	✓ 19 May 2017
Information papers		
IPHC-2017-SRB10-INF01	Abundance based management for Pacific halibut PSC (NPFMC June 2017-C5)	✓ 25 May 2017
IPHC-2017-SRB10-INF02	5-yr Biological and Ecosystem Science Program Research Plan	✓ 19 May 2017

APPENDIX IV

CONSOLIDATED SET OF RECOMMENDATIONS AND REQUESTS OF THE 10TH SESSION OF THE IPHC SCIENTIFIC REVIEW BOARD (SRB10)

RECOMMENDATIONS

(para. 2) **NOTING** that the core purpose of the SRB10 is to review progress on the IPHC scientific program, and to provide guidance for the delivery of products to the SRB11 in September 2017, the SRB **AGREED** that formal recommendations to the Commission would not be developed at the present meeting, but rather, these would be developed at the SRB11.

REQUESTS

Pacific halibut stock assessment development - Data source development

SRB10–Req.01 (para. 18) The SRB **REQUESTED** that a plot of non-tribal CPUE (y-axis) vs. tribal CPUE (x-axis) be created/presented as a supplement to the current time series plots to improve communication.

Size limit analysis for 2017

SRB10–Req.02 (para. 28) The SRB **REQUESTED** an evaluation of the potential to try different size limits in different regions given the diversity of impacts on Pacific halibut fishing sectors and areas. MSL changes may need an adaptive management experiment approach that considers the biological, economic, and sociological consequences MSL changes. Indeed, predictions of consequences in each IPHC Regulatory Area should be a pre-requisite to any proposed MSL changes.

Progress on ongoing IPHC-funded research projects

SRB10–Req.03 (para. 51) The SRB **REQUESTED** that prior to future SRB meetings, the IPHC Secretariat prepare a report that details topics associated with each research area and then limit the topics for presentation to those that they consider to be most crucial.

Genetics and genomics

SRB10–Req.04 (para. 73) The SRB **REQUESTED** that a future presentation on the overall research initiatives showing how stock assessment, biology, and policy are integrated.

Report of the 11th Session of the IPHC Scientific Review Board (SRB11)

Seattle, Washington, U.S.A., 26-28 September 2017

DISTRIBUTION:
Participants in the Session
Members of the Commission
IPHC Secretariat

BIBLIOGRAPHIC ENTRY
IPHC 2017. Report of the 11th Session of the IPHC Scientific Review Board (SRB11). Seattle, Washington, U.S.A., 26-28 September 2017.
IPHC–2017–SRB11–R, 17 pp.

INTERNATIONAL PACIFIC HALIBUT COMMISSION

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ACRONYMS

CPUE	Catch-per-unit-effort
CV	Coefficient of Variation
IPHC	International Pacific Halibut Commission
MSAB	Management Strategy Advisory Board
MSL	Minimum Size Limit
SRB	Scientific Review Board
WPUE	Weight-Per-Unit-Effort

HOW TO INTERPRET TERMINOLOGY CONTAINED IN THIS REPORT

The SRB11 Report has been written using the following terms and associated definitions so as to remove ambiguity surrounding how particular paragraphs should be interpreted.

Level 1: **RECOMMENDED**; **RECOMMENDATION** (formal); **REQUESTED** (informal): A conclusion for an action to be undertaken, by the Commission, a Contracting Party, a subsidiary (advisory) body of the Commission and/or the IPHC Secretariat. *Note*: Subsidiary (advisory) bodies of the Commission must have their Recommendations and Requests formally provided to the next level in the structure of the Commission for its consideration/endorsement (e.g. from an Advisory Board to the Commission). The intention is that the higher body will consider the action for endorsement under its own mandate, if the subsidiary body does not already have the required mandate. Ideally, this should be task-specific and contain a timeframe for completion.

Level 2: **AGREED**: Any point of discussion from a meeting, which the IPHC body considers to be an agreed course of action covered by its mandate, which has not already been dealt with under Level 1 above; a general point of agreement among delegations/participants of a meeting which does not need to be elevated in the Commission's reporting structure.

Level 3: **NOTED/NOTING**; **CONSIDERED**; **URGED**; **ACKNOWLEDGED**: General terms to be used for consistency. Any point of discussion from a meeting, which the SRB considers to be important enough to record in a meeting report for future reference. Any other term may be used to highlight to the reader of an IPHC report, the importance of the relevant paragraph. Other terms may be used but will be considered for explanatory/informational purposes only and shall have no higher rating within the reporting terminology hierarchy than Level 3.

TABLE OF CONTENTS

EXECUTIVE SUMMARY

The 11th Session of the International Pacific Halibut Commission (IPHC) Scientific Review Board (SRB11) was held in Seattle, Washington, U.S.A. from 26 to 28 September 2017. The meeting was opened by the Chairperson, Dr Sean Cox (Canada).

The following are a subset of the complete recommendations/requests arising from the SRB11, which are provided at Appendix V.

RECOMMENDATIONS

Pacific halibut stock assessment (2017): Data source development

SRB11–Rec.01 (para. 14) The SRB **RECOMMENDED** continuing to down-weight terminal year fishery CPUE in the annual stock assessment because terminal and post-season CPUE may be substantially different. Generating and presenting the conditional distribution for post-season CPUE given terminal CPUE, should be undertaken as a way to improve communication about most recent fishery CPUE values.

Management Strategy Evaluation: A description of the closed-loop simulations

SRB11–Rec.02 (para. 25) The SRB **RECOMMENDED** that the IPHC Secretariat and Management Strategy Advisory Board collaborate to:

a) further clarify and improve the presentation of the Harvest Strategy Policy (Appendix IV). This would improve not only transparency of the existing interim harvest policy, but also of the MSE process for evaluating alternatives.
b) Review harvest policies from other bodies to develop an objectives hierarchy that explicitly prioritizes long-term conservation over short-/medium-term (e.g., 3-8 years) catch performance.

SRB11–Rec.03 (para. 29) The SRB **RECOMMENDED** that the IPHC Secretariat hire a modeler/programmer to support MSE work so that timely feedback can be given the MSAB in the MSE process.

Biological and ecosystem science program: Presentation of potential future research projects

SRB11–Rec.04 (para. 36) The SRB **RECOMMENDED** that IPHC consider hiring a life-history modeler to provide more explicit linkage between the empirical biological program and the applied assessment and MSE modeling programs.

REQUESTS

Size limit analysis for 2017: Update

SRB11–Req.05 (para. 21) **NOTING** the thoughtful and detailed presentation on the potential impacts of changing the minimum size limit presented in Appendix E (*Evaluation of adaptive management approaches*) of paper IPHC-2017-SRB11-07, the SRB **REQUESTED** that the IPHC Secretariat, between now and SRB12, seek feedback from the Commissioners, Conference Board, Processor Advisory Board, and the Management Strategy Advisory Board, on a modified version of Appendix E. In particular, a modified version would include (i) a process for starting and possibly ending an experiment, (ii) performance metrics, and (iii) criteria for making conclusions based on the experimental outcomes.

Biological and ecosystem science program: Progress on ongoing IPHC-funded research projects

SRB11–Req.08 (para. 32) The SRB **REQUESTED** that the IPHC Secretariat prepare a presentation for SRB12, on the overall research initiatives to show how stock assessment, biology, and policy are integrated. Ultimately, such an integrated presentation should be a key component of science presentations at future IPHC Annual Meetings. For example, all research presentations would have been more effective had there been:

a) more precise linkages among key knowledge gaps within the biology, annual stock assessment, and MSE simulations;
b) a specific suite of questions to be discussed during the SRB meeting;
c) sufficient background material provided such that the SRB can provide informed comment and advice related to the specific questions in (b).

1. OPENING OF THE SESSION

1. The 11th Session of the International Pacific Halibut Commission (IPHC) Scientific Review Board (SRB11) was held in Seattle, Washington, U.S.A. from 26 to 28 September 2017. The list of participants is provided at Appendix I. The meeting was opened by the Chairperson, Dr Sean Cox (Canada).

2. ADOPTION OF THE AGENDA AND ARRANGEMENTS FOR THE SESSION

2. The SRB **ADOPTED** the Agenda as provided at Appendix II. The documents provided to the SRB are listed in Appendix III.

3. IPHC PROCESS

3.1 Update on the actions arising from the 10th Session of the SRB (SRB10)

3. The SRB **NOTED** paper IPHC-2017-SRB11-03, which provided an opportunity to consider the progress made during the inter-sessional period since the SRB10 meeting held in June 2017.

4. The SRB **AGREED** to consider and revise as necessary, the actions arising that are either in progress or pending, and for these to be combined with any new actions arising from the SRB11 into a consolidated list for future reporting.

5. The SRB **RECALLED** that at its 93rd Session, the Commission adopted revised IPHC Rules of Procedure (2017) by consensus. The document is available for download from the IPHC website: http://iphc.int/basic-texts-of-the-commission.html and includes the Terms of Reference for the SRB as follows:

   Appendix VIII, Sect I, para 1. *The Scientific Review Board's (SRB) main objective is to provide an independent scientific review of Commission science products and programs, and to support and strengthen the stock assessment process. The SRB shall review modeling and evaluation used by the Management Strategy Advisory Board, and review research proposals from the Research Advisory Board and the IPHC Secretariat. The SRB will prepare reports to the Commission summarising findings, recommendations, and documentation of any divergent views for all of its reviews.*

4. IPHC FISHERY-INDEPENDENT SETLINE SURVEY

4.1 Methods for spatial survey modelling – Update on work since June SRB meeting

6. The SRB **NOTED** paper IPHC-2017-SRB11-04, which provided an update on space-time related modelling work undertaken since the SRB10 meeting in June 2017.

7. The SRB **REQUESTED** that the IPHC Secretariat present a form of Table 1 to Commissioners, adding a column for Qualitative Cost (e.g., High, Low given sampling intensity, fishing cost, etc.).

8. The SRB **NOTED** and was pleased to see progress on a manuscript for the space-time modelling of the fishery-independent setline survey.

9. The SRB **REQUESTED** that the following be maintained on the IPHC Program of Work: (i) examination of revenue and cost-recovery (i.e., cost benefit analyses), (ii) forecast the effect on CV of the presence or absence of expansion FISS stations, (iii) plotting relative error against number of stations, and (iv) comparison of frequency of zeros between standard and expansion FISS stations.

Table 1. Summary of FISS expansion data and recommendations for future survey frequency.

IPHC Regulatory Area	Expansion region	Density†	Variability (spatial/ temporal)	Recommend FISS frequency
2A	Deep and shallow waters	Low	Low	≥ 10 years
2A	Salish Sea	Low-average	High	5 years
2A	Northern California	Average above 40°N; low south of 40°N	Average (during expansion period 2011-2014)	3-5 years
4A	Aleutian Islands	High	High	3-5 years
4A	Shelf edge	Average	Low	≥ 10 years

†Density relative to annually surveyed parts of the regulatory area.

4.2 Preliminary FISS results

10. The SRB **NOTED** paper IPHC-2017-SRB11-05, which outlined the material on preliminary IPHC fishery-independent setline survey (FISS) results.

11. The SRB **NOTED** substantial variation in survey catch rates within IPHC Regulatory Areas such as 4B. Therefore, expansion of FISS stations to increase coverage (over 100%) is justified within IPHC Regulatory Area 4B to improve estimation of the overall mean density.

12. The SRB **REQUESTED** continuing research – subsequent to the 94th Annual Meeting of the IPHC (AM094) **-** on the effect of other covariates such as dissolved oxygen on the IPHC fishery-independent setline survey catch rates, and for any results to be presented at SRB12.

5. PACIFIC HALIBUT STOCK ASSESSMENT: 2017

13. The SRB **NOTED** paper IPHC-2017-SRB11-06 which provided an overview of data and modelling updates, as well as a preliminary evaluation of the stock assessment ensemble proposed for use in the 2017-18 annual process.

5.1 Data source development

14. The SRB **RECOMMENDED** continuing to down-weight terminal year fishery CPUE in the annual stock assessment because terminal and post-season CPUE may be substantially different. Generating and presenting the conditional distribution for post-season CPUE given terminal CPUE, should be undertaken as a way to improve communication about most recent fishery CPUE values.

15. The SRB **REQUESTED** continuing research on discrepancies between Estimated and Measured weights of Pacific halibut, be presented at SRB12.

16. The SRB **NOTED** the plot of WA Commercial vs WA Tribal fishery CPUE (Fig. 1), provide in response to a previous request of the SRB.

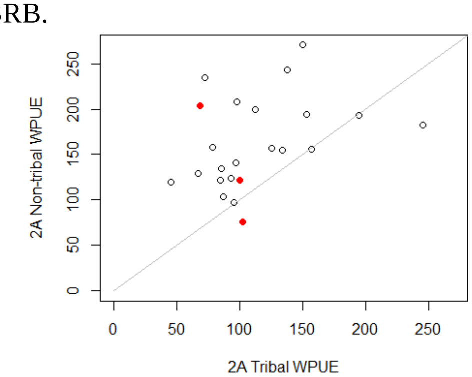


Fig. 1. Non-tribal commercial WPUE vs. tribal WPUE (1989-2016) in IPHC Regulatory Area 2A. The most recent three years available (2014-16) are highlighted in red; the grey line indicates a 1:1 relationship.

5.2 Modelling updates

17. The SRB **NOTED** the continuing research on weighting models within the ensemble. Among the approaches tested, none appeared more suitable than equal weighting, as is currently used in assessment.

5.3 Preliminary results for 2017

18. The SRB **NOTED** that no preliminary assessments model runs were available, which was fine given the lack of major changes to the assessment model and historical data.

6. SIZE LIMIT ANALYSIS FOR 2017: UPDATE

19. The SRB **NOTED** paper IPHC-2017-SRB11-07 that provided an evaluation of the current 32” (81.3 cm) Minimum Size Limit (MSL) in the directed commercial Pacific halibut fishery, and described likely changes to the Pacific halibut fishery under alternative minimum size limits.
20. The SRB **NOTED** the plot demonstrating that removing the minimum size limit is expected to cause an increase in total mortality (Z) for younger Pacific halibut for both males and females, and a slight decrease in total mortality of older fish.
21. **NOTING** the thoughtful and detailed presentation on the potential impacts of changing the minimum size limit presented in Appendix E (*Evaluation of adaptive management approaches*) of paper IPHC-2017-SRB11-07, the SRB **REQUESTED** that the IPHC Secretariat, between now and SRB12, seek feedback from the Commissioners, Conference Board, Processors Advisory Board, and the Management Strategy Advisory Board, on a modified version of Appendix E. In particular, a modified version would include (i) a process for starting and possibly ending an experiment, (ii) performance metrics, and (iii) criteria for making conclusions based on the experimental outcomes.

7. MANAGEMENT STRATEGY EVALUATION: UPDATE

22. The SRB **NOTED** paper IPHC-2017-SRB11-08 that provided an update on the progress of the IPHC Management Strategy Evaluation process and seek recommendations from the SRB related to the Management Strategy Evaluation.

7.1 A description of the closed-loop simulations

23. The SRB **NOTED** the substantial progress in developing a very powerful simulation tool for evaluating robustness of alternative harvest policies. For example, the current simulation modeling framework could examine the expected long-term consequences of the current harvest policy.
24. The SRB **NOTED** that the current simulation framework is not yet adequate for evaluating short-term and medium-term outcomes because it assumes perfect knowledge about stock size and parameters in all future years. The SRB looks forward to SRB12 where we *expect* to see the implications of uncertainty in annual assessments and parameters.
25. The SRB **RECOMMENDED** that the IPHC Secretariat and Management Strategy Advisory Board collaborate to:
    a) further clarify and improve the presentation of the Harvest Strategy Policy (Appendix IV). This would improve not only transparency of the existing interim harvest policy, but also of the MSE process for evaluating alternatives.
    b) Review harvest policies from other bodies to develop an objectives hierarchy that explicitly prioritizes long-term conservation over short-/medium-term (e.g., 3-8 years) catch performance.
26. The SRB **NOTED** that the simulation model for projecting future changes in weight-at-age and regime shifts was presented in the type of detail that had previously been requested by the SRB; that is, with some specific equations and distributional assumptions so that the SRB could evaluate the model input, output, and parameterization, as well as alternative formulations.

27. The SRB **REQUESTED** that a quasi-extinction threshold be established so that:
    a) simulation replicates can be flagged when projected spawning biomass drops below this threshold;
    b) parameter sets causing quasi-extinction in the historical period can be dropped from the operating model initialization.
28. The SRB **REQUESTED** that the MSE simulation initialize the operating model biomass in the current year from the more precise Ensemble distribution of the current state (e.g., 2017) rather than the wider distribution obtained from the Operating model.
29. The SRB **RECOMMENDED** that the IPHC Secretariat hire a modeler/programmer to support MSE work so that timely feedback can be given the MSAB in the MSE process.

7.2 Simulation results and presenting results to the IPHC Management Strategy Advisory Board (MSAB)

See paragraphs 23 and 24.

8. BIOLOGICAL AND ECOSYSTEM SCIENCE PROGRAM RESEARCH UPDATES

8.1 Progress on ongoing IPHC-funded research projects

30. The SRB **NOTED** papers IPHC-2017-SRB11-09 which detailed current progress on research projects conducted by the IPHC Biological and Ecosystem Science Research Program.
31. The SRB **NOTED** an improved presentation and substantial progress of the biological research program. In particular, material was presented in a more concise fashion and an effort was made to link biological research program goals and objectives to key IPHC activities such as annual assessments and MSE simulations. However, the SRB did not consider this a sufficient response to SRB10-Req. 04:

    "The SRB REQUESTED that a future presentation on the overall research initiatives show how stock assessment, biology, and policy are integrated"

32. The SRB **REQUESTED** that the IPHC Secretariat prepare a presentation for SRB12, on the overall research initiatives to show how stock assessment, biology, and policy are integrated. Ultimately, such an integrated presentation should be a key component of science presentations at future IPHC Annual Meetings. For example, all research presentations would have been more effective had there been:
    a) more precise linkages among key knowledge gaps within the biology, annual stock assessment, and MSE simulations;
    b) a specific suite of questions to be discussed during the SRB meeting;
    c) sufficient background material provided such that the SRB can provide informed comment and advice related to the specific questions in (b).
33. **NOTING** that some of the biological science work is externally funded and peer-reviewed, the SRB **REQUESTED** that future background papers include successfully funded proposals so that the SRB has sufficient detail to review implementation and progress of the work.
34. The SRB **REQUESTED** that the IPHC Secretariat provide specific advice about the SRB's role in reviewing the design, analytical methods, and implementation of internally-funded projects.

8.2 Implementation plans and scheduling for externally-funded projects

No comments

8.3 Presentation of potential future research projects

35. **NOTING** the presentation of project timelines and milestones, the SRB **REQUESTED** that timelines also be included for incorporating biological research results into the stock assessment and MSE work.

36. The SRB **RECOMMENDED** that IPHC consider hiring a life-history modeler to provide more explicit linkage between the empirical biological program and the applied assessment and MSE modeling programs.

9. OTHER BUSINESS

9.1 IPHC meetings calendar (2018-20): SRB

37. **NOTING** the annual IPHC meetings calendar (2017-19) adopted by the Commission at its 93rd Session in 2017, the SRB **AGREED** to the improved format of the current Session and that the same format should apply to all future SRB meetings.

10. THE PROCESS FOR 'REVIEW OF THE DRAFT AND ADOPTION OF THE REPORT OF THE 11TH SESSION OF THE IPHC SCIENTIFIC REVIEW BOARD (SRB11)

38. The report of the 11th Session of the IPHC Scientific Review Board (IPHC-2017-SRB11–R) was **ADOPTED** via correspondence on 29 September 2017, including the consolidated set of recommendations and/or requests arising from SRB11, provided at Appendix V.

APPENDIX I
LIST OF PARTICIPANTS FOR THE 11TH SESSION OF THE IPHC SCIENTIFIC REVIEW BOARD (SRB11)

SRB Members

Dr Sean **Cox**:	spcox@sfu.ca; Professor, School of Resource and Environmental Management, Simon Fraser University, 8888 University Dr., Burnaby, B.C., Canada V5A 1S6
Dr Marc **Mangel**:	msmangel@ucsc.edu; Distinguished Research Professor and Director, Center for Stock Assessment Research, University of California, Santa Cruz, CA, U.S.A., 95064
Dr Kim **Scribner**:	scribne3@msu.edu; Professor, Department of Fisheries and Wildlife, Michigan State University, 2E Natural Resources Building, East Lansing, MI, U.S.A., 48824
Absent	
Dr James **Ianelli**:	jim.ianelli@noaa.gov; Research Scientist, National Marine Fisheries Service-NOAA, 7600 Sand Pt Way NE, Seattle, WA, U.S.A., 98115

Observers

Canada	United States of America
Dr Allen **Kronlund**: Allen.Kronlund@dfo-mpo.gc.ca	Dr Carey **McGilliard**: carey.mcgillard@noaa.gov

IPHC Secretariat

Name	Position and email
Dr David **Wilson**	Executive Director, david@iphc.int
Mr Stephen **Keith**	Assistant Director, steve@iphc.int
Dr Allan **Hicks**	Quantitative Scientist, allan@iphc.int
Dr Ian **Stewart**	Quantitative Scientist, ian@iphc.int
Dr Ray **Webster**	Quantitative Scientist, ray@iphc.int
Dr Josep **Planas**	Biological and Ecosystem Sciences Branch Manager, josep@iphc.int

APPENDIX II
AGENDA FOR THE 11TH SESSION OF THE IPHC SCIENTIFIC REVIEW BOARD (SRB11)

Date: 26–28 September 2017
Location: Seattle, Washington, U.S.A.
Venue: IPHC Board Room, Salmon Bay
Time: 12:00-17:00 (26th), 09:00-17:00 (27th), 09:00-14:00 (the 28th)
Chairperson: Dr Sean Cox (Simon Fraser University)
Vice-Chairpersons: Nil

1. OPENING OF THE SESSION

2. ADOPTION OF THE AGENDA AND ARRANGEMENTS FOR THE SESSION

3. IPHC PROCESS

4. IPHC FISHERY-INDEPENDENT SETLINE SURVEY

4.1 Methods for spatial survey modelling **-** Update on work since June SRB meeting (R. Webster)

4.2 Preliminary setline survey results (R. Webster)

5. PACIFIC HALIBUT STOCK ASSESSMENT: 2017

5.1 Data source development (I. Stewart)

5.2 Modelling updates (I. Stewart)

5.3 Preliminary results for 2017 (I. Stewart)

6. SIZE LIMIT ANALYSIS FOR 2017: Update (I. Stewart)

7. MANAGEMENT STRATEGY EVALUATION: UPDATE

7.1 A description of the closed-loops simulations (A. Hicks)

7.2 Simulation results and presenting results to the IPHC Management Strategy Advisory Board (A. Hicks)

8. BIOLOGICAL AND ECOSYSTEM SCIENCE PROGRAM RESEARCH UPDATES

8.1 Progress on ongoing IPHC-funded research projects (J. Planas)

8.2 Implementation plans and scheduling for externally-funded projects (J. Planas)

8.3 Presentation of potential future research projects (J. Planas)

9. OTHER BUSINESS

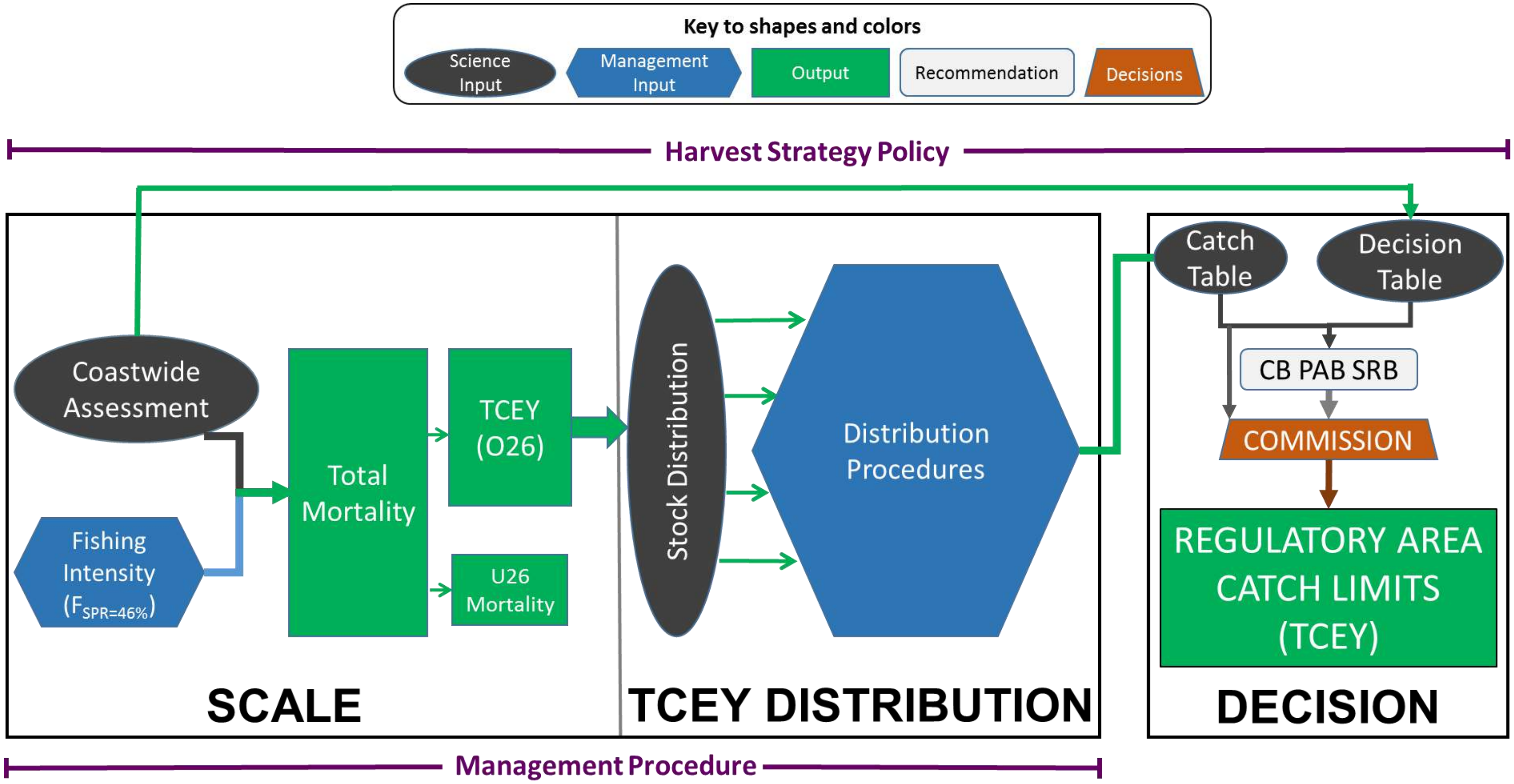
10. THE PROCESS FOR 'REVIEW OF THE DRAFT AND ADOPTION OF THE REPORT OF THE 11th SESSION OF THE IPHC SCIENTIFIC REVIEW BOARD (SRB11)'

APPENDIX III
LIST OF DOCUMENTS FOR THE 11TH SESSION OF THE IPHC SCIENTIFIC REVIEW BOARD (SRB11)

Document	Title	Availability
IPHC-2017-SRB11-01	DRAFT: Agenda & Schedule for the 11th Session of the Scientific Review Board (SRB11)	✓ 26 June 2017
IPHC-2017-SRB11-02	DRAFT: List of Documents for the 11th Session of the Scientific Review Board (SRB11)	✓ 28 & 31 August 2017
IPHC-2017-SRB11-03	Update on the actions arising from the 10th Session of the SRB (SRB10) (IPHC Secretariat)	✓ 27 August 2017
IPHC-2017-SRB11-04	Methods for spatial survey modelling - Update on work since June SRB10 meeting (R. Webster)	✓ 29 August 2017
IPHC-2017-SRB11-05	Preliminary IPHC Fishery-independent setline survey (FISS) results: 2017 (R. Webster)	✓ 30 August 2017
IPHC-2017-SRB11-06	Pacific halibut stock assessment development for 2017 (I. Stewart)	✓ 31 August 2017
IPHC-2017-SRB11-07	Evaluation of the IPHC's 32" minimum size limit: Update since the June SRB10 meeting (I. Stewart & A. Hicks)	✓ 28 August 2017
IPHC-2017-SRB11-08	Management Strategy Evaluation: Update since the June SRB10 meeting (A. Hicks)	✓ 30 August 2017
IPHC-2017-SRB11-09	Report on biological research activities at IPHC: Update since the June SRB10 meeting (J. Planas)	✓ 28 August 2017
Information papers		
IPHC-2017-SRB11-INF01	Nil	Nil

APPENDIX IV

REVISED: HARVEST STRATEGY POLICY PROCESS



APPENDIX V

CONSOLIDATED SET OF RECOMMENDATIONS AND REQUESTS OF THE 11TH SESSION OF THE IPHC SCIENTIFIC REVIEW BOARD (SRB11)

RECOMMENDATIONS

Pacific halibut stock assessment (2017): Data source development

SRB11–Rec.01 (para. 14) The SRB **RECOMMENDED** continuing to down-weight terminal year fishery CPUE in the annual stock assessment because terminal and post-season CPUE may be substantially different. Generating and presenting the conditional distribution for post-season CPUE given terminal CPUE, should be undertaken as a way to improve communication about most recent fishery CPUE values.

Management Strategy Evaluation: A description of the closed-loop simulations

SRB11–Rec.02 (para. 25) The SRB **RECOMMENDED** that the IPHC Secretariat and Management Strategy Advisory Board collaborate to:

c) further clarify and improve the presentation of the Harvest Strategy Policy (Appendix IV). This would improve not only transparency of the existing interim harvest policy, but also of the MSE process for evaluating alternatives.

d) Review harvest policies from other bodies to develop an objectives hierarchy that explicitly prioritizes long-term conservation over short-/medium-term (e.g., 3-8 years) catch performance.

SRB11–Rec.03 (para. 29) The SRB **RECOMMENDED** that the IPHC Secretariat hire a modeler/programmer to support MSE work so that timely feedback can be given the MSAB in the MSE process.

Biological and ecosystem science program: Presentation of potential future research projects

SRB11–Rec.04 (para. 36) The SRB **RECOMMENDED** that IPHC consider hiring a life-history modeler to provide more explicit linkage between the empirical biological program and the applied assessment and MSE modeling programs.

REQUESTS

IPHC fishery-independent setline survey: Methods for spatial survey modelling

SRB11–Req.01 (para. 7) The SRB **REQUESTED** that the IPHC Secretariat present a form of Table 1 to Commissioners, adding a column for Qualitative Cost (e.g., High, Low given sampling intensity, fishing cost, etc.).

SRB11–Req.02 (para. 9) The SRB **REQUESTED** that the following be maintained on the IPHC Program of Work: (i) examination of revenue and cost-recovery (i.e., cost benefit analyses), (ii) forecast the effect on CV of the presence or absence of expansion FISS stations, (iii) plotting relative error against number of stations, and (iv) comparison of frequency of zeros between standard and expansion FISS stations.

IPHC fishery-independent setline survey: Preliminary FISS results

SRB11–Req.03 (para. 12) The SRB **REQUESTED** continuing research – subsequent to the 94th Annual Meeting of the IPHC (AM094) - on the effect of other covariates such as dissolved oxygen on the IPHC fishery-independent setline survey catch rates, and for any results to be presented at SRB12.

Pacific halibut stock assessment (2017): Data source development

SRB11–Req.04 (para. 15) The SRB **REQUESTED** continuing research on discrepancies between Estimated and Measured weights of Pacific halibut, be presented at SRB12.

Size limit analysis for 2017: Update

SRB11–Req.05 (para. 21) **NOTING** the thoughtful and detailed presentation on the potential impacts of changing the minimum size limit presented in Appendix E (*Evaluation of adaptive management approaches*) of paper IPHC-2017-SRB11-07, the SRB **REQUESTED** that the IPHC Secretariat, between now and SRB12, seek feedback from the Commissioners, Conference Board, Processors Advisory Board, and the Management Strategy Advisory Board, on a modified version of Appendix E. In particular, a modified version would include (i) a process for starting and possibly ending an experiment, (ii) performance metrics, and (iii) criteria for making conclusions based on the experimental outcomes.

Management Strategy Evaluation: A description of the closed-loop simulations

SRB11–Req.06 (para. 27) The SRB **REQUESTED** that a quasi-extinction threshold be established so that:

a) simulation replicates can be flagged when projected spawning biomass drops below this threshold;

b) parameter sets causing quasi-extinction in the historical period can be dropped from the operating model initialization.

SRB11–Req.07 (para. 28) The SRB **REQUESTED** that the MSE simulation initialize the operating model biomass in the current year from the more precise Ensemble distribution of the current state (e.g., 2017) rather than the wider distribution obtained from the Operating model.

Biological and ecosystem science program: Progress on ongoing IPHC-funded research projects

SRB11–Req.08 (para. 32) The SRB **REQUESTED** that the IPHC Secretariat prepare a presentation for SRB12, on the overall research initiatives to show how stock assessment, biology, and policy are integrated. Ultimately, such an integrated presentation should be a key component of science presentations at future IPHC Annual Meetings. For example, all research presentations would have been more effective had there been:

d) more precise linkages among key knowledge gaps within the biology, annual stock assessment, and MSE simulations;

e) a specific suite of questions to be discussed during the SRB meeting;

f) sufficient background material provided such that the SRB can provide informed comment and advice related to the specific questions in (b).

SRB11–Req.09 (para. 33) **NOTING** that some of the biological science work is externally funded and peer-reviewed, the SRB **REQUESTED** that future background papers include successfully funded proposals so that the SRB has sufficient detail to review implementation and progress of the work.

SRB11–Req.10 (para. 34) The SRB **REQUESTED** that the IPHC Secretariat provide specific advice about the SRB's role in reviewing the design, analytical methods, and implementation of internally-funded projects.

Biological and ecosystem science program: Presentation of potential future research projects

SRB11–Req.11 (para. 35) **NOTING** the presentation of project timelines and milestones, the SRB **REQUESTED** that timelines also be included for incorporating biological research results into the stock assessment and MSE work.

Report of the 9th Session of the IPHC Management Strategy Advisory Board (MSAB09)

Seattle, Washington, U.S.A., 9-11 May 2017

DISTRIBUTION:	**BIBLIOGRAPHIC ENTRY**
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INTERNATIONAL PACIFIC HALIBUT COMMISSION

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ACRONYMS

CDN	Canada
EM	Estimation Model
FCEY	Fishery Constant Exploitation Yield
F_{SPR}	The Fishing Intensity that results in an equilibrium Spawning Potential Ratio
HCR	Harvest Control Rule
IPHC	International Pacific Halibut Commission
LRP	Limit Reference Point
M	Natural Mortality
MSAB	Management Strategy Advisory Board
OM	Operating Model
RSB	Relative Spawning Biomass
SRB	Scientific Review Board
SPR	Spawning Potential Ratio
TCEY	Total Constant Exploitation Yield
TRP	Threshold/Trigger Reference Point
TM	Total mortality
U.S.A.	United States of America
WPUE	Weight-Per-Unit-Effort

HOW TO INTERPRET TERMINOLOGY CONTAINED IN THIS REPORT

The MSAB09 Report has been written using the following terms and associated definitions so as to remove ambiguity surrounding how particular paragraphs should be interpreted.

Level 1: **RECOMMENDED**; **RECOMMENDATION** (formal); **REQUESTED** (informal): A conclusion for an action to be undertaken, by the Commission, a Contracting Party, a subsidiary (advisory) body of the Commission and/or the IPHC Secretariat. *Note*: Subsidiary (advisory) bodies of the Commission must have their Recommendations and Requests formally provided to the next level in the structure of the Commission for its consideration/endorsement (e.g. from an Advisory Board to the Commission). The intention is that the higher body will consider the action for endorsement under its own mandate, if the subsidiary body does not already have the required mandate. Ideally, this should be task-specific and contain a timeframe for completion.

Level 2: **AGREED**: Any point of discussion from a meeting, which the IPHC body considers to be an agreed course of action covered by its mandate, which has not already been dealt with under Level 1 above; a general point of agreement among delegations/participants of a meeting which does not need to be elevated in the Commission's reporting structure.

Level 3: **NOTED/NOTING**; **CONSIDERED**; **URGED**; **ACKNOWLEDGED**: General terms to be used for consistency. Any point of discussion from a meeting, which the IPHC body considers to be important enough to record in a meeting report for future reference. Any other term may be used to highlight to the reader of an IPHC report, the importance of the relevant paragraph. Other terms may be used but will be considered for explanatory/informational purposes only and shall have no higher rating within the reporting terminology hierarchy than Level 3.

TABLE OF CONTENTS

EXECUTIVE SUMMARY

The 9th Session of the International Pacific Halibut Commission (IPHC) Management Strategy Advisory Board (MSAB09) was held in Seattle, Washington, U.S.A. from 9 to 11 May 2017. The MSAB consists of 20 board members, 17 of which attended the Session from the two (2) Contracting Parties. A total of four (4) individuals attended the Session as Observers. In addition, two (2) IPHC Commissioners were in attendance, Mr Paul Ryall (Canada) and Mr Bob Alverson (U.S.A.). The meeting was opened by the Co-Chairpersons, Mr Adam Keizer (Canada) and Ms Michele Culver (U.S.A.).

The following are a subset of the complete recommendations/requests for action from the MSAB09, which are provided at Appendix VII.

RECOMMENDATIONS

NOTING that the core purpose of the MSAB09 is to review progress on the MSE Program of Work, and to provide guidance for the delivery of products to the MSAB10 in October 2017, the MSAB **AGREED** that formal recommendations to the Commission would not be developed at the present meeting, but rather, these would be developed at the MSAB10.

REQUESTS

MSAB Program of Work and delivery schedule for 2017

MSAB09–Req.01 (para. 15) The MSAB **REQUESTED** that the MSE Program of Work and delivery schedule be expanded past the current 2018 timeframe, to provide a three-year outlook, thereby detailing the work to be completed and delivery times, noting that the Commission has directed the IPHC Secretariat to accelerate the process as follows:

> AM093–Rec.07 (para. 39) "*The Commission RECOMMENDED that the IPHC Management Strategy Evaluation (MSE) process be accelerated so that more of the elements contained within the current Program of Work are delivered at the 94th Annual Meeting of the Commission in 2018. The IPHC Secretariat is directed to mobilise carryover funds from "core operations" to ensure the accelerated delivery schedule.*"

Harvest strategy policy: Framework

MSAB09–Req.02 (para. 21) The MSAB **REQUESTED** that the IPHC Secretariat staff move forward by using a coastwide Operating Model with five coastwide fleets, as in the coastwide assessment models. A coastwide model lacks complexity but has utility for investigating coastwide fishing intensity.

Harvest strategy policy: Management procedures

MSAB09–Req.03 (para. 28) The MSAB **REQUESTED** that:

a) F_{SPR} be analysed as the primary metric of fishing intensity, over a range of values, and that several other fishing intensity metrics described in paper IPHC-2017-MSAB09-07 be reported as performance metrics. Table 2 describes the specific Management Procedures and values in priority order that should be evaluated.

b) further evaluation of the harvest control rule described in paper IPHC-2017-MSAB09-07 be undertaken, with F_{SPR} as the object of the control rule's actions, but including a nominal amount of bycatch and personal use catch (based on realistic expectations from the fishery) when F_{SPR} is set to zero by the control rule. Table 2 describes the specific Management Procedures and values in priority order that should be evaluated.

c) simulation sensitivities, as described in Table 2, be evaluated for a selection of specific combinations of Management Procedures.

Goals, objectives, and performance metrics

MSAB09–Req.04 (para. 33) The MSAB **REQUESTED** that performance metrics be reported for short-, medium-, and long-term timeframes. Long-term timeframes would be at least 50 to 60 years, and other timeframes will be considered in consultation with the IPHC's Scientific Review Board.

MSAB09–Req.05 (para. 35) The MSAB **REQUESTED** that the goals and objectives provided at Appendix VI be used for the IPHC Secretariat's analysis to be prepared for MSAB10, **NOTING** that, although objectives for the overarching goals concerning bycatch, consumer needs, and preserving biocomplexity have not yet been identified, those goals would be addressed at least partially by other elements of the analysis.

1. OPENING OF THE SESSION

1. The 9th Session of the International Pacific Halibut Commission (IPHC) Management Strategy Advisory Board (MSAB09) was held in Seattle, Washington, U.S.A. from 9 to 11 May 2017. The MSAB consists of 20 board members, 17 of which attended the Session from the two (2) Contracting Parties. A total of four (4) individuals attended the Session as Observers. In addition, two (2) IPHC Commissioners were in attendance, Mr Paul Ryall (Canada) and Mr Bob Alverson (U.S.A.). The list of participants is provided at Appendix I. The meeting was opened by the Co-Chairpersons, Mr Adam Keizer (Canada) and Ms Michele Culver (U.S.A.), who welcomed participants to Seattle.
2. The MSAB **NOTED** apologies received from the following board members: Mr Chris Sporer (CDN commercial harvester rep.), Mr Robert Hauknes (CDN commercial harvester rep.) and Ms Rachel Baker (U.S.A. government Rep.).
3. The MSAB **RECALLED** the importance for all members to attend each Session of the MSAB, both to be fully engaged in the process and to fulfil fishery sector representation.
4. **NOTING** that the core purpose of the MSAB09 is to review progress on the MSE Program of Work, and to provide guidance for the delivery of products to the MSAB10 in October 2017, the MSAB **AGREED** that formal recommendations to the Commission would not be developed at the present meeting, but rather, these would be developed at the MSAB10.

2. ADOPTION OF THE AGENDA AND ARRANGEMENTS FOR THE SESSION

5. The MSAB **ADOPTED** the Agenda as provided at Appendix II. The documents provided to the MSAB09 are listed in Appendix III.

3. IPHC PROCESS

3.1 IPHC Rules of Procedure (2017)

6. The MSAB **NOTED** that at its 93rd Session, the Commission adopted revised IPHC Rules of Procedure (2017) by consensus. The document is available for download from the IPHC website: http://iphc.int/basic-texts-of-the-commission.html.
7. The MSAB **NOTED** the modifications adopted by the Commission, including the MSAB membership, reporting requirements, and other governance improvements.

3.2 2017 MSAB membership

8. The MSAB **NOTED** paper IPHC-2017-MSAB09-06 which detailed the inter-sessional decision-making process undertaken to provide the Commission with an opportunity to review and subsequently approve an MSAB membership list for 2017.
9. The MSAB **NOTED** that in accordance with the Terms of Reference and Rules of Procedure of the MSAB, as detailed in Appendix V (Section II, paragraphs 3-4) of the IPHC Rules of Procedure (2017), the MSAB is required to maintain a diverse membership to ensure representation of core stakeholder groups and regulatory areas.
10. The MSAB **NOTED** that on 21 March 2017, the Commission approved the MSAB membership list as provided in Appendix IV, including three new members (Mr Martin Paish (CDN recreational/sport rep.), Mr Robert Hauknes (CDN commercial harvester rep.), and Mr Dan Falvey (U.S.A. commercial harvester rep.)).

3.3 Update on the actions arising from the 8th Session of the MSAB (MSAB08)

11. The MSAB **NOTED** paper IPHC-2017-MSAB09-03 which provided an opportunity to consider the progress made during the inter-sessional period since the MSAB08 meeting held in October 2016.

12. The MSAB **AGREED** to consider and revise as necessary, the actions arising that are either in progress or pending, and for these to be combined with any new actions arising from the MSAB09 into a consolidated list of recommendations and requests for future reporting.

3.4 Outcomes of the 93rd Session of the IPHC Annual Meeting (AM093)

13. The MSAB **NOTED** paper IPHC-2017-MSAB09-04 which outlined the main outcomes of the 93rd Session of the Commission, specifically related to the MSAB, and **AGREED** to consider how best to provide the Commission with the information it has requested, throughout the course of the current MSAB meeting.

3.5 MSAB Program of Work and delivery schedule for 2017

14. The MSAB **NOTED** paper IPHC-2017-MSAB09-05, which provided a description of activities related to the MSAB that IPHC Secretariat staff will engage in for the next two years, including priority tasks, the resources needed for each task, and a timeline for each task.

15. The MSAB **REQUESTED** that the MSE Program of Work and delivery schedule be expanded past the current 2018 timeframe, to provide a three-year outlook, thereby detailing the work to be completed and delivery times, noting that the Commission has directed the IPHC Secretariat to accelerate the process as follows:

    AM093–Rec.07 (para. 39) "*The Commission RECOMMENDED that the IPHC Management Strategy Evaluation (MSE) process be accelerated so that more of the elements contained within the current Program of Work are delivered at the 94th Annual Meeting of the Commission in 2018. The IPHC Secretariat is directed to mobilise carryover funds from "core operations" to ensure the accelerated delivery schedule.*"

16. **NOTING** the revised accelerated delivery schedule, for the MSE Program of Work (2016-20) provided at Appendix V, the MSAB **AGREED** that the details post-2017 would be considered at the MSAB10 in October 2017, prior to submission to the Commission.

4. HARVEST STRATEGY POLICY, PART 1: SIMULATIONS TO EVALUATE FISHING INTENSITY

17. The MSAB **NOTED** paper IPHC-2017-MSAB09-07 which aimed to inform and stimulate discussion about the framework and inputs to the closed-loop simulations used to investigate measures of and specific values for fishing intensity (e.g. F_{SPR}).

18. The MSAB **NOTED** that fishing intensity defines the coastwide scale of fishing, and that these simulations will help to determine a specific fishing intensity that will best meet the objectives defined by the MSAB.

4.1 Framework

19. The MSAB **NOTED** that there are four main modules to the closed-loop simulation framework:

    a) The ***Operating Model*** (OM) is a representation of the population and the fishery. It produces the numbers-at-age, accounting for mortality and any other important processes, and also incorporates uncertainty in the processes.

    b) ***Monitoring*** (data generation) is the code that simulates the data from the Operating Model that is used by the Estimation Model. It can introduce variability, bias, and any other properties that are desired. The data to be generated are dictated by the Estimation Model and Harvest Strategy decisions.

    c) The ***Estimation Model*** (EM), which can range from simple trend analysis to, in this case, a model similar to a full stock assessment. Using the data generated, it provides the basis for setting the catch levels for the next time step.

d) ***Harvest Strategy*** is the application of the estimation model output along with the scale and IPHC Regulatory Area distribution procedures to produce the catch limit for that year, that is then applied to the Operating Model.

20. **NOTING** the suggestions provided for defining the Operating Model, the MSAB **AGREED** that using the Stock Synthesis framework, as in the current IPHC stock assessment, provides an efficient way to conduct the simulations and uses a model that is conditioned to data and generally understood.

21. The MSAB **REQUESTED** that the IPHC Secretariat staff move forward by using a coastwide Operating Model with five coastwide fleets, as in the coastwide assessment models. A coastwide model lacks complexity but has utility for investigating coastwide fishing intensity.

22. The MSAB **AGREED** that:

    a) the Estimation Model include a Perfect Information case to illustrate the best performance that a management strategy could obtain given the uncertainty in the Operating Model. Additionally, the Estimation Model should also include a model to mimic the level of uncertainty in the current stock assessment process.

    b) distributing the Total Mortality to the five fleets be treated as a Scenario with uncertainty.

23. The MSAB **NOTED** that:

    a) Data Generation specifications are mostly a science product to be discussed with the IPHC Scientific Review Board, rather than the MSAB.

    b) Data Generation assumptions are consistent with current data collection, but potential changes to data collection (such as sex-specific fishery observations) may be considered.

4.2 Scenarios

24. The MSAB **NOTED** that scenarios represent both uncertainty (in the form of distributions) as well as alternative states of nature in the Operating Model, which reflect parameter and structural uncertainty. These alternative states of nature integrate over the uncertainty in the system that we cannot, or choose not to, control. The scenarios for the MSE simulations may include uncertainty in the processes, as detailed in Table 1.

Table 1. Scenarios for the MSE simulations.

Process	**Uncertainty**
Natural Mortality (M)	From assessment
Recruitment	Random, lognormal deviations, variability=0.5-0.65
Size-at-age	Trend in size-at-age (random walk)
Maturity-at-age	Variable a50; function of size-at-age?
Steepness	Variability in OM: N(0.75, σ=0.1)
Regime Shifts	Autocorrelated index as indicator for regime shift
Fishery Selectivity	Time-varying, consistent with estimated variability
Survey Selectivity	Time-varying, consistent with estimated variability
WPUE catchability	Random walk as estimated
Survey catchability	Constant
Total Mortality to sectors (e.g. bycatch)	Described below in paragraph 25
Proportion of Total Mortality taken	Sector-specific

25. The MSAB **NOTED** that catch history, in conjunction with uncertainties and sensitivities, can be used to attribute Total Mortality (TM) to each sector. There are also concerns about parameter values and management processes at the scenario extremes, such as when the stock level approaches 20%SB_0 and

directed fishing is stopped, but other harvest might continue, but that this would not impede the analysis and is addressed, in part, in paragraph 28(b).

26. The MSAB **AGREED** that the IPHC Secretariat staff continue with refinement of the scenario approach described in paper IPHC-2017-MSAB09-07, including consultation with the IPHC Scientific Review Board.

4.3 Management Procedures

27. The MSAB **NOTED** the possibilities for Management Procedures presented in paper IPHC-2017-MSAB09-07 and focused its attention on metrics of fishing intensity and control rules in order to guide the IPHC Secretariat's Program of Work (2017-20). The MSE will grow incrementally from this first iteration of Management Procedure simulation, to refine initial results and incorporate new procedures in subsequent iterations.

28. The MSAB **REQUESTED** that:

    a) F_{SPR} be analysed as the primary metric of fishing intensity, over a range of values, and that several other fishing intensity metrics described in paper IPHC-2017-MSAB09-07 be reported as performance metrics. Table 2 describes the specific Management Procedures and values in priority order that should be evaluated.

    b) further evaluation of the harvest control rule described in paper IPHC-2017-MSAB09-07 be undertaken, with F_{SPR} as the object of the control rule's actions, but including a nominal amount of bycatch and personal use catch (based on realistic expectations from the fishery) when F_{SPR} is set to zero by the control rule. Table 2 describes the specific management procedures and values in priority order that should be evaluated.

    c) simulation sensitivities, as described in Table 2, be evaluated for a selection of specific combinations of Management Procedures.

Table 2 Management Procedures and values, in priority order, to be used by the IPHC Secretariat staff for evaluation.

Management Procedure	**Values**
SPR	0.25 – 0.60, higher density near 46%
Control Rule	30:20, 40:20 threshold/trigger and limit, respectively
Ceiling on Total Mortality	85 Mlbs
Floor on Total Mortality	30 Mlbs
Sensitivity	**Values**
Size-at-age	High and low states
Recruitment	High and low states
Maximum bycatch	At per-area maximum regulatory bycatch
Bycatch selectivity	Shifted to a greater proportion of U26 fish
Uncertainty in total mortality	Unknown

29. The MSAB **NOTED** that not all simulation scenarios can be evaluated for all sensitivities, but that sensitivities will be employed to spotlight their most salient effects.

4.4 Example of presenting results

30. The MSAB **AGREED** that this agenda item would be combined with item 5.3 *Reporting results for evaluation*, below.

5. GOALS, OBJECTIVES, AND PERFORMANCE METRICS

31. The MSAB **NOTED** paper IPHC-2017-MSAB09-08 Rev_2 which provided a review of the goals and objectives previously defined by the MSAB, a number of possible performance metrics to be evaluated, and a list of actions previously requested by the MSAB.

32. The MSAB **NOTED** that performance metrics can be developed from a measurable objective with an outcome, timeframe, and probability defined, and that these performance metrics have already been defined for most objectives.

33. The MSAB **REQUESTED** that performance metrics be reported for short-, medium-, and long-term timeframes. Long-term timeframes would be at least 50 to 60 years, and other timeframes will be considered in consultation with the IPHC's Scientific Review Board.

5.1 Further clarifying objectives

34. The MSAB **CONSIDERED** the goals and objectives presented in paper IPHC-2017-MSAB09-08 Rev_2, as well as possible additions or deletions.

35. The MSAB **REQUESTED** that the goals and objectives provided at Appendix VI be used for the IPHC Secretariat's analysis to be prepared for MSAB10, **NOTING** that, although objectives for the overarching goals concerning bycatch, consumer needs, and preserving biocomplexity have not yet been identified, those goals would be addressed at least partially by other elements of the analysis.

36. The MSAB **AGREED** that:

    a) the objective to maintain a minimum absolute number of female Pacific halibut coastwide may be a useful objective, because it would remain static, especially if a dynamic RSB will be used to determine the current status of the stock for use in the control rule.

    b) the objective to maintain a minimum spawning stock biomass will be rephrased into two objectives, 1) avoid very low stock sizes, and 2) mostly avoid low stock sizes, which would use the limit and threshold (trigger) reference points (LRP, TRP) as outcomes, respectively.

    c) the objectives related to wastage are already being met and do not need to be specifically considered in these simulations, and that a statement should be made that these objectives are currently met. As per paragraph 37(b), a statistic regarding wastage may still be reported.

5.2 Useful performance metrics

37. The MSAB **AGREED**:

    a) to report on the performance metrics provided at Appendix VI.

    b) that since a desired minimum number of mature female Pacific halibut has not been defined, a performance metric reporting a statistic (e.g. average) of the number of mature females be provided.

    c) that a proxy metric for FCEY should be the sum of the commercial, wastage, sport and personal use mortality.

    d) that the following performance metrics should be reported to help evaluate the expectations of the simulation model: 1) percentage of bycatch relative to the total mortality, and 2) the weight of the bycatch.

5.3 Reporting results for evaluation

38. The MSAB **NOTED** that the goal of the simulations is to produce metrics for multiple Management Procedures which can be evaluated against the objectives defined by the MSAB. A table is a common way to display these metrics, but figures may be useful to evaluate trade-offs between objectives.

39. **NOTING** the examples for presenting results described by the IPHC Secretariat staff, the MSAB **AGREED** that they be used as the starting point for presenting results to MSAB10 (October 2017), and offered comments and suggestions for their use as a table with Management Procedures as columns and performance statistics as rows.

40. The MSAB **AGREED** that when reporting simulation results, the format should include simple, clear naming conventions, performance metrics should be reported in smaller sets with trade-offs still obvious, and an easy to identify symbol should be used when a measurable objective is met. In addition, plots of the time series, plots of specific simulation trajectories, and box plots showing quantiles may be useful.

6. HARVEST STRATEGY POLICY, PART 2: ADDRESSING STOCK AND CATCH DISTRIBUTION

41. The MSAB **NOTED** paper IPHC-2017-MSAB09-09, which aimed to stimulate discussion about alternatives to distribute the TCEY in the current harvest strategy policy, noting that the Commission has directed the IPHC Secretariat to initiate a process as follows:

    AM093–Req.02 (para. 40) "*The Commission REQUESTED that the IPHC Secretariat initiate a process to develop alternative, biologically based stock distribution strategies for consideration by the Commission and its subsidiary bodies. This should also be incorporated into the MSE Program of Work.*"

42. The MSAB **NOTED** a Harvest Strategy and terms to describe the Harvest Strategy Policy, specifically the distribution component, and **AGREED** to continue development of this Harvest Strategy and the terms to describe the components for further consideration at the MSAB10.

43. The MSAB **AGREED** that there are separate components, science (e.g. stock distribution) and management-focused, associated with distributing the TCEY when describing the harvest strategy policy. Management components may include different harvest rates in each Regulatory Area (or region), trends in fishery WPUE, age/size compositions, national shares, or simple allocations.

44. The MSAB **NOTED** the proposed alternatives for distributing the TCEY (pseudo-status quo and regional distribution) to evaluate in the future using the MSE framework.

45. The MSAB **CONSIDERED** the proposal for stock distribution to operate on the regions defined in paper IPHC-2017-MSAB09-09.

46. The MSAB **AGREED** to further consider a goal related to preserving biocomplexity at MSAB10.

7. DELIVERABLES FOR MSAB10 AND FOR THE 2018 ANNUAL MEETING (AM094)

47. The MSAB **REQUESTED** that the following items be delivered by the IPHC Secretariat staff to the MSAB10 for further consideration, prior to their delivery to the Commission at AM094:
    a) Simulation results of Management Procedure evaluation including sensitivity analysis.
    b) Terms and Definitions for a refined Harvest Strategy Policy.
    c) Updates on the Scientific Review Board discussions/recommendations on stock distribution, biocomplexity, and performance metric timeframes.
    d) Updated MSE Program of Work (2016-20).
    e) Updates on other pertinent work.

8. OTHER BUSINESS

8.1 Election of Co-Chairpersons for the next biennium

48. The MSAB **NOTED** that the terms of the current Co-Chairpersons, Mr Adam Keizer (Canada) and Ms Michele Culver (U.S.A.) are due to expire at the closing of the current Session, and in accordance with the IPHC Rules of Procedure (2017) (Rule 14, paragraph 7(b)), the MSAB is required to elect or re-elect new Co-Chairpersons for the next biennium.

49. The MSAB **CALLED** for nominations for the positions of Co-Chairpersons of the IPHC MSAB for the next biennium. Mr Adam Keizer (Canada) and Ms Rachel Baker (U.S.A.) were nominated, seconded and elected as Co-Chairpersons of the IPHC MSAB for the next biennium.

8.2 Election of the Steering Committee for the next biennium

50. The MSAB **NOTED** that in accordance with the Terms of Reference and Rules of Procedure of the MSAB, as detailed in Appendix V (Section V, paragraph 10) of the IPHC Rules of Procedure (2017), the MSAB is required to elect or re-elect members of the MSAB Steering Committee for the next biennium.

51. The MSAB **CALLED** for nominations to the MSAB Steering Committee for the next biennium. The following list was nominated, seconded and elected as members of the MSAB Steering Committee for the next biennium:

Canada	United States of America
Mr Adam Keizer	Ms Rachel Baker
Mr Jim Lane	Ms Michele Culver
Mr Chris Sporer	Ms Peggy Parker

8.3 IPHC meetings calendar (2017-19): MSAB

52. **NOTING** the annual IPHC meetings calendar (2017-19) adopted by the Commission at its 93rd Session in 2017, and the revised MSE Program of Work discussed during the current meeting, the MSAB **AGREED** that moving forward, the May MSAB meetings should move to a three (3) day format and the October MSAB meeting should move to a three (3) or four (4) day format, dependent on content. MSAB10 will commence on Monday 23 October 2017 (noon) and close on Thursday 26 October 2017, 5:00pm.

9. REVIEW OF THE DRAFT AND ADOPTION OF THE REPORT OF THE 9TH SESSION OF THE IPHC MANAGEMENT STRATEGY ADVISORY BOARD (MSAB)

53. The report of the 9th Session of the IPHC Management Strategy Advisory Board (IPHC-2017-MSAB09–R) was **ADOPTED** via correspondence on 19 May 2017, including the consolidated set of recommendations and/or requests arising from MSAB09, provided at Appendix VII.

APPENDIX I
LIST OF PARTICIPANTS FOR THE 9TH SESSION OF THE IPHC MANAGEMENT STRATEGY ADVISORY BOARD (MSAB09)

Officers

Co-Chairperson (Canada)	Co-Chairperson (United States of America)
Mr Adam **Keizer**: adam.keizer@dfo-mpo.gc.ca	Ms Michele **Culver**: Michele.Culver@dfw.wa.gov

MSAB Members

Canada	United States of America
Dr Robyn **Forrest:** Robyn.Forrest@dfo-mpo.gc.ca	Mr Craig **Cross**: craigc@starboats.com
Mr Adam **Keizer**: adam.keizer@dfo-mpo.gc.ca	Ms Michele **Culver**: Michele.Culver@dfw.wa.gov
Mr Jim **Lane**: jim.lane@nuuchahnulth.org	Mr Dan **Falvey**: myriadfisheries@gmail.com
Mr Brad **Mirau**: brad@aerotrading.ca	Mr Bruce **Gabrys**: gabryscpa@mtaonline.net
Mr Martin **Paish**: martinpaish1@gmail.com	Mr Jeff **Kaufman**: jeff@spfishco.com
	Mr Tom **Marking**: tmmarking@gmail.com
	Mr Scott **Mazzone**: smazzone@quinault.org
	Dr Carey **McGillard**: Carey.McGilliard@noaa.gov
	Mr Scott **Meyer**: scott.meyer@alaska.gov
	Mr Per **Odegaard**: vanseeodegaard@hotmail.com
	Ms Peggy **Parker**: peggyparker616@gmail.com
	Mr John **Woodruff**: johnw@icicleseafoods.com
Absentees	**Absentees**
Mr Chris **Sporer**: chris.sporer@phma.ca	Ms Rachel **Baker**: rachel.baker@noaa.gov
Mr Robert **Hauknes**: robert_hauknes@hotmail.com	

Commissioners

Canada	United States of America
Mr Paul **Ryall**: Paul.Ryall@dfo-mpo.gc.ca	Mr Robert **Alverson**: roberta@fvoa.org

Observers

Canada	United States of America
	Ms Ruth **Christiansen**, United Catcher Boats
	Mr Jim **Hasbrouck**, ADFG
	Ms Kristin **Marshall**, NMFS
	Mr Frank **Lockhart**, NMFS

IPHC Secretariat

Name	Position and email
Dr David **Wilson**	Executive Director, david@iphc.int
Mr Stephen **Keith**	Assistant Director, steve@iphc.int
Dr Allan **Hicks**	Quantitative Scientist, allan@iphc.int
Dr Ian **Stewart**	Quantitative Scientist, ian@iphc.int

APPENDIX II
AGENDA FOR THE 9TH SESSION OF THE IPHC MANAGEMENT STRATEGY ADVISORY BOARD (MSAB09)

Date: 9–11 May 2017
Location: Seattle, Washington, U.S.A.
Venue: IPHC Training Room, Salmon Bay
Time: 09:00-17:00 daily
Co-Chairpersons: Mr Adam Keizer (Canada) and Ms Michele Culver (U.S.A.)

1. **OPENING OF THE SESSION**

2. **ADOPTION OF THE AGENGA AND ARRANGEMENTS FOR THE SESSION**

3. **IPHC PROCESS**
   - 3.1. IPHC Rules of Procedure (2017)
   - 3.2. 2017 MSAB membership
   - 3.3. Update on the actions arising from the 8th Session of the MSAB (MSAB08)
   - 3.4. Outcomes of the 93rd Session of the IPHC Annual Meeting (AM093)
   - 3.5. MSAB program of work and delivery schedule for 2017

4. **HARVEST STRATEGY POLICY, PART 1: SIMULATIONS TO EVALUATE FISHING INTENSITY**
   - 4.1. Framework
   - 4.2. Scenarios
   - 4.3. Management procedures
   - 4.4. Example of presenting results

5. **GOALS, OBJECTIVES, AND PERFORMANCE METRICS**
   - 5.1. Further clarifying objectives
   - 5.2. Useful performance metrics
   - 5.3. Reporting results for evaluation

6. **HARVEST STRATEGY POLICY, PART 2: ADDRESSING STOCK AND CATCH DISTRIBUTION**

7. **DELIVERABLES FOR MSAB10 AND FOR THE 2018 ANNUAL MEETING (AM094)**

8. **OTHER BUSINESS**
   - 8.1. Election of Co-Chairpersons for the next biennium
   - 8.2. Election of the Steering Committee for the next biennium
   - 8.3. IPHC meetings calendar (2017-19): MSAB

9. **REVIEW OF THE DRAFT AND ADOPTION OF THE REPORT OF THE 9th SESSION OF THE IPHC MANAGEMENT STRATEGY ADVISORY BOARD (MSAB09)**

APPENDIX III
LIST OF DOCUMENTS FOR THE 9TH SESSION OF THE MANAGEMENT STRATEGY ADVISORY BOARD (MSAB09)

Document	Title	Availability
IPHC-2017-MSAB09-01	Agenda & Schedule for the 9th Session of the IPHC Management Strategy Advisory Board (MSAB09)	✓ 7 Apr 2017 ✓ 9 May 2017
IPHC-2017-MSAB09-02	List of Documents for the 9th Session of the IPHC Management Strategy Advisory Board (MSAB09)	✓ 7 Apr 2017 ✓ 9 May 2017
IPHC-2017-MSAB09-03	Update on the actions arising from the 8th Session of the IPHC Management Strategy Advisory Board (MSAB08) (IPHC Secretariat)	✓ 29 Mar 2017
IPHC-2017-MSAB09-04	Outcomes of the 93rd Session of the IPHC Annual Meeting (AM093) (IPHC Secretariat)	✓ 7 Apr 2017
IPHC-2017-MSAB09-05	MSAB program of work and delivery schedule for 2017 (A. Hicks)	✓ 7 Apr 2017
IPHC-2017-MSAB09-06	2017 MSAB Membership (S. Keith)	✓ 22 Mar 2017
IPHC-2017-MSAB09-07	Simulations to evaluate F_{SPR} (A. Hicks)	✓ 24 Apr 2017
IPHC-2017-MSAB09-08 Rev_2	Goals, Objectives, and Performance Metrics defined by the Management Strategy Advisory Board (MSAB) (A. Hicks)	✓ 28, 30 Apr 2017 ✓ 8 May 2017
IPHC-2017-MSAB09-09	Ideas on stock and catch distribution (A. Hicks)	✓ 24 Apr 2017
Information papers		
IPHC-2017-MSAB09-INF01	MSAB08 Meeting Minutes	✓ 28 Nov 2016
IPHC-2017-MSAB09-INF02	IPHC Rules of Procedure (2017)	✓ 28 Feb 2017
IPHC-2017-MSAB09-INF03	MSAB Summary 2013-2017	✓ 7 Apr 2017
IPHC-2017-MSAB09-INF04	SharePoint Information	✓ 7 Apr 2017
IPHC-2017-MSAB09-INF05	MSE Best Practices paper	✓ 29 Mar 2017
IPHC-2017-MSAB09-INF06	MSAB09 Agenda Notes	✓ 7 Apr 2017

APPENDIX IV
MSAB MEMBERSHIP: DESIGNATIONS AND TERMS
(*As of 09 May 2017*)

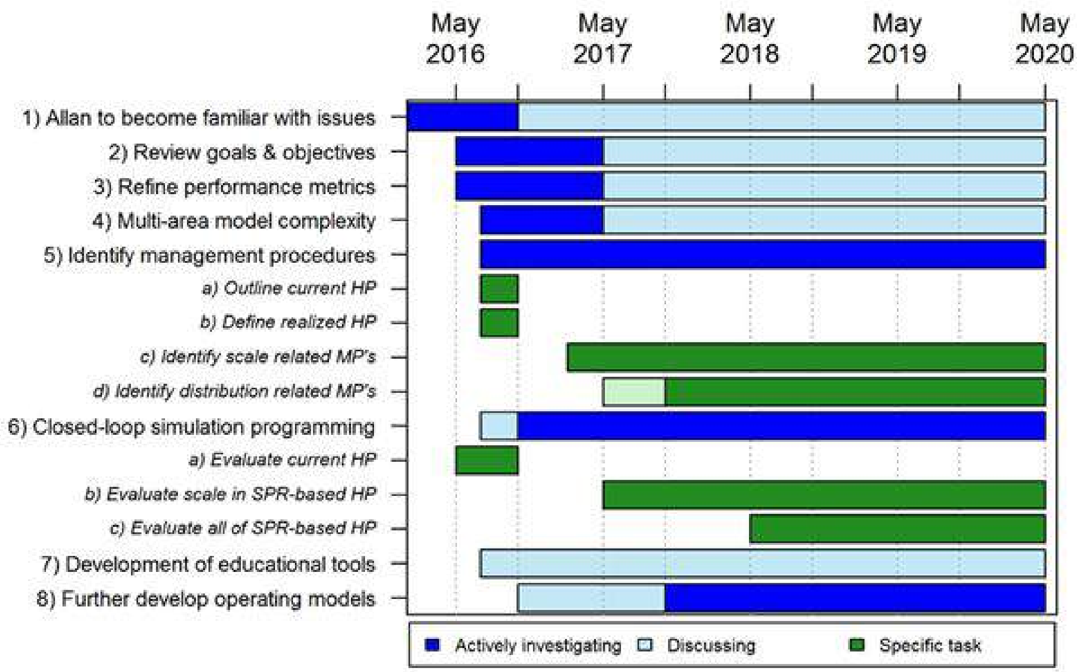
Membership category	Member	Canada	U.S.A.	Current Term commencement	Current Term expiration *	Notes
Harvesters (6-8)						
1	Gabrys, Bruce		US Commercial	9-May-17	2021	
2	Kauffman, Jeff		US Commercial	9-May-17	2019	
3	Odegaard, Per		US Commercial	9-May-17	2021	
4	Falvey, Dan		US Commercial	9-May-17	2021	
5	Sporer, Chris	CDN Commercial		9-May-17	2021	
6	Hauknes, Robert	CDN Commercial		9-May-17	2021	
7						
8						
First Nations/Tribal fisheries (2-4)						
1	Lane, Jim	CDN First Nations		9-May-17	2021	
2	Mazzone, Scott		US Treaty Tribes	9-May-17	2019	
3						
4						
Government Agencies (4-8)						
1	Keizer, Adam	DFO		9-May-17	2019	
2	Baker, Rachel		NMFS	9-May-17	2019	
3	Forrest, Robyn	CDN Science Advisor		9-May-17	2021	
4	McGilliard, Carey		US Science Advisor	9-May-17	2021	
5	Culver, Michele		PFMC	9-May-17	2021	
6	Cross, Craig		NPFMC	9-May-17	2021	
7	Meyer, Scott		ADFG	9-May-17	2021	Note 1
8						

Membership category	Member	Canada	U.S.A.	Current Term commencement	Current Term expiration *	Notes
Processors (2-4)						
1	Parker, Peggy	US/CDN Processing	US/CDN Processing	9-May-17	2019	
2	Woodruff, John		US Processing	9-May-17	2019	
3	Mirau, Brad	CDN Processing		9-May-17	2019	
4						
Recreational/Sport fisheries (2-4)						
1	Marking, Tom		US Sportfishing (CA)	9-May-17	2019	
2	Paish, Martin	CDN Sport Fishing Advisory Board		9-May-17	2021	
3						
4						

***** MSAB member terms begin and end at the start of the first MSAB meeting of the year

Note 1 Expect ADFG to propose replacement when Meyer retires

APPENDIX V
MSE PROGRAM OF WORK (2016-20): TIMELINE



APPENDIX VI
GOALS, OBJECTIVES AND PERFORMANCE METRICS

Biological Sustainability				
Measurable Objective	**Outcome**	**Time-frame**	**Probability**	**Performance Metrics**
Maintain a minimum of number of mature female halibut coast-wide	Number of mature female halibut less than a threshold	10 year period, long-term	0.01	Median average number of mature female halibut
Avoid very low stock sizes	dRSB < Limit of control rule	10 year period, long-term	0.05	$P(dRSB < Limit)$
Mostly avoid low stock sizes	dRSB < Threshold of control rule	10 year period, long-term	0.25	$P(dRSB < Threshold)$
When Limit < Estimated Biomass < Threshold, limit the probability of declines	SSB declines when 20%<RSB<30%	10 year period, long-term	0.05 – 0.5, depending on est. stock status	$P(SSB_{i+1} < SSB_i)$ given $20\% < RSB < 30\%$
Spawning Biomass	An absolute measure	10 year period, long-term	NA	Median $\overline{RSB}$

Fishery Sustainability, Stability, and Access				
Measurable Objective	**Outcome**	**Time-frame**	**Probability**	**Performance Metrics**
Maintain directed fishing opportunity	Fishery is open	Each year	0.05	$P(FCEY = 0)$
Maximize yield in each regulatory area		Each year	0.5	
Maintain median catch	Within ±10% of 1993-2012 average	Within 5 yrs, 10 yr per, long term		$P(FCEY > 110\%$ or $FCEY < 90\%$
Maintain average catch	> 70% of historical 1993-2012 average	10 year period, long-term	0.1	$P(FCEY < 70\%)$
Limit annual changes in TAC, coast-wide and/or by Regulatory Area	Change in FCEY < 15%	10 year period, long-term		$P\left(\frac{FCEY_{i+1} - FCEY_i}{FCEY_i} > 15\%\right)$
Absolute	FCEY	10 year period, long-term	NA	Median $\overline{FCEY}$
Absolute	Variability in FCEY	10 year period, long term		Average Annual Variability (AAV)

Minimize wastage				
Measurable Objective	**Outcome**	**Time-frame**	**Probability**	**Performance Metrics**
Wastage in the longline fishery	<10% of annual catch limit	10 year period, Long-term	0.25	$P(wastage > 10\% FCEY)$
Absolute	Wastage	10 year period, Long-term		Median $\overline{wastage}$

Minimize bycatch and bycatch mortality				
Measurable Objective	**Outcome**	**Time-frame**	**Probability**	**Performance Metrics**

Serve consumer needs				
Measurable Objective	**Outcome**	**Time-frame**	**Probability**	**Performance Metrics**

Preserve biocomplexity				
Measurable Objective	**Outcome**	**Time-frame**	**Probability**	**Performance Metrics**

APPENDIX VII

CONSOLIDATED SET OF RECOMMENDATIONS AND REQUESTS OF THE 9TH SESSION OF THE IPHC MANAGEMENT STRATEGY ADVISORY BOARD (MSAB09)

RECOMMENDATIONS

NOTING that the core purpose of the MSAB09 is to review progress on the MSE Program of Work, and to provide guidance for the delivery of products to the MSAB10 in October 2017, the MSAB **AGREED** that formal recommendations to the Commission would not be developed at the present meeting, but rather, these would be developed at the MSAB10.

REQUESTS

MSAB Program of Work and delivery schedule for 2017

MSAB09–Req.01 (para. 15) The MSAB **REQUESTED** that the MSE Program of Work and delivery schedule be expanded past the current 2018 timeframe, to provide a three-year outlook, thereby detailing the work to be completed and delivery times, noting that the Commission has directed the IPHC Secretariat to accelerate the process as follows:

> AM093–Rec.07 (para. 39) "*The Commission RECOMMENDED that the IPHC Management Strategy Evaluation (MSE) process be accelerated so that more of the elements contained within the current Program of Work are delivered at the 94th Annual Meeting of the Commission in 2018. The IPHC Secretariat is directed to mobilise carryover funds from "core operations" to ensure the accelerated delivery schedule.*"

Harvest strategy policy: Framework

MSAB09–Req.02 (para. 21) The MSAB **REQUESTED** that the IPHC Secretariat staff move forward by using a coastwide Operating Model with five coastwide fleets, as in the coastwide assessment models. A coastwide model lacks complexity but has utility for investigating coastwide fishing intensity.

Harvest strategy policy: Management procedures

MSAB09–Req.03 (para. 28) The MSAB **REQUESTED** that:

a) F_{SPR} be analysed as the primary metric of fishing intensityover a range of values, and that several other fishing intensity metrics described in paper IPHC-2017-MSAB09-07 be reported as performance metrics. Table 2 describes the specific Management Procedures and values in priority order that should be evaluated.

b) further evaluation of the harvest control rule described in paper IPHC-2017-MSAB09-07 be undertaken, with F_{SPR} as the object of the control rule's actions, but including a nominal amount of bycatch and personal use catch (based on realistic expectations from the fishery) when F_{SPR} is set to zero by the control rule. Table 2 describes the specific management procedures and values in priority order that should be evaluated.

c) simulation sensitivities, as described in Table 2, be evaluated for a selection of specific combinations of Management Procedures.

Table 2 Management Procedures and values, in priority order, to be used by the IPHC Secretariat staff for evaluation.

Management Procedure	**Values**
SPR	0.25 – 0.60, higher density near 46%
Control Rule	30:20, 40:20 threshold and limit, respectively
Ceiling on Total Mortality	85 Mlbs
Floor on Total Mortality	30 Mlbs
Sensitivity	**Values**
Size-at-age	High and low states
Recruitment	High and low states
Maximum bycatch	At per-area maximum regulatory bycatch
Bycatch selectivity	Shifted to a greater proportion of U26 fish
Uncertainty in total mortality	Unknown

Goals, objectives, and performance metrics

MSAB09–Req.04 (para. 33) The MSAB **REQUESTED** that performance metrics be reported for short-, medium-, and long-term timeframes. Long-term timeframes would be at least 50 to 60 years, and other timeframes will be considered in consultation with the IPHC's Scientific Review Board.

MSAB09–Req.05 (para. 35) The MSAB **REQUESTED** that the goals and objectives provided at Appendix VI be used for the IPHC Secretariat's analysis to be prepared for MSAB10, **NOTING** that, although objectives for the overarching goals concerning bycatch,consumer needs, and preserving biocomplexity have not yet been identified, those goals would be addressed at least partially by other elements of the analysis.

Deliverables for MSAB10 and for the 2018 Annual Meeting (AM094)

MSAB09–Req.06 (para. 47) The MSAB **REQUESTED** that the following items be delivered by the IPHC Secretariat staff to the MSAB10 for further consideration, prior to their delivery to the Commission at AM094:

a) Simulation results of Management Procedure evaluation including sensitivity analysis.
b) Terms and Definitions for a refined Harvest Strategy Policy.
c) Updates on the Scientific Review Board discussions/recommendations on stock distribution, biocomplexity, and performance metric timeframes.
d) Updated MSE Program of Work (2016-20).
e) Updates on other pertinent work.

Report of the 10th Session of the IPHC Management Strategy Advisory Board (MSAB10)

Seattle, Washington, U.S.A., 23-26 October 2017

DISTRIBUTION:
Participants in the Session
Members of the Commission
IPHC Secretariat

BIBLIOGRAPHIC ENTRY
IPHC 2017. Report of the 10th Session of the IPHC Management Strategy Advisory Board (MSAB10). Seattle, Washington, U.S.A., 23-26 October 2017.
IPHC–2017–MSAB10–R, 20 pp.

INTERNATIONAL PACIFIC HALIBUT COMMISSION

Contact details:

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ACRONYMS

AAV	Average Annual Variability
dRSB	dynamic Relative Spawning Biomass
FCEY	Fishery Constant Exploitation Yield
F_{SPR}	The Fishing Intensity that results in an equilibrium Spawning Potential Ratio
HCR	Harvest Control Rule
IPHC	International Pacific Halibut Commission
MSAB	Management Strategy Advisory Board
OCP	Operational Control Point
RSB	Relative Spawning Biomass
SRB	Scientific Review Board
SPR	Spawning Potential Ratio
TCEY	Total Constant Exploitation Yield
U.S.A.	United States of America

HOW TO INTERPRET TERMINOLOGY CONTAINED IN THIS REPORT

This Report has been written using the following terms and associated definitions so as to remove ambiguity surrounding how particular paragraphs should be interpreted.

Level 1: **RECOMMENDED**; **RECOMMENDATION** (formal); **REQUESTED** (informal): A conclusion for an action to be undertaken, by the Commission, a Contracting Party, a subsidiary (advisory) body of the Commission and/or the IPHC Secretariat. *Note*: Subsidiary (advisory) bodies of the Commission must have their Recommendations and Requests formally provided to the next level in the structure of the Commission for its consideration/endorsement (e.g. from an Advisory Board to the Commission). The intention is that the higher body will consider the action for endorsement under its own mandate, if the subsidiary body does not already have the required mandate. Ideally, this should be task-specific and contain a timeframe for completion.

Level 2: **AGREED**: Any point of discussion from a meeting, which the IPHC body considers to be an agreed course of action covered by its mandate, which has not already been dealt with under Level 1 above; a general point of agreement among delegations/participants of a meeting which does not need to be elevated in the Commission's reporting structure.

Level 3: **NOTED/NOTING**; **CONSIDERED**; **URGED**; **ACKNOWLEDGED**: General terms to be used for consistency. Any point of discussion from a meeting, which the IPHC body considers to be important enough to record in a meeting report for future reference. Any other term may be used to highlight to the reader of an IPHC report, the importance of the relevant paragraph. Other terms may be used but will be considered for explanatory/informational purposes only and shall have no higher rating within the reporting terminology hierarchy than Level 3.

TABLE OF CONTENTS

EXECUTIVE SUMMARY

The 10th Session of the International Pacific Halibut Commission (IPHC) Management Strategy Advisory Board (MSAB10) was held in Seattle, Washington, U.S.A. from 23 to 26 October 2017. The MSAB consists of 20 board members, 19 of which attended the Session from the two (2) Contracting Parties. A total of five (5) individuals attended the Session as Observers. In addition, two (2) IPHC Commissioners were in attendance, Mr Paul Ryall (Canada) and Mr Bob Alverson (U.S.A.). The meeting was opened by the Co-Chairpersons, Mr Adam Keizer (Canada) and Ms Rachel Baker (U.S.A.).

The following are a subset of the complete recommendations/requests for action from the MSAB10, which are provided in full at Appendix VII.

RECOMMENDATIONS

A review of the goals and objectives of the IPHC MSE process

MSAB10–Rec.01 (para. 11) The MSAB **AGREED** to further revise the goals, objectives, and performance metrics, as detailed at Appendix IV, at MSAB11, and also **RECOMMENDED** that the Commission review and provide guidance on them at the 94th Session of the Commission, thereby providing clear direction for the IPHC Secretariat and MSAB for action in 2018.

Discussion of the performance metrics reported

MSAB10–Rec.02 (para. 32) The MSAB **RECOMMENDED** that future iterations of the simulations focus on the reduced range of SPR targets (greater than 40%, less than 55%) based on preliminary interpretation of results, and that 2% intervals between SPR values is sufficient to interpret future results.

MSAB Program of Work 2018-22

MSAB10–Rec.03 (para. 41) The MSAB **RECOMMENDED** the updated Program of Work provided at Appendix VI, for the Commission's further consideration.

REQUESTS

Performance metrics for evaluation

MSAB10–Req.01 (para. 15) The MSAB **REQUESTED** that the IPHC Secretariat link the goals and objectives to each reported performance metric and provide a summary of key performance metrics over the range of Management Procedures evaluated for presentation to the Commission at the 93rd Interim Meeting and the 94th Annual Meeting.

Simulations to evaluate fishing intensity: A review of variability and scenarios

MSAB10–Req.02 (para. 21) **NOTING** the current simulated bycatch mortality probability distribution is unrelated to the total mortality in the operating model, the MSAB **REQUESTED** the IPHC Secretariat to consider alternative methods to simulate bycatch mortality at various Pacific halibut abundances.

1. Opening of the Session

1. The 10th Session of the International Pacific Halibut Commission (IPHC) Management Strategy Advisory Board (MSAB10) was held in Seattle, Washington, U.S.A. from 23 to 26 October 2017. The MSAB consists of 20 board members, 19 of which attended the Session from the two (2) Contracting Parties. A total of five (5) individuals attended the Session as Observers. In addition, two (2) IPHC Commissioners were in attendance, Mr Paul Ryall (Canada) and Mr Bob Alverson (U.S.A.). The list of participants is provided at Appendix I. The meeting was opened by the Co-Chairpersons, Mr Adam Keizer (Canada) and Ms Rachel Baker (U.S.A.).
2. The MSAB **NOTED** apologies received from the following board members: Mr Jim Lane (Canadian First Nations representative).

2. Adoption of the Agenda and Arrangements for the Session

3. The MSAB **ADOPTED** the Agenda as provided at Appendix II. The documents provided to the MSAB10 are listed at Appendix III.

3. IPHC process

3.1 MSAB membership

4. The MSAB **NOTED** paper IPHC-2017-MSAB10-03 which provided the current membership list and term expirations.

3.2 Outcomes of the 93rd Session of the IPHC Annual Meeting (AM093)

5. The MSAB **NOTED** paper IPHC-2017-MSAB10-04 which outlined the main outcomes of the 93rd Session of the Commission, specifically related to the MSAB, and **AGREED** to consider how best to provide the Commission with the information it has requested, throughout the course of the current MSAB meeting.

3.3 Outcomes of the 10th Session of the IPHC Scientific Review Board (SRB10)

6. The MSAB **NOTED** paper IPHC-2017-MSAB10-06, which provided the results of the 11th Session of the IPHC Scientific Review Board (SB11) relevant to the mandate of the MSAB, which included the following recommendations and requests:

   SRB11–Rec.02 (para. 25) The SRB RECOMMENDED that the IPHC Secretariat and Management Strategy Advisory Board collaborate to:

   a) further clarify and improve the presentation of the Harvest Strategy Policy (Appendix IV). This would improve not only transparency of the existing interim harvest policy, but also of the MSE process for evaluating alternatives.

   b) Review harvest policies from other bodies to develop an objectives hierarchy that explicitly prioritizes long-term conservation over short-/medium-term (e.g., 3-8 years) catch performance.

   SRB11–Rec.03 (para. 29) The SRB RECOMMENDED that the IPHC Secretariat hire a modeller/programmer to support MSE work so that timely feedback can be given the MSAB in the MSE process.

   SRB11–Req.06 (para. 27) The SRB REQUESTED that a quasi-extinction threshold be established so that:

   a) simulation replicates can be flagged when projected spawning biomass drops below this threshold;

   b) parameter sets causing quasi-extinction in the historical period can be dropped from the operating model initialization.

4. SIZE LIMIT ANALYSIS FOR 2017: UPDATE

7. The MSAB **NOTED** paper IPHC-2017-MSAB10-07, which provided an evaluation of the current 32" (81.3 cm) Minimum Size Limit (MSL) in the directed commercial Pacific halibut fishery, and described likely changes to the Pacific halibut fishery under alternative minimum size limits.
8. The MSAB **AGREED** that further evaluation of MSLs within the MSE framework will divert resources from the current MSE Program of Work and thus, should not be incorporated at this time. Spatial modelling is considered by the MSAB to be a higher priority. The consequences of an MSL change include biological and operational uncertainties that cannot be assessed with available information. Determination and distribution of yield at various MSLs, and the value of the fishery as a result of changes in the MSL are examples of these uncertainties that cannot be assessed.
9. The MSAB **NOTED** that if a stakeholder group came forward with a specific adaptive management proposal on MSLs, it should be submitted for consideration at a future IPHC Annual Meeting.

5. GOALS, OBJECTIVES, AND PERFORMANCE METRICS

5.1 A review of the goals and objectives of the IPHC MSE process

10. The MSAB **NOTED** paper IPHC-2017-MSAB10-08 which provided a review of the goals and objectives.
11. The MSAB **AGREED** to further revise the goals, objectives, and performance metrics, as detailed at Appendix IV, at MSAB11, and also **RECOMMENDED** that the Commission review and provide guidance on them at the 94th Session of the Commission, thereby providing clear direction for the IPHC Secretariat and MSAB for action in 2018.

5.2 Performance metrics for evaluation

12. The MSAB **NOTED** that the goal of the simulations is to produce metrics for multiple Management Procedures, which can be evaluated against the objectives defined by the MSAB. A table is a common way to display these metrics, but figures may be useful to evaluate trade-offs between objectives.
13. The MSAB **CONSIDERED** options to report the performance metrics and results from the simulations considered in paper IPHC-2017-MSAB10-09.
14. The MSAB **AGREED** that both tables and plots are preferred, while keeping the number of options presented to a more plausible range to effectively evaluate the trade-offs. Preferred performance metrics include those related to conservation (e.g. dynamic Relative Spawning Biomass, dRSB), fishery yield (e.g. median FCEY and total mortality), and fishery yield stability (e.g. FCEY Average Annual Variability, AAV).
15. The MSAB **REQUESTED** that the IPHC Secretariat link the goals and objectives to each reported performance metric and provide a summary of key performance metrics over the range of Management Procedures evaluated for presentation to the Commission at the 93rd Interim Meeting and the 94th Annual Meeting.
16. The MSAB **AGREED** on the importance of metrics that are meaningful to stakeholders. For example, performance metrics that report minimum number of mature females or a dRSB-based threshold.
17. The MSAB **URGED** that the reported performance metrics be categorized into metrics that (1) directly evaluate procedures against objectives (e.g. dRSB, AAV), and (2) that are useful for interpreting the behaviour of a procedure (e.g. time spent on the ramp of a harvest control rule).
18. The MSAB **URGED** that the performance metric associated with an objective is consistent with how the objective is stated.

6. HARVEST STRATEGY POLICY, PART 1: SIMULATIONS TO EVALUATE FISHING INTENSITY

19. The MSAB **NOTED** paper IPHC-2017-MSAB10-09 Rev_1 which provided an overview of the simulation framework to evaluate the fishing intensity and harvest control rules in the IPHC harvest strategy policy.

6.1 A description of the closed-loop simulation framework

Incorporated below

6.2 A review of variability and scenarios

20. The MSAB **CONSIDERED** the simulation framework and assumptions as described, sources of uncertainty and variability in the Operating Model, including weight-at-age and an environmental regime, and distribution of the Total Mortality to sectors.
21. **NOTING** the current simulated bycatch mortality probability distribution is unrelated to the total mortality in the operating model, the MSAB **REQUESTED** the IPHC Secretariat to consider alternative methods to simulate bycatch mortality at various Pacific halibut abundances.
22. The MSAB **AGREED** that additions to the simulation framework are required. These include adding variability to the simulated selectivities for all sectors (e.g. changes in selectivity of bycatch due to future management changes), incorporating time-varying maturity-at-age, improvements to simulating weight-at-age, using an estimation model to introduce estimation error (and data generation with error if necessary), and incorporate implementation variability in the simulations. The MSAB **REQUESTED** that these modifications be added to the simulation framework and assumptions.

6.3 Management Procedures related to fishing intensity

23. The MSAB **CONSIDERED** different combinations of elements in various management procedures which included values of SPR ranging from 25% to 60% and also including 100%, operational control points (OCPs) of the reduction of fishing intensity equal to 40:20 and 30:20, a maximum total mortality of 85 M lbs, and a minimum total mortality of 30 M lbs.
24. **NOTING** the need to prioritize conservation, yield, and stability objectives, the MSAB **AGREED** that SPR targets less than 40% and greater than 55% are inconsistent with the current objectives of maintaining the stock above 0.3dRSB and stability in FCEY.
25. The MSAB **AGREED** that the simulation model currently does not simulate potential estimation model error and thus portrays the most optimistic outcome (low risk and low variability). Although the results from these simulations are useful to identify management procedures that do not perform well, the results do not incorporate the feedback from an assessment model and its prediction error, which will result in additional asymmetric variability that will likely result in more precautionary choices to meet objectives.

6.4 Closed-loop simulations results

26. The MSAB **CONSIDERED** the long-term results looking at the outcomes of various management procedures and the trade-offs between them.
27. The MSAB **NOTED** the IPHC Secretariat definitions with regards to the meanings and implications of simulated model results/projections:
    a) **Short-term: Population projections of 1-11 years from the point of stock recruitment.** This period is defined by the interaction of the maturity schedule and the availability of data. The information from the IPHC's fishery-independent setline survey lags recruitment by roughly seven years, due to the need for replicate observations of a year class and the fact that Pacific halibut are first observed between 5 and 6 years old. Pacific halibut are 50% mature between 11 and 12 years old. Therefore, to avoid introducing important dynamics created largely by yet unobserved ("electronic") fish in the projections, a maximum of four years (one for the current year, and three future years) are projected in the short term.
    b) **Medium-term projections: Population projections of 12-50 years from the point of stock recruitment.** The medium term represents a period over which initial conditions remain important (unlike the long-term or equilibrium), but are insufficient to provide precision to the projections. This period therefore relies mainly on model/process assumptions for which predictive skill is low to nonexistent. Therefore, this period should be considered of much lower value for decision making purposes.

c) **Long-term projections: Population projections of 50+ years from the point of stock recruitment.** Long-term results represent equilibrium conditions resulting from harvesting consistently using the define management procedure. The period of time needed to simulate to achieve equilibrium depends on the biology of the stock and the periodicity of environmental factors that it responds to. The current closed-loop simulations suggest that a period slightly longer than 100 years is necessary to remove the effects of variable weight-at-age and recruitment regimes.

28. The MSAB **NOTED** that potential time periods of stakeholder interest for evaluation include very short- (1-3 from current year, similar to short in para. 27), short- (3-10 from current year), medium- (11-20 from current year), and long-term (equilibrium, similar to long-term in para. 27).

29. **CONSIDERING** the need to determine appropriate methods for producing and reporting short-term, medium-term, and long-term results, the MSAB **REQUESTED** the IPHC Secretariat to review literature of past MSEs with regard to principles to help define appropriate time periods, consider the development of informative methods, and communicate any concerns at the MSAB11 meeting.

30. The MSAB **AGREED** that recent realized SPRs are within the range of target SPRs described in para. 24, and **REQUESTED** that the management procedures described in MSAB09-R should continue to be evaluated under the revised simulation framework.

31. **CONSIDERING** the effect that operational control points (OCPs) have on the conservation, yield, and stability objectives, the MSAB **REQUESTED** that in addition to 30:20 and 40:20, additional OCPs should be evaluated as determined at subsequent meetings.

7. Evaluating the management procedures

7.1 Discussion of the performance metrics reported

32. The MSAB **RECOMMENDED** that future iterations of the simulations focus on the reduced range of SPR targets (greater than 40%, less than 55%) based on preliminary interpretation of results, and that 2% intervals between SPR values is sufficient to interpret future results.

7.2 Discussion of the results and trade-offs

33. **NOTING** that clear and consistent communication with stakeholders and managers is necessary, the MSAB **AGREED** that the IPHC Secretariat should undertake a review of communication material to be prepared by MSAB members.

7.3 Recommendations to bring to 2018 Annual Meeting (AM094)

Incorporated throughout

8. Harvest strategy policy, Part 2: Addressing stock and total constant exploitation yield (TCEY) distribution

34. The MSAB **NOTED** paper IPHC-2017-MSAB10-10 which provided an update on discussions and ideas related to science inputs and management procedures for distributing the TCEY across the IPHC Convention Area, and describes a harvest strategy policy that includes distributing the TCEY and addresses the task assigned to the IPHC Secretariat and the MSAB at the 2017 Annual Meeting (AM093) to initiate a process to develop alternative, biologically based stock distribution strategies for consideration by the Commission and its subsidiary bodies.

35. The MSAB **CONSIDERED** the proposal for stock distribution to operate on the Regions defined in paper IPHC-2017-MSAB10-10.

36. The MSAB **CONSIDERED** if the TCEY distribution framework could potentially meet a goal of preserving biocomplexity, and **AGREED** that biocomplexity must be defined and objectives be developed to evaluate this goal.

8.1 Review procedures to distribute the TCEY among IPHC Regulatory Areas

37. **NOTING** the order of operations in the proposed TCEY distribution procedure, the MSAB **AGREED** that the order of stock distribution and TCEY distribution procedures is a management choice that could be evaluated.
38. The MSAB **NOTED** that the order of operations in the proposed TCEY distribution procedure will be subject to review at future MSAB meetings and that the specific components require further definition.
39. The MSAB **AGREED** that the output of the TCEY distribution procedure should be a catch table describing mortality in each IPHC Regulatory Area (Appendix V).

8.2 Recommendations to bring to the 2018 Annual Meeting (AM094)

Incorporated throughout

9. MSAB PROGRAM OF WORK 2018-22

40. The MSAB **NOTED** paper IPHC-2017-MSAB10-11 which provided an update on the 5-year MSE Program of Work (2018-22), given current Commission directives.
41. The MSAB **RECOMMENDED** the updated Program of Work provided at Appendix VI, for the Commission's further consideration.

10. OTHER BUSINESS

10.1 IPHC meetings calendar (2018-20): MSAB

42. **NOTING** the annual IPHC meetings calendar (2017-19) adopted by the Commission at its 93rd Session in 2017, and the revised MSE Program of Work discussed during the current meeting, the MSAB **AGREED** that moving forward, the MSAB meetings should move to a three (3) to four (4) day format, dependent on content.
43. The MSAB **AGREED** that MSAB11 should take place from 7-10 May 2018, and the MSAB12 take place from 22-25 October 2018, and **REQUESTED** that the IPHC Secretariat include these dates in the IPHC meetings calendar for the Commissions consideration

10.2 Steering Committee

44. The MSAB **RECALLED** that the members of the MSAB Steering Committee are as follows, and that their terms shall expire at the close of the 13th Session of the MSAB in 2019:

Canada	United States of America
Mr Adam Keizer	Ms Rachel Baker
Mr Jim Lane	Ms Michele Culver
Mr Chris Sporer	Ms Peggy Parker

11. REVIEW OF THE DRAFT AND ADOPTION OF THE REPORT OF THE 10TH SESSION OF THE IPHC MANAGEMENT STRATEGY ADVISORY BOARD (MSAB10)

45. The report of the 10th Session of the IPHC Management Strategy Advisory Board (IPHC-2017-MSAB10–R) was **ADOPTED** on 26 October 2017, including the consolidated set of recommendations and/or requests arising from MSAB09, provided at Appendix VII.

APPENDIX I
LIST OF PARTICIPANTS FOR THE 10TH SESSION OF THE IPHC MANAGEMENT STRATEGY ADVISORY BOARD (MSAB10)

Officers

Co-Chairperson (Canada)	**Co-Chairperson (United States of America)**
Mr Adam **Keizer**: adam.keizer@dfo-mpo.gc.ca	Ms Rachel Baker: rachel.baker@noaa.gov

MSAB Members

Canada	**United States of America**
Mr Robert **Hauknes**: robert_hauknes@hotmail.com	Ms Rachel **Baker**: rachel.baker@noaa.gov
Mr Allen (Rob) **Kronlund**: Allen.Kronlund@dfo-mpo.gc.ca	Mr Craig **Cross**: craigc@starboats.com
Mr Adam **Keizer**: adam.keizer@dfo-mpo.gc.ca	Ms Michele **Culver**: Michele.Culver@dfw.wa.gov
Mr Brad **Mirau**: brad@aerotrading.ca	Mr Dan **Falvey**: myriadfisheries@gmail.com
Mr Martin **Paish**: martinpaish1@gmail.com	Mr Bruce **Gabrys**: gabryscpa@mtaonline.net
Mr Chris **Sporer**: chris.sporer@phma.ca	Mr Jeff **Kauffman**: jeff@spfishco.com
	Mr Tom **Marking**: tmmarking@gmail.com
	Mr Scott **Mazzone**: smazzone@quinault.org
	Dr Carey **McGilliard**:Carey.McGilliard@noaa.gov
	Mr Scott **Meyer**: scott.meyer@alaska.gov
	Mr Per **Odegaard**: vanseeodegaard@hotmail.com
	Ms Peggy **Parker**: peggyparker616@gmail.com
	Mr John **Woodruff**: johnw@icicleseafoods.com
Absentees	**Absentees**
Mr Jim **Lane**: jim.lane@nuuchahnulth.org	

Commissioners

Canada	**United States of America**
Mr Paul **Ryall**: Paul.Ryall@dfo-mpo.gc.ca	Mr Robert **Alverson**: roberta@fvoa.org

Observers

Canada	**United States of America**
Dr. Jaclyn **Cleary**, DFO	Ms. Caitlin **Allen-Akselrud**, UW
Mr. Roger **Kanno**, DFO	Ms Ruth **Christiansen**, United Catcher Boats
	Mr Jim **Hasbrouck**, ADFG

IPHC Secretariat

Name	**Position and email**
Dr David **Wilson**	Executive Director, david@iphc.int
Mr Stephen **Keith**	Assistant Director, steve@iphc.int
Dr Allan **Hicks**	Quantitative Scientist, allan@iphc.int
Dr Ian **Stewart**	Quantitative Scientist, ian@iphc.int

APPENDIX II
AGENDA FOR THE 10TH SESSION OF THE IPHC MANAGEMENT STRATEGY ADVISORY BOARD (MSAB10)

Date: 23–26 October 2017
Location: Seattle, Washington, U.S.A.
Venue: IPHC Training Room, Salmon Bay
Time: 23rd: 12:00-17:00; 24th-26th: 09:00-17:00 daily
Co-Chairpersons: Mr Adam Keizer (Canada) and Ms Rachel Baker (U.S.A.)

1. OPENING OF THE SESSION

2. ADOPTION OF THE AGENGA AND ARRANGEMENTS FOR THE SESSION

3. IPHC PROCESS
- 3.1. MSAB membership
- 3.2. Outcomes of the 93rd Session of the IPHC Annual Meeting (AM093)
- 3.3. Update on the actions arising from the 9th Session of the MSAB (MSAB09)
- 3.4. Outcomes of the 10th Session of the Scientific Review Board (SRB10)

4. SIZE LIMIT ANALYSIS FOR 2017: Update

5. GOALS, OBJECTIVES, AND PERFORMANCE METRICS
- 5.1. A review of the goals and objectives of the IPHC MSE process
- 5.2. Performance metrics for evaluation

6. HARVEST STRATEGY POLICY, PART 1: SIMULATIONS TO EVALUATE FISHING INTENSITY
- 6.1. A description of the closed-loop simulation framework
- 6.2. A review of variability and scenarios
- 6.3. Management procedures related to fishing intensity
- 6.4. Closed-loop simulations results

7. EVALUATING THE MANAGEMENT PROCEDURES
- 7.1. Discussion of the performance metrics reported
- 7.2. Discussion of the results and trade-offs
- 7.3. Recommendations to bring to 2018 Annual Meeting (AM094)

8. HARVEST STRATEGY POLICY, PART 2: ADDRESSING STOCK AND TOTAL CONSTANT EXPLOITATION YIELD (TCEY) DISTRIBUTION
- 8.1. Review procedures to distribute the TCEY among IPHC Regulatory Areas
- 8.2. Recommendations to bring to the 2018 Annual Meeting (AM094)

9. MSAB PROGRAM OF WORK 2018-22
- 9.1. Priorities for 2018
- 9.2. Priorities for 2019-22

10. OTHER BUSINESS
- 10.1. IPHC meetings calendar (2017-19): MSAB

11. REVIEW OF THE DRAFT AND ADOPTION OF THE REPORT OF THE 10th SESSION OF THE IPHC MANAGEMENT STRATEGY ADVISORY BOARD (MSAB10)

APPENDIX III
LIST OF DOCUMENTS FOR THE 10TH SESSION OF THE MANAGEMENT STRATEGY ADVISORY BOARD (MSAB10)

Document	Title	Availability
IPHC-2017-MSAB10-01	Agenda & Schedule for the 10th Session of the IPHC Management Strategy Advisory Board (MSAB10)	✓ 24 July 2017 ✓ 23 Oct 2017
IPHC-2017-MSAB10-02	List of Documents for the 10th Session of the IPHC Management Strategy Advisory Board (MSAB10)	✓ 24 July 2017 ✓ 23 Oct 2017
IPHC-2017-MSAB10-03	2017 MSAB Membership: Update (IPHC Secretariat)	✓ 14 Sept 2017
IPHC-2017-MSAB10-04	Outcomes of the 93rd Session of the IPHC Annual Meeting (AM093) (IPHC Secretariat)	✓ 24 Sept 2017
IPHC-2017-MSAB10-05	Withdrawn	Withdrawn
IPHC-2017-MSAB10-06	Outcomes of the 11th Session of the IPHC Scientific Review Board (SRB11) (IPHC Secretariat)	✓ 10 Oct 2017
IPHC-2017-MSAB10-07	Evaluation of the IPHC's 32" minimum size limit (I. Stewart & A. Hicks)	✓ 24 Sept 2017
IPHC-2017-MSAB10-08	Goals, Objectives, and Performance Metrics for the IPHC Management Strategy Evaluation (MSE) (A. Hicks)	✓ 24 Sept 2017
IPHC-2017-MSAB10-09 Rev_1	Simulations to Evaluate Fishing Intensity (A. Hicks)	✓ 10 Oct 2017 ✓17 Octo 2017
IPHC-2017-MSAB10-10	Ideas on estimating stock distribution and distributing catch for Pacific halibut fisheries (A. Hicks & I. Stewart)	✓ 24 Sept 2017
IPHC-2017-MSAB10-11	MSAB Program of Work for MSAB related activities 2018-22 (A. Hicks)	✓ 24 Sept 2017
Information papers		
IPHC-2017-MSAB10-INF01	MSAB10 Agenda notes	✓ 19 Oct 2017

APPENDIX IV
MEASURABLE OBJECTIVES AND ASSOCIATED PERFORMANCE METRICS

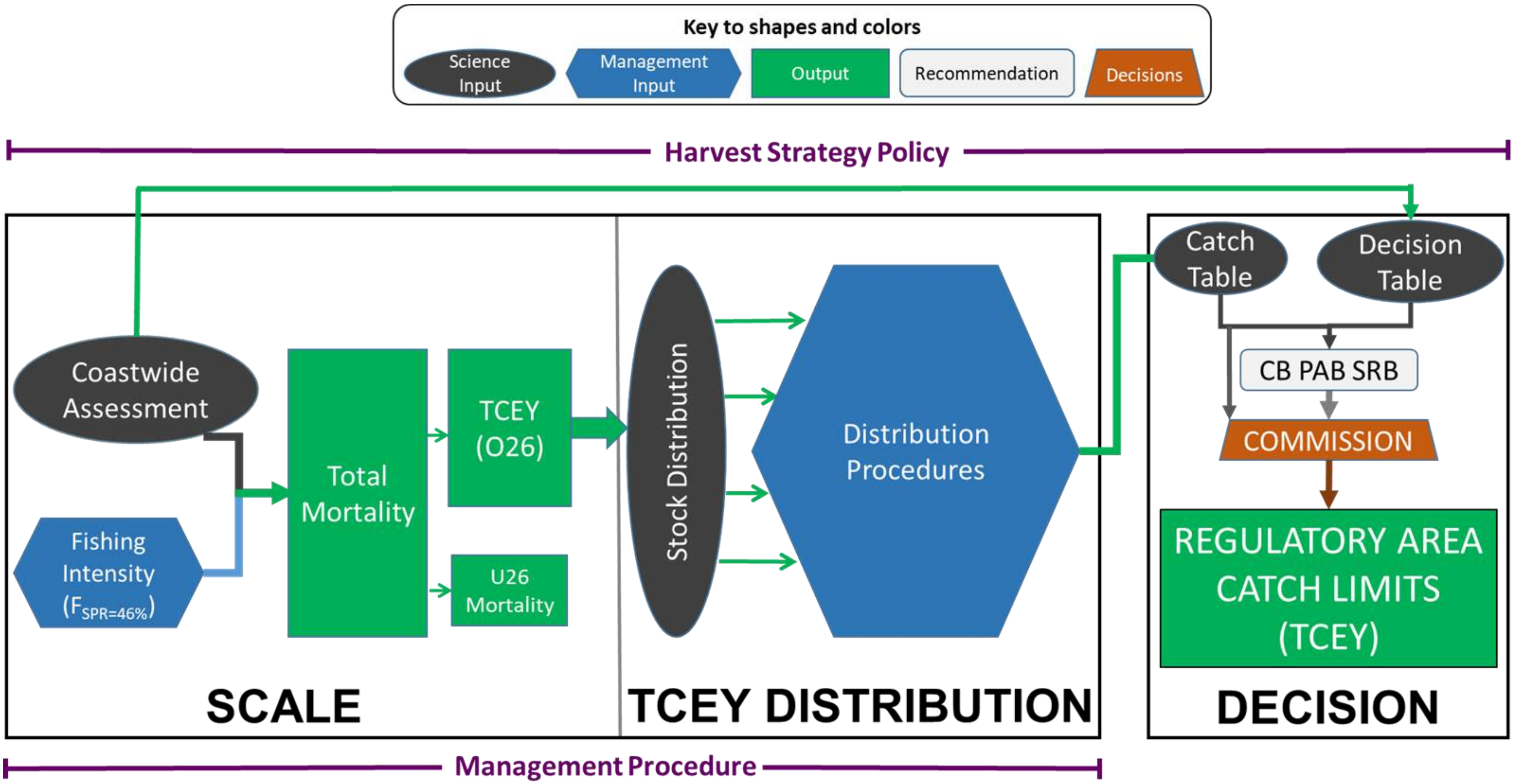
Biological Sustainability				
Measurable Objective	**Outcome**	**Time-frame**	**Probability**	**Performance Metrics**
Maintain a minimum of number of mature female halibut coast-wide	Number of mature female halibut less than a threshold	10 year period, long-term	0.01	Median average number of mature female halibut
Avoid very low stock sizes	dRSB < Limit of control rule	10 year period, long-term	0.05	$P(dRSB < Limit)$
Mostly avoid low stock sizes	dRSB < Threshold of control rule	10 year period, long-term	0.25	$P(dRSB < Threshold)$
When Limit < Estimated Biomass < Threshold, limit the probability of declines	SSB declines when 20%<RSB<30%	10 year period, long-term	0.05 – 0.5, depending on est. stock status	$P(SSB_{i+1} < SSB_i)$ given $20\% < RSB < 30\%$
Spawning Biomass	An absolute measure	10 year period, long-term	NA	Median $\overline{RSB}$

Fishery Sustainability, Stability, and Access				
Measurable Objective	**Outcome**	**Time-frame**	**Probability**	**Performance Metrics**
Maintain directed fishing opportunity	Fishery is open	Each year	0.05	$P(FCEY = 0)$
Maximize yield in each regulatory area		Each year	0.5	
Maintain median catch	Within ±10% of 1993-2012 average	Within 5 yrs, 10 yr per, long term		$P(FCEY > 110\%$ or $FCEY < 90\%$
Maintain average catch	> 70% of historical 1993-2012 average	10 year period, long-term	0.1	$P(FCEY < 70\%)$
Limit annual changes in TAC, coast-wide and/or by Regulatory Area	Change in FCEY < 15%	10 year period, long-term		$P\left(\frac{FCEY_{i+1} - FCEY_i}{FCEY_i} > 15\%\right)$
Absolute	FCEY	10 year period, long-term	NA	Median $\overline{FCEY}$
Absolute	Variability in FCEY	10 year period, long term		Average Annual Variability (AAV)

Minimize wastage				
Measurable Objective	**Outcome**	**Time-frame**	**Probability**	**Performance Metrics**
Wastage in the longline fishery	<10% of annual catch limit	10 year period, Long-term	0.25	$P(wastage > 10\%FCEY)$

Absolute	Wastage	10 year period, Long-term		Median $\overline{wastage}$
Minimize bycatch and bycatch mortality				
Measurable Objective	**Outcome**	**Time-frame**	**Probability**	**Performance Metrics**
Serve consumer needs				
Measurable Objective	**Outcome**	**Time-frame**	**Probability**	**Performance Metrics**
Preserve biocomplexity				
Measurable Objective	**Outcome**	**Time-frame**	**Probability**	**Performance Metrics**

APPENDIX V
REVISED: HARVEST STRATEGY POLICY PROCESS



APPENDIX VI
MSE PROGRAM OF WORK (2018-22): TIMELINE

May 2018 Meeting
Review Goals
Look at results of SPR
Review Performance Metrics
Identify Scale MP's
Review Framework
Identify Preliminary Distribution MP's
October 2018 Meeting
Review Goals
Complete results of SPR
Review Performance Metrics
Identify Scale MP'S
Verify Framework
Identify Distribution MP's
Annual Meeting 2019
Recommendation on Scale Present possible distribution MP’s
May 2019 Meeting
Review Goals
Spatial Model Complexity
Identify MP's (Distn Scale)
Review Framework
October 2019 Meeting
Review Goals
Spatial Model Complexity
Identify MP's (Distn Scale)
Review Framework
Review multi-area model development
Annual Meeting 2020
Update on progress
May 2020 Meeting
Review Goals
Review multi-area model
Review preliminary results
October 2020 Meeting
Review Goals
Review preliminary results
Annual Meeting 2021
Recommendations on Scale and Distribution

APPENDIX VII

CONSOLIDATED SET OF RECOMMENDATIONS AND REQUESTS OF THE 10TH SESSION OF THE IPHC MANAGEMENT STRATEGY ADVISORY BOARD (MSAB10)

RECOMMENDATIONS

A review of the goals and objectives of the IPHC MSE process

MSAB10–Rec.01 (para. 11) The MSAB **AGREED** to further revise the goals, objectives, and performance metrics, as detailed at Appendix IV, at MSAB11, and also **RECOMMENDED** that the Commission review and provide guidance on them at the 94th Session of the Commission, thereby providing clear direction for the IPHC Secretariat and MSAB for action in 2018.

Discussion of the performance metrics reported

MSAB10–Rec.02 (para. 32) The MSAB **RECOMMENDED** that future iterations of the simulations focus on the reduced range of SPR targets (greater than 40%, less than 55%) based on preliminary interpretation of results, and that 2% intervals between SPR values is sufficient to interpret future results.

MSAB Program of Work 2018-22

MSAB10–Rec.03 (para. 41) The MSAB **RECOMMENDED** the updated Program of Work provided at Appendix VI, for the Commission's further consideration.

REQUESTS

Performance metrics for evaluation

MSAB10–Req.01 (para. 15) The MSAB **REQUESTED** that the IPHC Secretariat link the goals and objectives to each reported performance metric and provide a summary of key performance metrics over the range of Management Procedures evaluated for presentation to the Commission at the 93rd Interim Meeting and the 94th Annual Meeting.

Simulations to evaluate fishing intensity: A review of variability and scenarios

MSAB10–Req.02 (para. 21) **NOTING** the current simulated bycatch mortality probability distribution is unrelated to the total mortality in the operating model, the MSAB **REQUESTED** the IPHC Secretariat to consider alternative methods to simulate bycatch mortality at various Pacific halibut abundances.

MSAB10–Req.03 (para. 22) The MSAB **AGREED** that additions to the simulation framework are required. These include adding variability to the simulated selectivities for all sectors (e.g. changes in selectivity of bycatch due to future management changes), incorporating time-varying maturity-at-age, improvements to simulating weight-at-age, using an estimation model to introduce estimation error (and data generation with error if necessary), and incorporate implementation variability in the simulations. The MSAB **REQUESTED** that these modifications be added to the simulation framework and assumptions.

Closed-loop simulations results

MSAB10–Req.04 (para. 29) **CONSIDERING** the need to determine appropriate methods for producing and reporting short-term, medium-term, and long-term results, the MSAB **REQUESTED** the IPHC Secretariat to review literature of past MSEs with regard to principles to help define appropriate time periods, consider the development of informative methods, and communicate any concerns at the MSAB11 meeting.

MSAB10–Req.05 (para. 30) The MSAB **AGREED** that recent realized SPRs are within the range of target SPRs described in para. 24, and **REQUESTED** that the management procedures described in MSAB09-R should continue to be evaluated under the revised simulation framework.

MSAB10–Req.06 (para. 31) **CONSIDERING** the effect that operational control points (OCPs) have on the conservation, yield, and stability objectives, the MSAB **REQUESTED** that in addition to 30:20 and 40:20, additional OCPs should be evaluated as determined at subsequent meetings.

IPHC meetings calendar (2018-20): MSAB

MSAB10–Req.07 (para. 43) The MSAB **AGREED** that MSAB11 should take place from 7-10 May 2018, and the MSAB12 take place from 22-25 October 2018, and **REQUESTED** that the IPHC Secretariat include these dates in the IPHC meetings calendar for the Commissions consideration.

INTERNATIONAL PACIFIC HALIBUT COMMISSION

IPHC-2018-PAB023-01

DRAFT: AGENDA FOR THE 23rd SESSION OF THE IPHC PROCESSOR ADVISORY BOARD (PAB023)

Date: 23–24 January 2018
Location: Portland, Oregon, U.S.A.
Venue: Grand Ballroom II, Hilton Portland & Executive Tower
Time: 23nd: 13:30-17:00; 24th: 09:00-17:00
Chairperson: Vacant (United States of America)
Vice-Chairperson: Vacant (Canada)

Note: *All sessions are open to observers and the general public.*

1. OPENING OF THE SESSION

2. ADOPTION OF THE AGENDA AND ARRANGEMENTS FOR THE SESSION

3. FISHING PERIODS: SEASON OPENING AND CLOSING DATES

4. CATCH LIMITS

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8. REVIEW OF THE DRAFT AND ADOPTION OF THE REPORT OF THE 23rd SESSION OF THE IPHC PROCESSOR ADVISORY BOARD (PAB023)

INTERNATIONAL PACIFIC HALIBUT COMMISSION

DRAFT: ANNOTATED AGENDA FOR THE 23rd SESSION OF THE IPHC PROCESSOR ADVISORY BOARD (PAB023)

Date: 23–24 January 2018
Location: Portland, Oregon, U.S.A.
Venue: Grand Ballroom II, Hilton Portland & Executive Tower
Time: 23nd: 13:30-17:00; 24th: 09:00-17:00
Chairperson: Vacant (United States of America)
Vice-Chairperson: Vacant (Canada)

***Note:** All sessions are open to observers and the general public.*

Tuesday, 23 January 2018 *SESSION I: 13:30 - 17:00*

1. OPENING OF THE SESSION

- *In accordance with the IPHC Rules of Procedure (2017), the PAB's annual meeting shall be convened by the President of HANA for the purpose of nominating and electing the PAB Chairperson and Vice-Chairperson. Once nominations are made, the election is confirmed by a simple majority vote of PAB members present.*
- *Voice Roll Call and Introductions*

2. ADOPTION OF THE AGENDA AND ARRANGEMENTS FOR THE SESSION

- *Additional presentations or clarifications may be asked of the IPHC Secretariat staff during discussion of agenda topics.*
- *Topics may be discussed and action taken in an order that is different from the agenda if agreed to by consensus of members present.*

3. FISHING PERIODS: SEASON OPENING AND CLOSING DATES

- *Proposal A2 (IPHC-2018-AM094-PropA2): Set permanent opening date of Noon local time, March 15 and permanent closing date of Noon local time, November 1. Full proposal is at http://iphc.int/uploads/pdf/am/2018am/iphc-2018-am094-propa2.pdf*

4. CATCH LIMITS

- *The values are the projected mortality for 2018 based on the Reference SPR of 46%, in millions of net pounds. These values are IPHC Secretariat referenced catch limits based on current management policy. Table 3 is on page 5 of the Preliminary Catch Table document found here: http://iphc.int/uploads/pdf/am/2018am/iphc-2018-am094-11.pdf [**NOTE**: Will be updated on 10/11 January 2018 with latest data]*

Wednesday, 24 January 2018 *SESSION II: 09:00 - 12:00*
SESSION III: 13:00 - 17:00

Continue discussion and Take Action on Agenda Items 3 and 4 as needed.

5. REGULATORY PROPOSALS FOR 2018

1. IPHC Secretariat regulatory proposals

- *Proposal A1 (IPHC-2018-AM094-PropA1): IPHC Closed Area (Bristol Bay) – I recommend reading this excellent history of the Nursery Area in the Bristol Bay, reasons for keeping it closed to directed fishing, and how all other gears eventually were allowed to fish -- including trawls, the most effective gear for removing juveniles -- throughout the area. It is here: http://iphc.int/uploads/pdf/am/2018am/iphc-2018-am094-propa1.pdf*

  To cut to the chase, the IPHC has recommended three options (from page 4 in the document) for the Commission to consider, noting that Option 2 has been indicated as their preferred approach:

  OPTION 1: Remove the IPHC Closed Area via a phased approach in concert with NPFMC and NMFS.

  OPTION 2: Agree that the Closed Area is not currently meeting its intended objective of protecting juvenile Pacific halibut, and direct the IPHC Secretariat to examine alternative management regimes for the Closed Area, and for these to be presented at the 95th Annual Meeting in 2019.

  OPTION 3: Retain the IPHC Closed Area and request that the NPFMC consider also closing the area to trawl fisheries in order to protect juvenile Pacific halibut.

- *Proposal A2 (IPHC-2018-AM094-PropA2): To establish permanent fishing periods for the commercial Pacific halibut fishery. Read more here: http://iphc.int/uploads/pdf/am/2018am/iphc-2018-am094-propa2.pdf*

- *Proposal A3 (IPHC-2018-AM094-PropA3): VMS requirement for IPHC Regulatory Area 4 clearances. Read more: http://iphc.int/uploads/pdf/am/2018am/iphc-2018-am094-propa3.pdf*

- *Proposal A4: (IPHC-2018-AM094-PropA4): IPHC Fishery Regulations: minor amendments, mostly standardizing and clarifying terminology, updating very old regulations. Read all about it at http://iphc.int/uploads/pdf/am/2018am/iphc-2018-am094-propa4.pdf*

- *Proposal A5: (IPHC-2018-AM094-PropA5): Not really a Proposal, but given the heartburn associated with the Head-On Delivery Requirement last year, worth a Discussion Paper. In it you'll learn why removing the exemption we set last year for frozen-at-sea operators should be lifted, and get clarification on why the regulation was asked for in the first place. See more (only 2 pages): http://iphc.int/uploads/pdf/am/2018am/iphc-2018-am094-propa5.pdf*

2. Contracting Party (by agency) regulatory proposals

[note: all "suggested action" text is from the IPHC Secretariat]

- *Proposal B1 (IPHC-2018-AM094-PropB1 Rev_1): CDQ Leasing in IPHC Regulatory Area 4 -- This was asked for by the directed fleet/processors in Area 4 and allowed by the NPFMC. Background here: http://iphc.int/uploads/pdf/am/2018am/iphc-2018-am094-propb1.pdf*

  ***Suggested action**: The IPHC Secretariat has no objection to this proposed modification of the IPHC Fishery Regulations (2017) and thus, recommends adoption.*

- *Proposal B2 (IPHC-2018-AM094-PropB2): Clarify sport fishing regulations in Regulatory Areas 2C and 3A -- Removing the word "All" in a sports regulation. Read more here: http://iphc.int/uploads/pdf/am/2018am/iphc-2018-am094-propb2.pdf*

  ***Suggested action**: The IPHC Secretariat has no objection to this proposed modification of the IPHC Fishery Regulations (2017) and thus, recommends adoption.*

- *Proposal B3 (IPHC-2018-AM094-PropB3): Clarify head-on requirement in Alaska Commercial Fisheries.*

  ***Suggested action**: For the head-on requirement clarifications coming from both PropA4 and PropB3, the IPHC Secretariat recommends adopting the U.S.A. (NOAA-Fisheries) PropB3 regulatory language for paragraphs (5) and (6) of IPHC Regulation Section 17. [Note from Peggy/HANA: there is clarifying language also offered by the Secretariat Staff (see Prop A4) that uses slightly different terminology. I'll have a handout comparing the two versions at the PAB meeting.] http://iphc.int/uploads/pdf/am/2018am/iphc-2018-am094-propb3.pdf*

3. Other Stakeholder regulatory proposals

[*Note: all text following proposal titles is from the IPHC Secretariat. individual proposals can be seen on the following page if you scroll down about 3/4 of the way: http://iphc.int/venues/details/94th-session-of-the-iphc-annual-meeting-am094*

- *Proposal C1 (IPHC-2018-AM094-PropC1): Catch limit proposals [Note from Peggy: See Agenda Item 4.]*

  ***Suggested action**: The IPHC Secretariat recommends Commissioners use the harvest decision table, as provided in paper IPHC-2018-AM094-10, as the primary tool to measure the risks of the various catch limit proposals.*

- *Proposal C2 (IPHC-2018-AM094-PropC2): Preserving catch on private live-aboard vessels (A. Cooper) -- The proposal suggests a new paragraph for Section 28 of the regulations and includes suggested measures to track retained Pacific halibut by logging each catch with location caught, measuring each fish (length or weight), state issued license information of the angler, and photographing of each fish prior to processing.*

***Suggested action**: The IPHC Secretariat has concerns regarding compliance with possession and bag limits in response to this regulatory proposal. The options of logbook or photo documentation do not satisfy these concerns. As this regulation (IPHC Regulation 28(1)(d)) is important for enforcement purposes, the IPHC Secretariat recommends that the Commission does not adopt this proposal at this time. Further discussion with enforcement agencies is required.*

- *Proposal C3 (IPHC-2018-AM094-PropC3): For unguided sport fishing (P. Phillips) -- This proposal would require logbook-style record keeping and reporting requirements for unguided recreational fisheries in Alaska.*
- ***Suggested action**: The IPHC Secretariat supports improved recordkeeping and reporting from the non-charter recreational sector. Record keeping and reporting would need to be coordinated with the Alaska Department of Fish and Game (ADFG), NMFS, and the North Pacific Fishery Management Council (NPFMC). Indicate that the authors should forwarded their proposal to the NPFMC for further consideration.*
- *Proposal C4 (IPHC-2018-AM094-PropC4): Sport Fishing for Halibut - Cleaning Regulations (S. Riehemann) -- The proposal suggests adding "unless preserved" or "unless preservation facilities are aboard" to paragraph (1)(d) of Section 28 of the regulations where the required condition of recreational caught Pacific halibut onboard the vessel are detailed.*
- ***Suggested action**: The IPHC Secretariat has concerns regarding compliance with possession and bag limits in response to this regulatory proposal. As this regulation (IPHC Regulation 28(1)(d)) is important for enforcement purposes, the IPHC Secretariat recommends that the Commission does not adopt this proposal at this time. Further discussion with enforcement agencies is required.*
- *Proposal C5 (IPHC-2018-AM094-PropC5): Elimination of skin-on regulation (J. Shirk) -- The proposal suggests removing the requirement for skin on all pieces of Pacific halibut in paragraph (1)(d) of Section 28 in the regulations.*
- ***Suggested action**: The IPHC Secretariat has concerns regarding compliance with possession and bag limits in response to this regulatory proposal. However, it is not the IPHC's intention to require the entire fillet to be with 'skin attached'. As is the case in numerous fisheries globally, a smaller size of naturally attached skin on each piece of Pacific halibut (only require enough skin to determine that the fillets are from a Pacific halibut and which side) is all that is required to determine that a fillet is from a Pacific halibut and whether it is from the ventral (light) or dorsal (dark) side. This is sufficient to enforce the applicable Pacific halibut bag and possession limits. The IPHC Secretariat recommends the following revised regulatory language for IPHC Regulation Section 28(1)(d):*

  28. Sport Fishing for Halibut—Areas 2C, 3A, 3B, 4A, 4B, 4C, 4D, 4E

  In Convention waters in and off Alaska: ...

  (d) No person shall possess on board a vessel, including charter vessels and pleasure craft used for fishing, halibut that have been filleted, mutilated, or

otherwise disfigured in any manner, except that each halibut may be cut into no more than 2 ventral pieces, 2 dorsal pieces, and 2 cheek pieces, with a patch of skin on each all pieces that is approximately two (2) inches (~5 cm) square, naturally attached.

- *Proposal C6 (IPHC-2018-AM094-PropC6): Live-aboard processing exemption (D. Robertson) -- The proposal suggests adding "except pleasure vessels with live aboard accommodations and processing facilities, may process, preserve, maintain and transport halibut on board" to paragraph (1)(d) of Section 28 of the regulations where the required condition of recreational caught Pacific halibut onboard the vessel are detailed.*

  ***Suggested action**: The IPHC Secretariat has concerns regarding compliance with possession and bag limits in response to this regulatory proposal. As this regulation (IPHC Regulation 28(1)(d)) is important for enforcement purposes, the IPHC Secretariat recommends that the Commission does not adopt this proposal.*

- *Proposal C7 (IPHC-2018-AM094-PropC7): Eliminate the requirement for a CHP (S. Riehemann) -- This proposal suggests eliminating the requirement for a Charter Halibut Permits (CHP) for private, crewed vessels that are not available for charter.*

  ***Suggested action**: CHPs for the recreational fishery in Alaska are not an IPHC Regulation requirement. Any CHP requirements would need to be coordinated with the Alaska Department of Fish and Game (ADFG), NMFS, and the NPFMC. Indicate that the authors should forwarded their proposal to the NPFMC for further consideration.*

- *Proposal C8 (IPHC-2018-AM094-PropC8): Allow shellfish pots on board (ALFA) -- The IPHC Secretariat supports this regulatory proposal as long as any Pacific halibut caught in the shellfish pots on the trip are tracked and reported.*

- ***Suggested action**: The Commission may wish to consider whether there should be a limit on the number of shellfish pots onboard during commercial Pacific halibut trips. Suggested regulatory language is included in the proposal, but requires further coordination with Contracting Parties on the description of a shellfish pot. Indicate that the authors should forwarded their proposal to the NPFMC for further consideration, and for the IPHC Secretariat and NOAA-Fisheries to coordinate over the coming year to further clarify the proposal and determine how best to implement it effectively.*

- *Proposal C9 (IPHC-2018-AM094-PropC9): Processing halibut greater than four filets (M. Cowart) -- The proposal suggests a new paragraph for Section 28 of the regulations and includes suggested measures to track retained Pacific halibut on private live aboard vessels by logging catch record, date stamp photos prior to processing, and labeling of processed packages.*

  ***Suggested action**: The IPHC Secretariat has concerns regarding compliance with possession and bag limits in response to this regulatory proposal. The options of logbook or photo documentation do not satisfy these concerns. This regulation (IPHC Regulation 28(1)(d)) is important for enforcement purposes. The IPHC Secretariat recommends that the Commission does not adopt this proposal.*

- *Proposal C10 (IPHC-2018-AM094-PropC10): Halibut length measurement method (R. Yamada) -- This proposal suggests revised language for Section 25(2) where fish measurement procedures are detailed. The proposal suggests replacing "over the pectoral fin" with "under the fish".*

  Suggested action: The IPHC Secretariat deems this revision unnecessary. Measurements in a straight line 'over' and 'under' the fish would produce the same value. The IPHC Secretariat recommends that the Commission does not adopt this proposal.

- *Proposal C11 (IPHC-2018-AM094-PropC11): Long term storage aboard pleasure vessels (L. Thompson) -- The proposal suggests adding "possession does not include preserved fish" to paragraph (1)(d) of Section 28 of the regulations where the required condition of recreational caught Pacific halibut onboard the vessel are detailed.*

  ***Suggested action**: The IPHC Secretariat has concerns regarding compliance with possession and bag limits in response to this regulatory proposal. The proposal secondly suggests adding "halibut" to paragraph (1)(e) of Section 28 of the regulations where the gear for recreational caught Pacific halibut onboard the vessel are detailed. The IPHC Secretariat has concerns regarding compliance with current gear restrictions as non- halibut gear may catch Pacific halibut. This regulation (IPHC Regulation 28(1)(d)) is important for enforcement purposes. The IPHC Secretariat recommends that the Commission does not adopt this proposal.*

- *Proposal C12 (IPHC-2018-AM094-PropC12): Long term storage on cruising vessels (W. Cornell) -- The proposal suggests adding "processed (frozen or canned)" to paragraph (1)(d) of Section 28 of the regulations where the required condition of recreational caught Pacific halibut onboard the vessel are detailed. The proposal includes suggested measures to track retained Pacific halibut by logging each catch with date, time, and location caught, measuring each fish (length), state issued license information of the angler, documented proof of the vessel functioning as the angler's domicile, and photographing of each fish prior to processing with date/time stamp and processed fish packages must be marked to correspond to log information and photograph.*

  ***Suggested action**: The IPHC Secretariat has concerns regarding compliance with possession and bag limits in response to this regulatory proposal. The options of logbook or photo documentation do not satisfy these concerns. This regulation (IPHC Regulation 28(1)(d)) is important for enforcement purposes. The IPHC Secretariat recommends that the Commission does not adopt this proposal.*

- *Proposal C13 (IPHC-2018-AM094-PropC13): Halibut in Bering Sea pots (J. Kauffman) -- The IPHC Secretariat supports this regulatory proposal which is similar to the use of pots in the Gulf of Alaska which started in 2017. IPHC's concern is that any Pacific halibut caught in pots on the trip are tracked and reported. While this proposal includes suggsted IPHC regulatory language, the IPHC Secretariat suggests the following simplified, revised regulatory language for IPHC Regulation Section 19(1), (2):*

19. Fishing Gear

No person shall fish for halibut using any gear other than hook and line gear, except that vessels licensed to catch sablefish in Area 2B using sablefish trap gear as defined in the Condition of Licence can retain halibut caught as bycatch under regulations promulgated by DFO; or (b) except that a person may retain halibut taken with longline or single pot gear in the sablefish IFQ fishery if such retention is authorized by NMFS regulations published at 50 CFR Part 679. No person shall possess halibut taken with any gear other than hook and line gear, except that vessels licensed to catch sablefish in Area 2B using sablefish trap gear as defined by the Condition of Licence can retain halibut caught as bycatch under regulations promulgated by DFO; or except that a person may possess halibut taken with longline or single pot gear in the sablefish IFQ fishery if such possession is authorized by NMFS regulations published at 50 CFR Part 679...

***Suggested action**: The IPHC Secretariat recommends adopting the above revised regulatory language for Section 19(1), (2), and supports the suggested regulatory language provided in PropC13 for gear marking requirements in Section 19(4).*

- *Proposal C14 (IPHC-2018-AM094-PropC14): Status Quo Harvest Measures for Guided Anglers in Area 3A (R. Yamada) -- The IPHC Secretariat defers to the NPFMC's Catch Sharing Plan (CSP) and recreational management measures recommended by the NPFMC to IPHC to stay within the CSP. The NPFMC and their advisory body, the Charter Halibut Management Committee, meet in October and December each year to discuss charter halibut management measures in Regulatory Areas 2C and 3A for the upcoming year. This regulation proposal does not need to be forwarded to the NPFMC because they have already considered measures for 2018. In addition, this proposal is within the range of options brought forward by the NPFMC for consideration by the IPHC dependent on the final adopted TCEY.*

  ***Suggested action:** Indicate that the authors should forwarded their proposal to the NPFMC for further consideration.*

- *Proposal C15 (IPHC-2018-AM094-PropC15): Trawler Halibut Bycatch Tender boat program (J. Kearns) -- T*

  ***Suggested action**: The IPHC Secretariat defers to the NPFMC. Indicate that the authors should forwarded their proposal to the NPFMC for further consideration.*

6. RECOMMENDATIONS TO THE COMMISSION

- *On any subject within the purview of the PAB for the IPHC Annual Meeting, the PAB may "Recommend" or "Request" action by the Commissioners. In the past we have recommended action aimed at lowering mortality of halibut bycatch in the Bering Sea, for instance.*

- *Minimum Size Limit discussion: Discuss and make a recommendation to the Commission regarding paper IPHC-2018-AM094-14: Evaluation of the IPHC's 32" minimum size limit. http://iphc.int/uploads/pdf/am/2018am/iphc-2018-am094-14.pdf*

7. OTHER BUSINESS

8. REVIEW OF THE DRAFT AND ADOPTION OF THE REPORT OF THE 23rd SESSION OF THE IPHC PROCESSOR ADVISORY BOARD (PAB023)

- *The report of the PAB023 must be adopted in Session, so that it may be finalized for presentation to the Commission on Thursday 24 January 2018.*

Report of the 93rd Session of the IPHC Interim Meeting (IM093)

Seattle, Washington, United States of America, 28-29 November 2017

DISTRIBUTION:

Participants in the Session
Members of the Commission
IPHC Secretariat

BIBLIOGRAPHIC ENTRY

IPHC 2017. Report of the 93rd Session of the IPHC Interim Meeting (IM093). Seattle, Washington, U.S.A., 28-29 November 2017.
IPHC–2017–IM093–R, 29 pp.

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ACRONYMS

ABM	Abundance-Based Management (of Prohibited Species Catch limits)
CB	Conference Board
DFO	Department of Fisheries and Ocean (Canada)
DMR	Discard Mortality Rate
EEZ	Exclusive Economic Zone
FCEY	Fishery Constant Exploitation Yield
IFQ	Individual Fishing Quota
IPHC	International Pacific Halibut Commission
MSL	Minimum Size Limit
NMFS	National Marine Fisheries Services, of NOAA
NOAA	National Oceanic and Atmospheric Administration
NPFMC	North Pacific Fishery Management Council
NPUE	Number Per Unit Effort
PFMC	Pacific Fisheries Management Council
RAB	Research Advisory Board
SB	Spawning Biomass
SRB	Scientific Review Board
SPR	Spawning Potential Ratio
TCEY	Total Constant Exploitation Yield
WPUE	Weight Per Unit Effort

HOW TO INTERPRET TERMINOLOGY CONTAINED IN THIS REPORT

The IM093 Report has been written using the following terms and associated definitions so as to remove ambiguity surrounding how particular paragraphs should be interpreted.

Level 1: **RECOMMENDED**; **RECOMMENDATION** (formal); **REQUESTED** (informal): A conclusion for an action to be undertaken, by a Contracting Party, a subsidiary (advisory) body of the Commission and/or the IPHC Secretariat.

Level 2: **AGREED**: Any point of discussion from a meeting which the Commission considers to be an agreed course of action covered by its mandate, which has not already been dealt with under Level 1 above; a general point of agreement among delegations/participants of a meeting which does not need to be elevated in the Commission's reporting structure.

Level 3: **NOTED/NOTING**; **CONSIDERED**; **URGED**; **ACKNOWLEDGED**: General terms to be used for consistency. Any point of discussion from a meeting which the Commission considers to be important enough to record in a meeting report for future reference. Any other term may be used to highlight to the reader of an IPHC report, the importance of the relevant paragraph. Other terms may be used but will be considered for explanatory/informational purposes only and shall have no higher rating within the reporting terminology hierarchy than Level 3.

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EXECUTIVE SUMMARY

The 93rd Session of the International Pacific Halibut Commission (IPHC) Interim Meeting (IM093) was held in Seattle, Washington, U.S.A. from 28-29 November 2017. A total of 14 members (6 Commissioners; 8 advisors/experts) attended the Session from the two (2) Contracting Parties, as well as 55 members of the public and 74 via the webcast. The meeting was opened by the Chairperson, Dr Jim Balsiger (United States of America) and Vice-Chairperson, Mr Paul Ryall (Canada) and who welcomed participants to Seattle.

The following are a subset of the complete recommendations and requests for action from the IM093, which are provided at Appendix V.

RECOMMENDATIONS

Report of the IPHC Secretariat (2017)

IM093–Rec.01 (para. 6) The Commission **RECOMMENDED** that the IPHC Secretariat develop a working paper for consideration at the 94th Annual Meeting, containing the following:

a) A detailed description of how the Regulatory Area 2A commercial fishery (derby) is managed, including roles and responsibilities of agencies, the PFMC and the IPHC; and

b) An update to the analysis of various fishing periods and fishing period limits provided to the PFMC in September 2017, including the addition of 2- and 5-day fishing periods.

Review of fishery goals and objectives: Commission directive

IM093–Rec.02 (para. 38) **NOTING** the goals and objectives related to distributing the TCEY presented during the meeting by the U.S.A. (Table 3), the Commission **RECOMMENDED** that they be considered at the 94th Annual Meeting in January 2018 after soliciting input from stakeholders.

REQUESTS

Data overview and preliminary stock assessment (2017), and draft harvest decision table (2017)

IM093–Req.03 (para. 28) The Commission **REQUESTED** that the IPHC Secretariat provide columns in the decision table, three-year graphical projections, and catch tables for SPR values of 42%, 44%, 48%, and 50% in addition to the 46% SPR that was presented in documents IPHC-2017-IM093-08 and IPHC-2017-IM093-09.

IM093–Req.04 (para. 29) **NOTING** questions arising regarding the specific fisheries contributing to projected bycatch reductions from 2010 to 2017, the Commission **REQUESTED** that the IPHC Secretariat work with NMFS staff to facilitate a report for consideration at the 94th Annual Meeting in January 2018.

Report of the 10th Session of the IPHC Management Strategy Advisory Board (MSAB10)

IM093–Req.05 (para. 36) The Commission **REQUESTED** that the MSAB look at SPR values consistent with recent estimated SPR values from the assessment model and lower. This would mean expanding the lower range of SPR values to below 40%.

Review of fishery goals and objectives: Commission directive

IM093–Req.06 (para. 39) The Commission **REQUESTED** the IPHC Secretariat to consolidate the objectives related to TCEY distribution (Table 3) with the current goals, objectives and performance metrics provided as Appendix IV of the MSAB10 Report, for presentation at the 94th Annual Meeting in January 2018.

1. Opening of the Session

1. The 93rd Session of the International Pacific Halibut Commission (IPHC) Interim Meeting (IM093) was held in Seattle, Washington, U.S.A. from 28-29 November 2017. A total of 14 members (6 Commissioners; 8 advisors/experts) attended the Session from the two (2) Contracting Parties, as well as 55 members of the public in person and 74 via the webcast. The list of participants is provided at Appendix I. The meeting was opened by the Chairperson, Dr Jim Balsiger (United States of America) and Vice-Chairperson, Mr Paul Ryall (Canada), who welcomed participants to Seattle.

2. Adoption of the agenda and arrangements for the Session

2. The Commission **ADOPTED** the Agenda as provided at Appendix II. The documents provided to the IM093 are listed in Appendix III.

3. Update on actions arising from the 93rd Annual Meeting

3. The Commission **NOTED** paper IPHC-2017-IM093-03 which provided an opportunity to consider the progress made during the inter-sessional period, in relation to the recommendations and requests of the 93rd Session of the IPHC Annual Meeting (AM093) in 2017.
4. The Commission **AGREED** to consider and revise as necessary, the actions arising, and for these to be combined with any new actions arising from the IM093.

4. Report of the IPHC Secretariat (2017)

5. The Commission **NOTED** paper IPHC-2017-IM093-04 which provided the Commission with a draft update on the activities of the IPHC Secretariat in 2017.
6. The Commission **RECOMMENDED** that the IPHC Secretariat develop a working paper for consideration at the 94th Annual Meeting, containing the following:
    a) A detailed description of how the Regulatory Area 2A commercial fishery (derby) is managed, including roles and responsibilities of agencies, the PFMC and the IPHC; and
    b) An update to the analysis of various fishing periods and fishing period limits provided to the PFMC in September 2017, including the addition of 2- and 5-day fishing periods.

5. Fishery statistics (2017)

7. The Commission **NOTED** paper IPHC-2017-IM093-05 Rev_1 which provided an overview of the key fishery statistics from fisheries catching Pacific halibut during 2017, including the status of landings compared to catch limits adopted by the Commission.
8. **NOTING** Appendix I of paper IPHC-2017-IM093-05 Rev_1 was provided the evening prior to the Interim Meeting, and detailed information available on bycatch levels among all gears/sectors, as requested by the Commission at its 93rd Annual Meeting (AM093-Rec.09), the Commission **REQUESTED** that the IPHC Secretariat facilitate consideration of the information inter-sessionally, so that the Commission may provide further guidance on the type of information it requires, for consideration at the 94th Annual Meeting in January 2018.
9. The Commission **NOTED** that fish in the Regulatory Area 2B Recreational Fishery could be landed after the 6 September 2017 closure date for the Regulatory Area 2B Recreational Fishery if the harvesters acquired quota as part of Regulatory Area 2B's Experimental Recreational Pacific halibut fishery.
10. The Commission **NOTED** that there has been confusion among vessels in the 26' to 60' size category fishing with pot gear in the Gulf of Alaska because they previously were only required to maintain an IPHC logbook. At present, while fishing under the IFQ sablefish fishery with pot gear, the captains of vessels in this size category are required to maintain a NMFS logbook. As a result, training for these vessels has been requested from NOAA Enforcement.

6. Stock status of Pacific halibut (2017) and Harvest decision table

6.1 Fishery Independent Setline Survey (FISS) design and implementation in 2017, including current and future expansions

11. The Commission **NOTED** paper IPHC-2017-IM093-06 which provided an overview of the IPHC's fishery-independent setline survey (FISS) design and implementation in 2017, including current and future expansions.

12. The Commission **NOTED** that the Fishery-Independent Setline Survey (FISS) program has specific parameters that trigger a requirement to complete a marine mammal depredation form. In 2017, the presence of marine mammals near FISS stations during haul-back, did not result in any of those stations being determined as ineffective due to depredation. In other words, there was not enough damage to the gear or missing baits to classify the station as ineffective. Comparatively, for the commercial fleet, anecdotal information on marine mammal sightings, as recorded in commercial vessel logbooks, suggests a higher presence of marine mammals.

13. The Commission **NOTED** that factors such as the presence of marine protected areas and tidal movement may affect the feasibility of surveying a particular proposed expansion station. The IPHC Secretariat engages with Contracting Parties annually to vett potential expansion stations.

6.2 Space-time modelling of survey data (WPUE; survey expansion results, etc.)

14. The Commission **NOTED** paper IPHC-2017-IM093-07 which provided the results of the fishery-independent setline survey (FISS) expansions in IPHC Regulatory Areas 4B and 2A in 2017, an outline of the space-time modelling methods used to estimate time series of weight and numbers-per-unit-effort and estimates of stock distribution among Regulatory Areas, and results of an evaluation of previous FISS expansions in Regulatory Areas 2A and 4A including the implications for future expansions in these areas.

15. The Commission **NOTED** that the mean setline survey WPUE in Oregon and California was similar in 2017 to 2016, while WPUE in Washington was down considerably. This could imply that the decrease overall of Regulatory Area 2A was attributable to the anoxic zone off the Washington coast. It is possible, however, that Pacific halibut moved from Washington to Oregon waters, or elsewhere to avoid this zone, and that we would have seen decreased setline survey catch rates in Regulatory Area 2A even if this zone had not been present.

16. The Commission **NOTED** that in some Regulatory Areas, particularly Areas 2B and 3B, the magnitude of the decrease from 2016 to 2017 was not previously seen in the setline survey time series. Regarding what is driving this decrease, nothing was considered unusual in the setline survey catch of non-target species, or the hook competition adjustment. Environmental data from the setline survey's water column profilers are currently being examined, and any findings of note will be reported at the 94th Annual Meeting in January 2018.

17. The Commission **REQUESTED** that the IPHC Secretariat examine alternative ways of computing bottom area that account for bathymetry, noting that the current method involves estimating the surface area of the ocean.

18. The Commission **NOTED** that the current evaluation of the Regulatory Area 2A setline survey expansion program combines all of the surveyed parts of California when the data show two distinct regions in terms of Pacific halibut density. Future evaluations will include additional low density Pacific halibut areas surveyed in 2017, and will consider whether setline survey stations south of latitude 40°N are needed.

19. The Commission **NOTED** that the setline survey expansion evaluation table (Table 1 in paper IPHC-2017-IM093-07) will in future include a column for relative cost, as recommended by the Scientific Review Board. The intention is to have this available for the 94th Annual Meeting in January 2018.

20. The Commission **NOTED** that the anoxic event off the Washington coast affected the catch rates on the Washington ad-hoc densification expansion grid. It was highlighted that there was a minor effect of the

densified expansion grid on overall value and precision of Regulatory Area 2A estimates of WPUE, and thus, does not support repeating this expansion in 2018.

21. The Commission **NOTED** that parts of the annual setline survey will be evaluated along with expansion stations to determine if annually sampling these stations is necessary. The IPHC Secretariat intends to undertake a full evaluation of the efficacy of the setline survey design including annually fished stations, once the expansion program is completed in 2019.

22. **NOTING** the call for additional information on several factors which may have impacted the space-time-model results for Regulatory Area 2A, including 1) The latitudinal covariate for halibut density in the space-time model for Regulatory Area 2A; 2) The number and location of ineffective stations; 3) The addition of historical data from 1993-97; and 4) The hypoxic zone observed off the Washington Coast; the Commission also **NOTED** the following initial response:
    a) Identifying a very minor role for the first three of these factors, and noting that under the assumption that the hypoxic zone did not produce Pacific halibut mortality, but likely induced movement to more favourable habitats, the setline survey should have encountered and adequately enumerated these fish at other locales.
    b) This last point illustrates the potential value of considering the stock distribution at the biologically meaningful level of Regions (e.g. Regulatory Areas 2A, 2B, and 2C in aggregate) rather than focusing on individual Regulatory Areas.
    c) Further clarification was provided regarding the historically large variance estimates for Regulatory Area 2A, which have been reduced in recent years, apparently as a function of both population processes and additional sampling as well as the application of the Space-Time model for analyzing these data.
    d) The IPHC Secretariat will provide additional information on these topics during the 94th Annual Meeting in January 2018.

6.3 Data overview and preliminary stock assessment (2017), and draft harvest decision table (2017)

23. The Commission **NOTED** paper IPHC-2017-IM093-08 which provided an opportunity to consider the results of the 2017 IPHC stock assessment for Pacific halibut within the Convention Area, including data used in the assessment, and the draft harvest decision table for 2018 (Table 1).

24. The Commission **NOTED** that:
    a) in 2017, total removals were below the 100-year average, and have been stable near 42 million pounds (19,050 t) from 2014-17. In 2017, 83% of the total removals from the stock were retained compared to 80% in 2016.
    b) the 2017 mortality from all sources corresponds to a point estimate of SPR = 40% (there is a 75% chance that fishing intensity exceeded the IPHC's interim reference level of 46%). In order to reach the interim reference level, catch limits would need to be reduced for 2018. The Commission does not currently have a coastwide limit fishing intensity reference point.
    c) the Pacific halibut female spawning biomass at the beginning of 2018 is estimated to be 202 million pounds (~91,600 t), with an approximate 95% confidence interval ranging from 148 to 256 million pounds (~67,100-116,100 t), which corresponds to only a 6% chance of being below the IPHC threshold (trigger) reference point of SB30%, and less than a 1% chance of being below the IPHC limit reference point of SB20%. Therefore, no adjustment to the interim target fishing intensity is required, and the stock is not considered to be 'overfished'. Projections indicate that the interim reference F_{SPR} fishing intensity is likely to result in similar, but declining biomass levels in the near future.
    d) regional stock distribution has been stable within estimated credibility intervals over the last five years. Region 2 currently represents a greater proportion, and Region 3 a lesser proportion of the coastwide stock than observed in previous decades.

25. The Commission **NOTED** that stock projections were conducted using the integrated results from the stock assessment ensemble, summaries of the 2017 directed fisheries and other sources of mortality. The harvest decision table (Table 1) provides a comparison of the relative risk (in times out of 100), using stock and fishery metrics (rows), against a range of alternative harvest levels for 2018 (columns). The orientation of this table has changed from previous analyses in order to make the comparison of additional metrics easier (the second year of projection is now explicitly included), and to increase consistency with the results produced from the Management Strategy Evaluation. The block of rows entitled "Stock Trend" provides for evaluation of the risks to short-term trend in spawning biomass, independent of all harvest policy calculations. The remaining rows portray risks relative to the spawning biomass reference points ("Stock Status") and fishery performance identified in the interim management procedure. The alternatives (columns) provided include several coarsely spaced levels of mortality intended to provide for evaluation of stock dynamics including:
    - No mortality (useful to evaluate the stock trend due solely to population processes),
    - A 10 million pound (~4,500 t) 2018 Total Constant Exploitation Yield (TCEY)
    - A 50 million pound (~22,700 t) 2018 TCEY
    - A 60 million pound (~27,200 t) 2018 TCEY
    - The removals consistent with the reference SPR (F46%) level.
26. The Commission **NOTED** that a finer grid of alternative TCEY values is provided around the column corresponding to the reference level of fishing intensity (SPR=46%; for 2018 a TCEY of 31 million pounds, ~14,060 t).

Table 1. Harvest decision table for 2018. Columns correspond to yield alternatives and rows to risk metrics. Values in the table represent the probability, in "times out of 100" (or percent chance) of a particular risk.

		2018 Alternative	No removals						*Reference: SPR=46%*							
		Total removals (M lb)	0.0	11.8	21.8	29.8	30.8	31.8	32.8	33.8	34.8	35.8	41.8	51.8	61.9	
		TCEY (M lb)	0.0	10.0	20.0	28.0	29.0	30.0	31.0	32.0	33.0	34.0	40.0	50.0	60.0	
		Fishing intensity	$F_{100\%}$	$F_{73\%}$	$F_{58\%}$	$F_{49\%}$	$F_{48\%}$	$F_{47\%}$	$F_{46\%}$	$F_{45\%}$	$F_{44\%}$	$F_{43\%}$	$F_{39\%}$	$F_{32\%}$	$F_{27\%}$	
		Fishing intensity interval	--	61-84%	45-73%	36-66%	36-65%	35-65%	34-64%	33-63%	32-63%	32-62%	28-58%	23-53%	19-48%	
Stock Trend (spawning biomass)	in 2019	is less than 2018	1	3	24	64	69	74	78	81	85	87	98	>99	>99	a
		is 5% less than 2018	<1	<1	<1	2	3	4	5	7	9	11	29	69	96	b
	in 2020	is less than 2018	<1	1	14	52	57	62	67	71	76	80	95	>99	>99	c
		is 5% less than 2018	<1	<1	1	11	14	18	21	25	29	34	61	94	>99	d
	in 2021	is less than 2018	<1	2	23	63	68	72	76	79	83	86	97	>99	>99	e
		is 5% less than 2018	<1	<1	5	32	36	41	46	50	55	59	83	99	>99	f
Stock Status (Spawning biomass)	in 2019	is less than 30%	3	4	5	6	7	7	7	7	7	7	9	11	15	g
		is less than 20%	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1	h
	in 2020	is less than 30%	2	2	4	6	6	7	7	8	8	9	12	21	32	i
		is less than 20%	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1	1	j
	in 2021	is less than 30%	1	1	4	8	8	9	10	11	12	13	21	37	54	k
		is less than 20%	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1	2	7	l
Fishery Trend (TCEY)	in 2019	is less than 2018	<1	<1	7	38	43	49	55	60	64	68	78	89	97	m
		is 10% less than 2018	<1	<1	3	26	30	34	38	43	48	53	72	82	92	n
	in 2020	is less than 2018	<1	<1	10	43	49	54	59	63	67	70	79	91	98	o
		is 10% less than 2018	<1	<1	6	31	36	40	45	50	54	59	74	84	95	p
	in 2021	is less than 2018	<1	<1	14	50	55	59	63	67	69	72	81	93	>99	q
		is 10% less than 2018	<1	<1	9	38	43	48	52	56	60	63	75	86	99	r
Fishery Status (Fishing intensity)	in 2018	is above $F_{46\%}$	0	<1	4	33	38	43	50	54	60	64	77	87	95	s

Terms: *Constant Exploitation Yield (CEY)*: A specific concept from the IPHC's interim management procedure: the Total CEY (TCEY) is the amount of yield of Pacific halibut greater than 26 inches (66 cm) in length, and Fishery CEY (FCEY), is the amount of yield for the directed Pacific halibut fisheries where applicable. *Spawning Potential Ratio (SPR)*: A commonly used metric of fishing intensity. SPR is the ratio of the equilibrium spawning biomass per recruit given some level of fishing and the equilibrium spawning biomass per recruit in the absence of fishing. Sometimes referred to as SBR, relative Spawning Biomass per Recruit.

27. The Commission **NOTED** that the stock is projected to decrease gradually over the period from 2018-20 for removals around the reference SPR level. The risk of stock decline begins to increase rapidly for TCEYs above 31 million pounds (~14,060 t), becoming more pronounced by 2020 (Table 1). The reference SPR corresponds to a 78/100 (78%) chance of stock decline through 2019, and a 46% chance of at least a 5% decline through 2021 at that constant level of TCEY. TCEYs corresponding to recent levels of fishing mortality correspond to probabilities of stock decline over the next one to three years greater than 95%. There is a <21/100 (21%) change that the stock will decline below the threshold reference point (SB30%) in projections for all the levels of TCEY up to 40 million pounds (~18,100 t) evaluated over three years; for TCEYs exceeding that level, the probability begins to increase rapidly.

28. The Commission **REQUESTED** that the IPHC Secretariat provide columns in the decision table, three-year graphical projections, and catch tables for SPR values of 42%, 44%, 48%, and 50% in addition to the 46% SPR that was presented in documents IPHC-2017-IM093-08 and IPHC-2017-IM093-09.

29. **NOTING** questions arising regarding the specific fisheries contributing to projected bycatch reductions from 2010 to 2017, the Commission **REQUESTED** that the IPHC Secretariat work with NMFS staff to facilitate a report for consideration at the 94th Annual Meeting in January 2018.

6.4 Draft: Pacific halibut catch tables

30. The Commission **NOTED** paper IPHC-2017-IM093-09 which provided the Commission with a summary of IPHC Regulatory Area-specific preliminary mortality projections for 2018 based on the interim management procedure and other alternatives.

31. The Commission **NOTED** that the reference projection results in a 2018 TCEY of 31.00 million lbs, (~14,060 t; Table 2). This represents a reduction of 21% from the reference level calculated based on the 2016 stock assessment, and 24% from the catch limits adopted for 2017. Because components within the TCEY have changed since 2016, the Fishery Constant Exploitation Yields (FCEYs), and allocations to specific fisheries based on domestic catch agreements have also changed; however, projected FCEYs are all lower for 2018 than values adopted in 2017.

Table 2. Comparison of TCEY values (Mlbs) among IPHC Regulatory Areas from 2017 and projected for 2018 using the reference SPR (SPR46%) along with the current management procedure for TCEY distribution, and the adopted limits from 2017.

	2A	**2B**	**2C**	**3A**	**3B**	**4A**	**4B**	**4CDE**	**Total**
2017 Reference SPR (46%)	0.96	6.08	6.47	13.84	4.39	1.84	1.46	4.06	39.10
2017 Adopted (40%)[1]	1.47	8.32	7.04	12.96	3.98	1.80	1.34	3.84	40.74
2018 Reference SPR (46%)	0.59	3.84	5.65	12.07	2.56	1.69	1.21	3.39	31.00

[1] This SPR value represents the current estimate, based on the 2017 stock assessment. At the time the 2017 catch limits were adopted, they were predicted to result in an SPR of 45%.

7. MANAGEMENT STRATEGY EVALUATION

7.1 IPHC Management Strategy Evaluation: update

32. The Commission **NOTED** paper IPHC-2017-IM093-10 which provided an update on the progress of the IPHC Management Strategy Evaluation process and seeks recommendations for future work, including a review of goals and objectives defined by the MSAB, an overview of the simulation framework to evaluate the fishing intensity and harvest control rules in the IPHC harvest strategy policy, results from the closed-loop simulations, ideas for distributing the TCEY to Regulatory Areas, and a five-year work plan.

33. The Commission **CONSIDERED** the following items and **AGREED** to discuss them in detail at the 94th Annual Meeting in January 2018 for potential decision:

a) The simulation framework and assumptions as described, including introducing variability to the Operating Model, simulating weight-at-age and an environmental regime, and allocation of the Total Mortality to sectors;

b) The long-term results looking at the outcomes of various management procedures and the trade-offs between them;

c) Management procedures (e.g. values of SPR in combination with a control rule threshold) that would meet the goal and objectives important to the Commission, based on the results shown, and additional procedures that may be of interest to evaluate in 2018;

d) Whether the clear separation of stock distribution, and distribution procedures satisfies the Commission's recommendation to replace apportionment with a more suitable term; and

e) The concept of distributing the TCEY to biological regions defined here as a method to satisfy the Commission's request to "initiate a process to develop alternative, biologically based stock distribution strategies."

7.2 Report of the 10th Session of the IPHC Management Strategy Advisory Board (MSAB10)

34. The Commission **NOTED** the Report of the 10th Session of the IPHC Management Strategy Advisory Board (MSAB10) (IPHC-2017-MSAB10-R) which was presented by Mr Adam Keizer (Canada) and Ms Rachel Baker (U.S.A). The MSAB consists of 20 board members, 19 of which attended the Session from the two (2) Contracting Parties. A total of five (5) individuals attended the Session as Observers. In addition, two (2) IPHC Commissioners were in attendance, Mr Paul Ryall (Canada) and Mr Bob Alverson (U.S.A.).

35. The Commission **CONSIDERED** the 3 recommendations and 7 requests made by the MSAB10, **NOTING** that formal consideration will be made at the 94th Annual Meeting in January 2018.

36. The Commission **REQUESTED** that the MSAB look at SPR values consistent with recent estimated SPR values from the assessment model and lower. This would mean expanding the lower range of SPR values to below 40%.

7.3 Review of fishery goals and objectives: Commission directive

37. **NOTING** the current fishery goals, objectives, and performance metrics identified by the MSAB for the MSE process, as detailed in the MSAB10 report (IPHC-2017-MSAB10-R), the Commission **AGREED** to provide guidance to the IPHC Secretariat and the MSAB on goals and objectives at the 94th Annual Meeting in January 2018.

38. **NOTING** the goals and objectives related to distributing the TCEY presented during the meeting by the U.S.A. (Table 3), the Commission **RECOMMENDED** that they be considered at the 94th Annual Meeting in January 2018 after soliciting input from stakeholders.

39. The Commission **REQUESTED** the IPHC Secretariat to consolidate the objectives related to TCEY distribution (Table 3) with the current goals, objectives and performance metrics provided as Appendix IV of the MSAB10 Report, for presentation at the 94th Annual Meeting in January 2018.

40. The Commission **NOTED** that providing guidance on the MSE process to the IPHC Secretariat and the MSAB at the Interim and Annual meetings would be an efficient and effective method to ensure the guidance is incorporated into the annual MSAB work plan.

Table 3. Pacific halibut TCEY distribution goals and objectives.

Goal	Objective
Biological sustainability: Preserving bio-complexity	1. Maintaining diversity in the population across IPHC Regulatory Areas. 2. Prevent local depletion at IPHC Regulatory Area scale.
Fisheries Sustainability: Maintain access and serve consumer needs.	1. Maintain commercial, recreational and subsistence fishing opportunities in each IPHC Regulatory Area. 2. Maintain processing opportunities in each IPHC Regulatory Area.
Fisheries Sustainability: Maximize yield by regulatory area	1. Distribution is responsive to IPHC Regulatory Area abundance trends and stock characteristics (ex. Fishery WPUE, age structure, size at age etc.). 2. Distribution is responsive to management precision in each IPHC Regulatory Area. 3. Minimize impact on downstream migration areas. 4. Minimize discard mortality and bycatch.
Fisheries Sustainability: Minimize variability,	1. Limit annual TCEY variability due to stock distribution in both time and scale. 2. Avoid zero sum distribution policy.

7.4 Discussion of allocation principles

41. The Commission **CONSIDERED** the IPHC Secretariat's presentations related to documents IPHC-2017-IM093-08 and IPHC-2017-IM093-10 of an approach for distributing the TCEY to biologically-based Regional Areas (Region 2, Region 3, Region 4, and Region 4B) composed of multiple IPHC Regulatory Areas.
42. The Commission **NOTED** that TCEY distribution among Regions could be modified through management procedures, and that the distribution from coastwide mortality to Regulatory Areas may occur at any step in the process.
43. The Commission **NOTED** that other distribution methods could be considered in addition to, or instead of, the Region approach, such as distribution to Regulatory Areas based on differences in production between areas, fishery WPUE, or defined allocations.
44. The Commission **AGREED** that the principles related to distributing the TCEY in the future will be further considered at the 94th Annual Meeting of the Commission in January 2018.

8. IPHC RESEARCH AND 5-YEAR RESEARCH PROGRAM

8.1 IPHC Research Advisory Board – Update

45. The Commission **NOTED** that the 19th Session of the IPHC Research Advisory Board (RAB19) was moved from November 2017, to 28 February 2018 to align better with the improved IPHC research coordination process, as part of the 5-year research plan as detailed in Section 8.3 below.

8.2 Report of the 11th Session of the IPHC Scientific Review Board (SRB11)

46. The Commission **NOTED** the Report of the 11th Session of the IPHC Scientific Review Board (SRB11) (IPHC-2017-SRB11-R) which was presented by Dr Marc Mangel (University of California, Santa Cruz), one of the four (4) SRB members.
47. The Commission **CONSIDERED** the recommendations made by the SRB11 and provided comment or endorsement as specified below.

a) Ideally, the Commission would like to see the SRB undertake a detailed review of the annual Pacific halibut stock assessment, including consideration of the most recent fishery-dependent and fishery-independent data prior to the Interim Meeting each year. However, due to the compressed timeline of data availability and subsequent meetings, it was indicated that this is not feasible. A comprehensive annual review of the stock assessment could be based on the previous year's data, and would require an extended SRB session mid-year.

b) The current review structure includes a detailed review of model configurations contributing to the stock assessment ensemble on a periodic basis, whenever major changes are made (recently 2012 and 2014). This is consistent with the 1st Performance Review of the IPHC and international best practice, but could be extended to include additional independent peer reviewers (beyond the SRB), as detailed below. Currently, small data and model revisions are reviewed at the mid-year SRB meeting, and finalized during the October meeting. No changes, other than updating the most recent data available, are made subsequent to that SRB review. The SRB, through a teleconference in December, has the opportunity to clarify any remaining issues prior to the Annual Meeting.

c) As indicated in the 1st Performance Review of the IPHC and to align with international best practice, the IPHC Stock Assessment should also undergo a periodic (every 3-5 years) external peer review.

8.3 IPHC 5-year Biological & Ecosystem Science research program: update

48. The Commission **NOTED** paper IPHC-2017-IM093-11 which provided an overview of the new and continuing research projects proposed by IPHC Secretariat and contemplated within the 5-year Biological and Ecosystem Science Research Program.

49. The Commission **NOTED** the summary of research projects proposed for 2018 (Appendix IVa) and the summary of research projects awarded for external funding in 2017 (Appendix IVb)

50. The Commission **NOTED** that the IPHC Secretariat will conduct genetic validation of collected biological samples of sex marked fish from the 2017 coastwide sex marking project in order to evaluate its success and possible future implementation and will therefore not request fishers participation in 2018.

51. The Commission **NOTED** that the IPHC Secretariat clarified that the absence of available data at this time from the satellite tagging efforts on Regulatory Area 4B is due to the fact that satellite pop-up tags were programmed to surface and emit data via satellite after 1 January 2018.

52. The Commission **AGREED** that the proposed research on marine mammal detection methods by the IPHC Secretariat is timely and well aligned with research on this topic by other organizations.

53. The Commission **NOTED** that the SRB recommendation on the usefulness of a life-history modeller is under consideration by the IPHC Secretariat and that a first step in that direction is the temporary hire of a modeller to work on Pacific halibut larval connectivity between the Gulf of Alaska and the Bering Sea.

54. The Commission **NOTED** that the IPHC Secretariat is undertaking studies on growth and reproduction in different biological regions that represent geographical regions within the geographic distribution of the Pacific halibut.

55. The Commission **NOTED** that the IPHC Secretariat is working towards clearly demonstrating how biological research objectives and stock assessment are integrated in order to inform the policy decision making process.

8.4 Evaluation of the IPHC's 32" minimum size limit

56. The Commission **NOTED** paper IPHC-2017-IM093-12 which provided a response to the Commission request made during the 2016 Interim Meeting (IPHC 2016): IM092–Req.07 (para. 73) "*The Commission REQUESTED that a review of the analysis of the effectiveness of size limits be undertaken by the IPHC Staff throughout 2017, for consideration by the Commission at its annual meeting in 2018*."

57. The Commission **NOTED** the discrepancy between survey- and observer-based estimates of potential discards due to the Minimum Size Limit (MSL), and the range of explanations for these differences, as well as the inadequate nature of both data sources to fully address the MSL.

58. The Commission **NOTED** the difficulty in designing an adaptive management approach. Specifically, comments identified the challenge in scaling the results from a small geographical area (or Regulatory Area) to the entire coastwide fishery, as well as the potential cost to a subset of the fleet voluntarily participating.

59. The Commission **AGREED** that the MSL discussion would benefit greatly from additional stakeholder input and should be presented at the 94th Annual Meeting of the Commission in January 2018.

60. The Commission **AGREED** that the current MSL does not restrict the landed catch to only mature Pacific halibut: the majority of the catch is estimated to be female, and the age at 50% maturity is very close to the average age in the commercial landings. Therefore, the MSL may be providing a limited benefit in the form of a 'recruitment refuge'. If that were the management goal, then it could be debated that a higher MSL would be warranted.

9. CONTRACTING PARTY (AGENCY) UPDATES

61. The Commission **REQUESTED** that the IPHC Secretariat develop a standard template for agency reports to the Commission, in order to improve their structure and consistency, as well as to allow the agencies to prepare the appropriate information at the appropriate level of detail for the Commission's consideration.

9.1 Fisheries and Oceans Canada (DFO)

62. The Commission **NOTED** that no update on Pacific halibut matters was received from Fisheries and Oceans Canada for consideration at the IM093.

9.2 NOAA - National Marine Fisheries Service (NOAA-Fisheries)

63. The Commission **NOTED** that no update on Pacific halibut matters was received from NOAA-Fisheries for consideration at the IM093.

9.3 North Pacific Fishery Management Council (NPFMC)

64. The Commission **NOTED** paper IPHC-2017-IM093-AR03 which provided an update from the NPFMC on Council research priorities and abundance-based PSC management.

9.4 Pacific Fishery Management Council (PFMC)

65. The Commission **NOTED** that no update on Pacific halibut matters was received from the PFMC for consideration at the IM093.

10. REGULATORY PROPOSALS FOR THE 2017/18 PROCESS

10.1 IPHC Secretariat regulatory proposals

10.1.1 IPHC Closed Area (Sect. 10)

66. The Commission **NOTED** paper IPHC-2017-IM093-PropA1 which considered the intent and purpose of the IPHC Closed Area, as defined in IPHC Fishery Regulations (2017) Section 10, which currently excludes directed Pacific "halibut fishing"' (i.e. the longline fleet), with the intent of protecting juveniles from extraction.

10.1.2 Commercial fishing periods (Sect. 8)

67. The Commission **NOTED** paper IPHC-2017-IM093-PropA2 which proposed establishing fixed fishing periods for the commercial Pacific halibut fisheries.

10.1.3 Removal of exemption for Vessel Monitoring System requirement for IPHC Regulatory Area 4 clearances (Sect. 15)

68. The Commission **NOTED** paper IPHC-2017-IM093-PropA3 which proposed streamlining regulatory requirements and improve monitoring for IPHC Regulatory Area 4 by requiring vessel monitoring systems (VMS) instead of an IPHC Clearance.

10.1.4 IPHC Fishery Regulations: minor amendments

69. The Commission **NOTED** paper IPHC-2017-IM093-PropA4 which proposed amendments to ensure clarity and consistency in the IPHC Fishery Regulations.

10.1.5 Discussion paper: Frozen-at-sea exemption for head-on requirement (Sect. 13)

70. The Commission **NOTED** paper IPHC-2017-IM093-PropA5 which proposed a discussion on retaining or removing the frozen-at-sea head-on exemption into the future.

10.2 Contracting Party (agency) regulatory proposals

10.2.1 Alaska CDQ Leasing in IPHC Regulatory Area 4

71. The Commission **NOTED** paper IPHC-2017-IM093-PropB1 which proposed IPHC Regulation changes to allow the use of leased Individual Fishing Quota (IFQ) by Community Development Quota (CDQ) organizations in IPHC Regulatory Areas 4B, 4C, 4D and 4E.

10.2.2 Clarify Alaska Sport Fishery Regulations

72. The Commission **NOTED** paper IPHC-2017-IM093-PropB2 which proposed a clarification to the IPHC Regulations regarding retention of Pacific halibut caught in the recreational charter fisheries in IPHC Regulatory Areas 2C and 3A.

10.2.3 Clarify Head-On Weight Requirement in Alaska Commercial Fisheries

73. The Commission **NOTED** paper IPHC-2017-IM093-PropB3 which proposed clarifications to the IPHC Regulations regarding the landing of Pacific halibut with the head on.

10.3 Stakeholder regulatory proposals

10.3.1 Commercial Catch Limits (Sect. 11): Proposals

74. The Commission **NOTED** paper IPHC-2017-IM093-PropC1 which summarises catch limit proposals received from stakeholders to date. Entries in the table reflect the individual proposals, and unless otherwise noted, proposals are expressed as TCEY (with values in millions of pounds) for particular IPHC Regulatory Areas or as a total for the whole coast.

10.3.2 Other stakeholder regulatory proposals

75. The Commission **NOTED** papers IPHC-2017-IM093-PropC2-14 which provided the Commission with 13 regulatory proposals from various stakeholders, for potential adoption and implementation in the 2018 fishing season, as detailed below.
    - IPHC-2017-IM093-PropC2 Preserving catch on private live-aboard vessels (A. Cooper)
    - IPHC-2017-IM093-PropC3 For unguided sport fishing (P. Phillips)
    - IPHC-2017-IM093-PropC4 Sport Fishing for Halibut - Cleaning Regulations (S. Riehemann)
    - IPHC-2017-IM093-PropC5 Elimination of skin-on regulation (J. Shirk)
    - IPHC-2017-IM093-PropC6 Live-aboard processing exemption (D. Robertson)
    - IPHC-2017-IM093-PropC7 Eliminate the requirement for a CHP (S. Riehemann)
    - IPHC-2017-IM093-PropC8 Allow shellfish pots on board (ALFA)
    - IPHC-2017-IM093-PropC9 Processing halibut greater than four filets (M. Cowart)
    - IPHC-2017-IM093-PropC10 Halibut length measurement method (R. Yamada)
    - IPHC-2017-IM093-PropC11 Long term storage aboard pleasure vessels (L. Thompson)

- IPHC-2017-IM093-PropC12 Long term storage on cruising vessels (W. Cornell)
- IPHC-2017-IM093-PropC13 Halibut in Bering Sea pots (J. Kauffman)
- IPHC-2017-IM093-PropC14 Status Quo Harvest Measures for Guided Anglers in Area 3A (R. Yamada)

76. The Commission **NOTED** that the IPHC Secretariat will develop an accompanying *Implementation Note*, detailing how each of the proposals could be implemented, as well as any complications. This may or may not include specific regulatory text additions or amendments. These will be considered at the 94th Annual Meeting of the IPHC in January 2018.

10.4 Stakeholder statements

77. The Commission **NOTED** that no 'stakeholder statements' were submitted prior to the submission deadline.

11. PERFORMANCE REVIEW

11.1 Update on progress regarding the implementation of the 1st IPHC Performance Review recommendations

78. The Commission **NOTED** paper IPHC-2017-IM093-13 which detailed the current status of implementation for each of the recommendations arising from the Report of the 1st IPHC Performance Review Panel (PRIPHC01).
79. The Commission **AGREED** to review the status table provided at Appendix I of paper IPHC-2017-IM093-13 and to provide comment prior to the 94th Session of the IPHC Annual Meeting for incorporation into the document as necessary.

11.2 2nd IPHC Performance Review: update

80. The Commission **NOTED** paper IPHC-2017-IM093-14 which provided the Commission with an update on progress regarding the 2nd Performance Review of the IPHC (PRIPHC02) and an opportunity to direct the IPHC Secretariat regarding its completion.
81. The Commission **AGREED** that there was still scope for further modifications to the terms of reference and criteria, and that these would be communicated at the 94th Annual Meeting in January 2018 for consideration and potential inclusion.
82. **NOTING** the Legal analysis of the IPHC Convention undertaken by the consultant (Appendix II of paper IPHC-2017-IM093-14), the Commission **AGREED** that each Contracting Party should undertake a detailed review of the legal analysis, and to present comments for consideration at the 94th Annual Meeting in January 2018. The intention is that the Legal review will form part of the information considered by the 2nd Performance Review Panel, among other documents, throughout 2018.

12. FINANCE AND ADMINISTRATION

12.1 Financial Statement for FY2017

83. The Commission **NOTED** paper IPHC-2016-IM092-17 which provided a draft end of year financial statement for the Commission (financial period: 1 October 2016 to 30 September 2017).
84. The Commission **NOTED** the contributions (in USD) received from Contracting Parties as follows:
    a) Canadian Contribution – In FY2017, the Canadian government contributed **$1,507,000** to the IPHC. The Canadian contributions included **$848,720** for general contributions (which has been unchanged since 2003), as well as a separate amount of **$95,508** to cover pension deficit payments as well as a one-time payment of the Canadian share of pension deficits of **$563,476**.
    b) U.S.A. Contribution – In FY2017, the U.S. Government appropriated **$4,160,000** to the IPHC. The U.S. contributions included funding for pension deficits and headquarters lease costs.

85. The Commission **NOTED** that FY2017 preliminary expenses were 96% of the projected budget (General Expenses at **$11,313,018**, and Income was 104% of the projected budget at **$10,117,619**).

12.2 Handling of the annual budget carryover

86. The Commission **NOTED** paper IPHC-2017-IM093-16 which provided the methodology to be used for parsing the IPHC General and Supplemental Fund carryovers into two distinct accounts. These accounts will be used to independently track annual carryovers related to IPHC Core operations and to the fisheries-independent setline survey and other related setline survey program income and expenses.

87. The Commission **AGREED** that the IPHC Secretariat should revise the IPHC Financial Regulations (2014) to incorporate the new methodology, for the consideration of the Commission at its 94th Annual Meeting in January 2018.

88. The Commission **AGREED** that a goal of revenue neutrality for resource use (fish sales) or long-term revenue neutrality for the IPHC fishery-independent setline survey (FISS) data collections may not be necessary or feasible, particularly given periodic expansion programs into fiscally negatively geared areas. However, the general objective of aligning resource use to cost recovery for research activities should be maintained.

12.3 Budget estimates for FY2018 and FY2019 for approval, and tentatively for FY2020

89. The Commission **NOTED** paper IPHC-2017-IM093-17 which detailed the proposed current (FY2018) budget estimate (financial period: 1 October 2017 to 30 September 2018), as well as that for FY2019 and tentatively for 2020.

90. The Commission **NOTED** that Contracting Party contributions in (USD) for FY2018 are still unresolved but currently indicated as follows:

    a) Canadian Contribution – In FY2018, the Canadian government contribution is estimated at **$1,511,508**. The Canadian contributions includes **$1,453,704** for general contributions (as proposed at the AM093 meeting), as well as an amount of **$54,000** to cover pension deficit payments.

    b) U.S.A. Contribution – In FY2018, indications are that the U.S. Government will appropriate **$4,200,000** to the IPHC. As currently constructed, the U.S. contributions included funding for pension deficits and headquarters lease costs.

91. The Commission **NOTED** that FY2018 anticipated income (in USD) is **$11,831,333** and expenses at **$12,503,971**. The Commission anticipates using **$672,638** from the General/Supplemental carryover for expenses in excess of income.

92. The Commission **NOTED** that new contributions levels are required from both U.S. and Canadian governments for pension shortfall payments based on the 2017 International Fisheries Commissions Pension Society triennial valuation of IPHC pension liabilities. These new payment levels begin in January 2018.

93. The Commission **NOTED** that the fiscal year 2018 and 2019 information being presented is preliminary and the final FY2018 and FY2019 budgets will be presented and approved at the 94th Annual Meeting in January 2018.

12.4 Draft: IPHC Financial Regulations (2018)

94. The Commission **NOTED** paper IPHC-2017-IM093-18 which provided the Commission with an initial opportunity to consider proposed amendments to the IPHC Financial Regulations.

95. The Commission **NOTED** that a detailed revision of the IPHC Financial Regulations will be provided for consideration at the 94th Session of the IPHC Annual Meeting in January 2018.

12.5 Independent auditor's report (2016)

96. The Commission **NOTED** paper IPHC-2017-IM093-19 was not available for consideration at the IM093, but would be provided for review at the 94th Annual Meeting in January 2018.

13. Other business

13.1 Preparation for 94th Session of the IPHC Annual Meeting (2018)

97. The Commission **NOTED** paper IPHC-2017-IM093-20 which provided an opportunity to direct preparations for the 94th Session of the IPHC Annual Meeting, to be held in Portland, OR, USA, from 22-26 January 2018.

98. The Commission **NOTED** that information concerning the meeting, including electronic versions of documents to be considered, will be published on the IPHC website as they become available, but no later than 30 days prior to the commencement of the Session (23 December 2017), in accordance with Rule 8.4 of the IPHC Rules of Procedure (2017).

13.2 Date and place of the 94th and 95th Sessions of the IPHC Interim Meeting (2018 and 2019)

99. The Commission **NOTED** paper IPHC-2017-IM093-21 which provided an opportunity to direct the IPHC Secretariat with regard to future sessions of the IPHC Interim Meeting.

100. The Commission **NOTED** the potential scheduling conflicts around the 95th Session of the IPHC Interim Meeting (IM095, 2019), with a view toward making a decision regarding IM095 no later than January 2018.

13.3 IPHC meetings calendar (2018-20)

101. The Commission **NOTED** paper IPHC-2017-IM093-21 which provided an opportunity to consider the draft IPHC meetings calendar (2018-20).

102. The Commission **AGREED** that any changes to the draft calendar would be considered and approved at the 94th Session of the IPHC Annual Meeting in January 2018.

13.4 News release

103. The Commission **AGREED** to consider the draft news release inter-sessionally for approval.

14. Review of the draft and adoption of the report of the 93rd Session of the IPHC Interim Meeting (IM093)

104. The report of the 93rd Session of the IPHC Interim Meeting (IPHC-2017-IM093-R) was **ADOPTED** via correspondence on 02 December 2017, including the consolidated set of recommendations and requests arising from IM093, provided at Appendix V.

APPENDIX I
LIST OF PARTICIPANTS FOR THE 93RD SESSION OF THE IPHC INTERIM MEETING (IM093)

Commission Officers

Chairperson	Vice-Chairperson
Dr James **Balsiger (United States of America)**	Mr Paul **Ryall** (Canada)

Commissioners

Canada	United States of America
Mr Paul **Ryall**	Dr James **Balsiger**
Mr Jake **Vanderheide**	Mr Robert **Alverson**
Mr Ted **Assu**	Ms Linda **Behnken**

Advisors/experts

Mr Neil **Davis**	Mr C. Colin **Brinkman**
Mr Adam **Keizer**	Mr John **Lepore**
Mr Allen (Rob) **Kronlund**	Dr Carey **McGilliard**
Mr Shane **Petersen**	Mr Brian **McTague**

Observers

Participant	Organisation	Email
Alison **Davies**	Organisations Work	aesaundersdavies@gmail.com
Anthony **Charles**	Lower Elwha Tribe	anthony.charles@elwha.org
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James **Johnson**	Deep Sea Fishermen's Union of the Pacific	jj.deepseafishermensunion@gmail.com
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Marilyn **Robertson**	Sport fisherman	
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Trent **Hartill**	ADFW	trent.hartill@alaska.gov
Yashwant **Meghare**	University of Washington	yashmeghare@yahoo.com

IPHC Secretariat

Dr David Wilson
Mr Stephen Keith
Mr Claude Dykstra
Ms Lara Erikson
Ms Jamie Goen
Dr Allan Hicks
Dr Timothy Loher
Ms Lauri Sadorus
Dr Ian Stewart
Dr Ray Webster
Ms Tracee Geernaert
Mr Tom Kong
Mr Jay Walker
Mr Keith Jernigan
Dr Josep Planas
Mr Michael Larsen
Ms Aregash Tesfatsion
Ms Kelly Chapman
Ms Tamara Briggie

APPENDIX II
AGENDA FOR THE 93RD SESSION OF THE IPHC INTERIM MEETING (IM093)

Date: 28–29 November 2017
Location: Seattle, Washington, USA
Venue: Grand Hyatt Seattle; Room: Leonesa III
Time: 09:00-17:00 daily
Chairperson: Dr Jim Balsiger (United States of America)
Vice-Chairperson: Mr Paul Ryall (Canada)

1. OPENING OF THE SESSION (Chairperson)

2. ADOPTION OF THE AGENDA AND ARRANGEMENTS FOR THE SESSION (Chairperson)

3. UPDATE ON ACTIONS ARISING FROM THE 93rd ANNUAL MEETING (D. Wilson)

4. REPORT OF THE IPHC SECRETARIAT (2017): Draft (D. Wilson)

5. FISHERY STATISTICS (2017) (J. Goen & L. Erikson)

6. STOCK STATUS OF PACIFIC HALIBUT (2017) AND HARVEST DECISION TABLE

6.1 Fishery Independent Setline Survey (FISS) design and implementation in 2017, including current and future expansions (J. Goen & T. Geernaert)
6.2 Space-time modelling of survey data (WPUE; survey expansion results, etc.) (R. Webster)
6.3 Data overview and preliminary stock assessment (2017), and draft harvest decision table (2017) (I. Stewart, A. Hicks, R. Webster & D. Wilson)
6.4 Draft: Pacific halibut catch tables (I. Stewart)

7. MANAGEMENT STRATEGY EVALUATION

7.1 IPHC Management Strategy Evaluation: update (A. Hicks & I. Stewart)
7.2 Report of the 10th Session of the IPHC Management Strategy Advisory Board (MSAB10) (A. Keizer)
7.3 Review of fishery goals and objectives: Commission directive (Chairperson)
7.4 Discussion of allocation principles (Chairperson)

8. IPHC RESEARCH AND 5-YEAR RESEARCH PROGRAM

8.1 IPHC Research Advisory Board – Update (D. Wilson)
8.2 Report of the 11th Session of the IPHC Scientific Review Board (SRB11) (M. Mangel)
8.3 IPHC 5-year Biological & Ecosystem Science research program: update (J. Planas)
8.4 Evaluation of the IPHC's 32" minimum size limit (I. Stewart & A. Hicks)

9. CONTRACTING PARTY (AGENCY) UPDATES

9.1 Fisheries and Oceans Canada (DFO)
9.2 NOAA – National Marine Fisheries Service (NMFS)
9.3 North Pacific Fishery Management Council (NPFMC)
9.4 Pacific Fishery Management Council (PFMC)

10. REGULATORY PROPOSALS FOR THE 2017-18 PROCESS

10.1 IPHC Secretariat regulatory proposals (S. Keith & J. Goen)
10.2 Contracting Party (agency) regulatory proposals (Agency staff)
10.3 Stakeholder regulatory proposals (S. Keith)

10.4 Stakeholder statements (S. Keith)

11. IPHC PERFORMANCE REVIEW

11.1 Update on progress regarding the implementation of the 1st IPHC Performance Review recommendations (S. Keith & D. Wilson)

11.2 2nd IPHC Performance Review: Update (D. Wilson)

- Discussion of Legal Review of the IPHC Convention

12. FINANCE AND ADMINISTRATION

12.1 Financial Statement for FY2017 (M. Larsen)

12.2 Handling of the annual budget carryover (M. Larsen & D. Wilson)

12.3 Budget estimates for FY2018 and FY2019 for approval, and tentatively for FY2020 (M. Larsen & D. Wilson)

12.4 Draft: IPHC Financial Regulations (2018) (M. Larsen & S. Keith)

12.5 Independent auditor's report (2016) (M. Larsen)

13. OTHER BUSINESS

13.1 Preparation for 94th Session of the IPHC Annual Meeting (2018) (S. Keith)

13.2 Date and place of the 94th and 95th Sessions of the IPHC Interim Meeting (2018 and 2019) (S. Keith)

13.3 IPHC meetings calendar (2018-20) (S. Keith)

13.4 News Release (S. Keith)

14. REVIEW OF THE DRAFT AND ADOPTION OF THE REPORT OF THE 93rd SESSION OF THE IPHC INTERIM MEETING (IM093)

14.1 Draft Report (Chairperson and Executive Director)

APPENDIX III
LIST OF DOCUMENTS FOR THE 93RD SESSION OF THE IPHC INTERIM MEETING (IM093)

Document	Title	Availability
IPHC-2017-IM093-01	Draft: Agenda & Schedule for the 93rd Session of the IPHC Interim Meeting (IM093)	✓ 22 Aug 2017 ✓ 14 Oct 2017 ✓ 27 Nov 2017
IPHC-2017-IM093-02	Draft: List of Documents for the 93rd Session of the IPHC Interim Meeting (IM093)	✓ 14, 31 Oct 2017 ✓ 8, 10 Nov 2017 ✓ 27 Nov 2017
IPHC-2017-IM093-03	Update on actions arising from the 93rd Annual Meeting (IPHC Secretariat)	✓ 24 Oct 2017
IPHC-2017-IM093-04	Report of the IPHC Secretariat (2017): Draft (IPHC Secretariat)	✓ 26 Oct 2017
IPHC-2017-IM093-05 Rev_1	Fishery statistics (2017): Draft (J. Goen & L. Erikson)	✓ 27 Oct 2017 ✓ 27 Nov 2017
IPHC-2017-IM093-06	Fishery Independent Setline Survey (FISS) design and implementation in 2017, including current and future expansions (J. Goen & T. Geernaert)	✓ 26 Oct 2017
IPHC-2017-IM093-07	Space-time modelling of IPHC fishery-independent setline survey data (R. Webster)	✓ 27 Oct 2017
IPHC-2017-IM093-08	Summary of the data, stock assessment, and harvest decision table for Pacific halibut (*Hippoglossus stenolepis*) at the end of 2017 (I. Stewart, A. Hicks, R. Webster & D. Wilson)	✓ 27 Nov 2017
IPHC-2017-IM093-09	Preliminary Pacific halibut catch tables for 2018 (I. Stewart)	✓ 27 Nov 2017
IPHC-2017-IM093-10	IPHC Management Strategy Evaluation (MSE): update (A. Hicks & I. Stewart)	✓ 8 Nov 2017
IPHC-2017-IM093-11	IPHC 5-year Biological and Ecosystem Science research program: update (J. Planas)	✓ 29 Oct 2017
IPHC-2017-IM093-12	Evaluation of the IPHC's 32" minimum size limit (I. Stewart & A. Hicks)	✓ 18 Oct 2017
IPHC-2017-IM093-13	Update on progress regarding the implementation of the 1st IPHC Performance Review recommendations (S. Keith & D. Wilson)	✓ 16 Oct 2017
IPHC-2017-IM093-14	2nd IPHC Performance Review: Update (D. Wilson)	✓ 16 Oct 2017
IPHC-2017-IM093-15	Financial Statement for FY2017 (M. Larsen)	✓ 30 Oct 2017
IPHC-2017-IM093-16	Handling of the annual budget carryover (M. Larsen)	✓ 29 Oct 2017
IPHC-2017-IM093-17	Budget estimates for FY2018 and FY2019 (for approval) and tentatively for 2020 (M. Larsen & D. Wilson)	✓ 10 Nov 2017
IPHC-2017-IM093-18	Draft: IPHC Financial Regulations (2018) (M. Larsen & S. Keith)	✓ 29 Oct 2017
IPHC-2017-IM093-19	Independent auditor's report (2016) (M. Larsen)	***Pending***
IPHC-2017-IM093-20	Preparation for the 94th Session of the IPHC Annual Meeting (2018) (S. Keith)	✓ 26 Oct 2017
IPHC-2017-IM093-21	Date and place of the 94th and 95th Sessions of the IPHC Interim Meeting (2018 and 2019) and the IPHC Work Meetings (S. Keith)	✓ 27 Oct 2017

IPHC-2017-IM093-22	Draft: IPHC meetings calendar (2018-20) (S. Keith)	✓ 27 Oct 2017
Contracting Party (Agency) updates		
IPHC-2017-IM093-AR01	Fisheries and Oceans Canada (DFO)	***None provided***
IPHC-2017-IM093-AR02	NOAA – National Marine Fisheries Service (NMFS)	***None provided***
IPHC-2017-IM093-AR03	North Pacific Fishery Management Council (NPFMC)	✓ 22 Nov 2017
IPHC-2017-IM093-AR04	Pacific Fishery Management Council (PFMC)	***None provided***
Regulatory proposals for 2018		
IPHC Secretariat regulatory proposals for 2018		
IPHC-2017-IM093-PropA1	IPHC Closed Area (Sect. 10) (IPHC Secretariat)	✓ 27 Oct 2017
IPHC-2017-IM093-PropA2	Fishing Periods (Sect. 8) (IPHC Secretariat)	✓ 26 Oct 2017
IPHC-2017-IM093-PropA3	Removal of exemption for Vessel Monitoring System requirement for IPHC Regulatory Area 4 clearances (Sect. 15) (IPHC Secretariat)	✓ 27 Oct 2017
IPHC-2017-IM093-PropA4	IPHC Fishery Regulations: minor amendments (IPHC Secretariat)	✓ 27 Oct 2017
IPHC-2017-IM093-PropA5	Discussion paper: Frozen-at-sea exemption for head-on requirement (Sect. 13) (IPHC Secretariat)	✓ 27 Oct 2017
Contracting Party (Agency) regulatory proposals for 2018		
IPHC-2017-IM093-PropB1	CDQ Leasing in IPHC Regulatory Area 4 (NMFS)	✓ 29 Oct 2017
IPHC-2017-IM093-PropB2	Clarify sport fishing regulations in Regulatory Areas 2C and 3A (NMFS)	✓ 29 Oct 2017
IPHC-2017-IM093-PropB3	Clarify head-on requirement in Alaska Commercial Fisheries (NMFS)	✓ 29 Oct 2017
Other Stakeholder regulatory proposals for 2018		
IPHC-2017-IM093-PropC1	Catch limit proposals (Sect. 11) (Various)	✓ 29 Oct 2017
IPHC-2017-IM093-PropC2	Preserving catch on private live-aboard vessels (A. Cooper)	✓ 16 Aug 2017
IPHC-2017-IM093-PropC3	For unguided sport fishing (P. Phillips)	✓ 14 Sept 2017
IPHC-2017-IM093-PropC4	Sport Fishing for Halibut - Cleaning Regulations (S. Riehemann)	✓ 22 Sept 2017
IPHC-2017-IM093-PropC5	Elimination of skin-on regulation (J. Shirk)	✓ 16 Oct 2017
IPHC-2017-IM093-PropC6	Live-aboard processing exemption (D. Robertson)	✓ 17 Oct 2017
IPHC-2017-IM093-PropC7	Eliminate the requirement for a CHP (S. Riehemann)	✓ 20 Oct 2017
IPHC-2017-IM093-PropC8	Allow shellfish pots on board (ALFA)	✓ 23 Oct 2017
IPHC-2017-IM093-PropC9	Processing halibut greater than four filets (M. Cowart)	✓ 24 Oct 2017
IPHC-2017-IM093-PropC10	Halibut length measurement method (R. Yamada)	✓ 26 Oct 2017
IPHC-2017-IM093-PropC11	Long term storage aboard pleasure vessels (L. Thompson)	✓ 26 Oct 2017
IPHC-2017-IM093-PropC12	Long term storage on cruising vessels (W. Cornell)	✓ 26 Oct 2017
IPHC-2017-IM093-PropC13	Halibut in Bering Sea pots (J. Kauffman)	✓ 27 Oct 2017
IPHC-2017-IM093-PropC14	Status Quo Harvest Measures for Guided Anglers in Area 3A (R. Yamada)	✓ 27 Oct 2017

Reports from IPHC subsidiary bodies		
IPHC-2017-SRB10-R	Report of the 10th Session of the IPHC Scientific Review Board (SRB10)	✓ 4 Oct 2017
IPHC-2017-SRB11-R	Report of the 11th Session of the IPHC Scientific Review Board (SRB11)	✓ 4 Oct 2017
IPHC-2017-MSAB09-R	Report of the 9th Session of the IPHC Management Strategy Advisory Board (MSAB09)	✓ 4 Oct 2017
IPHC-2017-MSAB10-R	Report of the 10th Session of the IPHC Management Strategy Advisory Board (MSAB10)	✓ 27 Oct 2017
IPHC-2017-PAB022-R	Report of the 22nd Session of the IPHC Processor Advisory Board (PAB022)	✓ 4 Oct 2017
IPHC-2017-CB087-R	Report of the 87th Session of the IPHC Conference Board (CB87)	✓ 4 Oct 2017
Information papers		
IPHC-2017-IM093-INF01	Understanding the IPHC harvest decision table (2017) (I. Stewart)	✓ 26 Oct 2017

APPENDIX IV
IPHC RESEARCH PROJECTS

Part a: Summary of research projects proposed for 2018.

Project #	Project Name	Priority	Budget ($US)	External funding for FY2018 ($US)	Management implications
New Projects					
2018-01	Influence of thermal history on growth	High	136,004	-	Changes in biomass/size-at-age
2018-02	Adult captive holding studies	High-Medium	58,395	-	Changes in biomass/size-at-age/distribution
2018-03	Whale detection methods	High	37,511	-	Mortality estimation
2018-04	Larval connectivity	High	20,000	-	Larval distribution
Continuing Projects					
621.16	Development of genetic sexing techniques	High	33,928	-	Sex composition of catch
642.00	Assessment of mercury and other contaminants	Medium	8,600	-	Environmental effects
650.18	Archival tags: tag attachment protocols	High	800	-	Adult distribution
650.21	Investigation of halibut dispersal in Area 4B	High	6,800	-	Spawning areas
661.11	*Ichthyophonus* incidence monitoring	Medium	8,755	-	Environmental effects
669.11	At-sea collection of halibut weight to reevaluate conversion factors	High	7,645	-	Length-weight relationship
670.11	Wire tagging of halibut on NMFS trawl and setline surveys	High	12,840	-	Juvenile and adult distribution
672.12	Condition factors for tagged U32 Fish	High	9,116	-	DMR estimates
672.13	Discard mortality rates and injury classification profile by release method	High-Medium	1,037	255,402	DMR estimates
673.13	Sequencing the Pacific halibut genome	High	32,500	-	Environmental effects
673.14	Identification and validation of markers for growth	High	25,681	57,773	Changes in biomass/size-at-age
674.11	Full characterization of the annual reproductive cycle	High	121,488	-	Maturity assessment
675.11	Tail pattern recognition	High	3,900	-	Juvenile and adult distribution
	Total - New Projects ($US)		**$251,910**		
	Total - Continuing Projects ($US)		**$273,090**		
	Overall Total (all projects) ($US)		**$525,000**		
	External Funding (for FY2018) ($US)			**$313,175**	

Part b: Summary of research projects awarded for external funding in 2017.

Project #	Grant agency	Project name	Partners	IPHC Budget ($US)	PI	Management implications	Grant period
1	**S-K NOAA**	Improving discard mortality rate estimates in the Pacific halibut by integrating handling practices, physiological condition and post-release survival (Award No. NA17NMF4270240)	Alaska Pacific University, Anchorage, AK	$286,121	Planas (lead PI) Dykstra Loher Stewart Hicks	Bycatch estimates	September 2017 – August 2019
2	**NPRB**	Somatic growth processes in the Pacific halibut (*Hippoglossus stenolepis*) and their response to temperature, density and stress manipulation effects (Award No. 1704)	AFSC-NOAA-Newport, OR	$131,891	Planas (lead PI) Rudy Loher	Changes in biomass/size-at-age	September 2017 – August 2019
			Total awarded ($)	**$418,012**			

APPENDIX V

CONSOLIDATED SET OF RECOMMENDATIONS AND REQUESTS OF THE 93RD SESSION OF THE IPHC INTERIM MEETING (IM093) (28-29 NOVEMBER 2017)

RECOMMENDATIONS

Report of the IPHC Secretariat (2017)

IM093–Rec.01 (para. 6) The Commission **RECOMMENDED** that the IPHC Secretariat develop a working paper for consideration at the 94th Annual Meeting, containing the following:

a) A detailed description of how the Regulatory Area 2A commercial fishery (derby) is managed, including roles and responsibilities of agencies, the PFMC and the IPHC; and

b) An update to the analysis of various fishing periods and fishing period limits provided to the PFMC in September 2017, including the addition of 2- and 5-day fishing periods.

Review of fishery goals and objectives: Commission directive

IM093–Rec.02 (para. 38) **NOTING** the goals and objectives related to distributing the TCEY presented during the meeting by the U.S.A. (Table 3), the Commission **RECOMMENDED** that they be considered at the 94th Annual Meeting in January 2018 after soliciting input from stakeholders.

REQUESTS

Fishery statistics (2017)

IM093–Rec.01 (para. 8) **NOTING** Appendix I of paper IPHC-2017-IM093-05 Rev_1 was provided the evening prior to the Interim Meeting, and detailed information available on bycatch levels among all gears/sectors, as requested by the Commission at its 93rd Annual Meeting (AM093-Rec.09), the Commission **REQUESTED** that the IPHC Secretariat facilitate consideration of the information inter-sessionally, so that the Commission may provide further guidance on the type of information it requires, for consideration at the 94th Annual Meeting in January 2018.

Space-time modelling of survey data (WPUE; survey expansion results, etc.)

IM093–Req.02 (para. 17) The Commission **REQUESTED** that the IPHC Secretariat examine alternative ways of computing bottom area that account for bathymetry, noting that the current method involves estimating the surface area of the ocean.

Data overview and preliminary stock assessment (2017), and draft harvest decision table (2017)

IM093–Req.03 (para. 28) The Commission **REQUESTED** that the IPHC Secretariat provide columns in the decision table, three-year graphical projections, and catch tables for SPR values of 42%, 44%, 48%, and 50% in addition to the 46% SPR that was presented in documents IPHC-2017-IM093-08 and IPHC-2017-IM093-09.

IM093–Req.04 (para. 29) **NOTING** questions arising regarding the specific fisheries contributing to projected bycatch reductions from 2010 to 2017, the Commission **REQUESTED** that the IPHC Secretariat work with NMFS staff to facilitate a report for consideration at the 94th Annual Meeting in January 2018.

Report of the 10th Session of the IPHC Management Strategy Advisory Board (MSAB10)

IM093–Req.05 (para. 36) The Commission **REQUESTED** that the MSAB look at SPR values consistent with recent estimated SPR values from the assessment model and lower. This would mean expanding the lower range of SPR values to below 40%.

Review of fishery goals and objectives: Commission directive

IM093–Req.06 (para. 39) The Commission **REQUESTED** the IPHC Secretariat to consolidate the objectives related to TCEY distribution (Table 3) with the current goals, objectives and performance metrics provided as Appendix IV of the MSAB10 Report, for presentation at the 94th Annual Meeting in January 2018.

Contracting Party (Agency) updates

IM093–Req.07 (para. 61) The Commission **REQUESTED** that the IPHC Secretariat develop a standard template for agency reports to the Commission, in order to improve their structure and consistency, as well as to allow the agencies to prepare the appropriate information at the appropriate level of detail for the Commission's consideration.

Understanding the IPHC's harvest decision table (2018)

PREPARED BY: IPHC SECRETARIAT (I. STEWART; 1 DECEMBER 2017)

PURPOSE

To provide an updated guide to the IPHC's harvest decision table reflecting changes made in response to Commission decisions at the 2017 Annual Meeting (AM093).

CONTEXT

The decision table represents one part of the IPHC's process for setting annual catch limits for Pacific halibut (*Hippoglossus stenolepis*). This process begins with the stock assessment, conducted each fall using the most recent data from the current year's fishery-independent setline survey and fisheries in addition to the historical data included in previous analyses. The stock assessment uses an ensemble of models to estimate the probability distributions describing the current stock size, trend, and demographics. These probability distributions are used to evaluate alternative harvest levels for the upcoming year (and up to three years in the future) such that the Commission and stakeholders can directly compare the trade-offs between potential yield (catch) and the short term risks to the stock and fishery. Additional information for Commission decision making comes in the form of recommendations from the Subsidiary Bodies (Conference Board, Processor Advisory Board, Scientific Review Board) as well as public comment. Regulatory Area-specific catch limits, distributing the coastwide yield found in the harvest decision table, are further informed by the catch tables produced before and during the meetings partitioning all projected mortality by fishery and Regulatory Area.

THE DECISION TABLE

The decision table summarizes the stock assessment results in the form of probability distributions. For the 2018 decision making process, the IPHC Secretariat will provide a modified format of the decision table produced in recent years. The primary change is to exchange the rows and columns, such that management alternatives will now occur as columns across the top of the table, and risk metrics as rows. This will allow for additional metrics to be included (such as 2-year projections), and also to highlight the reference line and other management options of similar magnitude down the center of the table. In this new format, each column of the table represents a different alternative harvest level for the upcoming year. Each column begins with the description of the harvest alternative including the sum of all sources of mortality (total removals), the coastwide Total Constant Exploitation Yield (TCEY; inclusive of all mortality of Pacific halibut except bycatch and commercial Pacific halibut fishery discards less than 26" (66 cm) in length), and the level of fishing intensity (measured as F_{SPR}[1]). The F_{SPR} is the only value that represents an estimate, and therefore an approximate 95% credible interval is reported such that the uncertainty in this estimate is explicit. The columns included in the table are divided into three sections:

1) Low levels of mortality on a coarse grid (~10 million pounds (~4,500 t) of total mortality) intended to illustrate the underlying stock dynamics and effects of low levels of fishing intensity. The first column consists of no anthropogenic removals of any kind from the stock.

[1] SPR denotes the Spawning Potential Ratio, the equilibrium reduction in the female spawning output per fish estimated to occur under a given level of fishing. This value ranges from 100% in the absence of all fishing mortality to 0% at a level of fishing under which each female fish would be estimated to have no reproductive output. It reflects current size-at-age, maturity, fecundity and fishery selectivity information.

2) A finer grid of catch limits (in ~ 1-2 million pound (450-900 t) increments) centered on the reference level of fishing intensity (SPR=46%). The reference level represents the average fishing intensity over the period 2014-2016, and was selected during the 2017 AM as an interim point of comparison pending results from the IPHC's ongoing Management Strategy Evaluation (MSE) process.
3) High levels of mortality (again on a coarse grid) for evaluating the effects of very high fishing intensity.

Additional columns are added as needed during the decision making process in order to place specific alternatives in context, e.g. historically, these have included the previous year's catch limits, alternative harvest rates, incremental changes between specific alternatives, and others. It is anticipated that one or more alternative fishing intensity levels will be included this year for comparison with MSE results.

The body of the table represents the probability (in times out of 100; this can be thought of as a percent or a ratio) estimated from the assessment ensemble of a specific outcome for set of management risk metrics. These metrics are divided into four categories:

1) ***Stock trend*** (rows a-f). Stock trend is defined as the probability of a decrease in female spawning biomass. This probability is estimated after the first year of the projection (row a), two years (row c), and three years into the future (row e). In order to gauge the severity of any projected decrease, the probability of at least a 5% decrease is also reported for one year (row b), two year (row d), and three year (row f) projections. Projections are limited to three years in order to avoid substantial influence of incoming year-classes (cohorts) that are not yet well informed by observed data. These risk metrics are independent of any harvest strategy policy considerations.

2) ***Stock status*** (rows g-l). Stock status is calculated relative to the threshold and limit female spawning biomass reference points used in the IPHC's historical harvest policy. The risk metrics are the probability of dropping (or remaining) below the $SB_{30\%}$[2] threshold (at which the historical harvest policy suggested a reduction in fishing intensity) in one year (row g), two years (row i), or three years (row k) or the $SB_{20\%}$ limit reference point (at which the historical harvest policy suggested suspending directed fishing) in one through three years (rows h,j, and l).

3) ***Fishery trend*** (rows m-r). Fishery trend reflects the probability that the TCEY would have to be reduced in order to achieve the reference level of fishing intensity after one year (row m), two years (row o), and three years (row q). In order to gauge the severity of any projected decrease, the probability of at least a 10% decrease is also reported for one year (row n), two year (row p), and three year (row r) projections.

4) ***Fishery status*** (row s). Fishery status reflects the probability that the catch level for that row would result in a fishing intensity that exceeds the reference level (SPR=46%). By definition, the column corresponding to the reference level of fishing intensity will have a probability of 50/100 (or 50%). The IPHC does not currently have a limit reference point (i.e., an overfishing level) for evaluation in this section of the table.

An example harvest decision table is provided on the next page.

[2] SB30% and SB20% are currently calculated using historical definitions of average recruitment and average spawning biomass per recruit. These calculations are under review during 2017 and may be replaced with dynamic reference points that better reflect current stock biology in the future.

Example decision table illustrating the new format for the 2018 decision making process.

		2018 Alternative	**No removals**						***Reference: SPR=46%***							
		Total removals (M lb)	**0.0**													
		TCEY (M lb)	**0.0**													
		Fishing intensity	**$F_{100\%}$**						**$Fxx_{\%}$**							
		Fishing intensity interval	--						xx-xx%							
Stock Trend (spawning biomass)	**in 2019**	**is less than 2018**														**a**
		is 5% less than 2018														**b**
	in 2020	**is less than 2018**														**c**
		is 5% less than 2018														**d**
	in 2021	**is less than 2018**														**e**
		is 5% less than 2018														**f**
Stock Status (Spawning biomass)	**in 2019**	**is less than 30%**														**g**
		is less than 20%														**h**
	in 2020	**is less than 30%**														**i**
		is less than 20%														**j**
	in 2021	**is less than 30%**														**k**
		is less than 20%														**l**
Fishery Trend (TCEY)	**in 2019**	**is less than 2018**														**m**
		is 10% less than 2018														**n**
	in 2020	**is less than 2018**														**o**
		is 10% less than 2018														**p**
	in 2021	**is less than 2018**														**q**
		is 10% less than 2018														**r**
Fishery Status (Fishing intensity)	**in 2018**	**is above $F_{46\%}$**	**0**						**50**							**s**

IPHC Regulatory Area 2A Directed commercial Pacific halibut fishery *management overview and fishing period options (2- and 5-days)*

PREPARED BY: IPHC SECRETARIAT (19 DECEMBER 2017)

PURPOSE

To provide a description of the IPHC Regulatory Area 2A Pacific halibut directed commercial fishery management, and an update of fishing period options in response to the Commission recommendation at the 2017 Interim Meeting (IM093-Rec.01).

BACKGROUND

The directed commercial Pacific halibut fishery in IPHC Regulatory Area 2A is one of the last commercial derby fisheries in the United States of America, operating as a series of potential 10-hr openings on pre-selected dates dependent on quota (catch limit) remaining in the fishery allocation. While commercial Pacific halibut fisheries in Alaska and British Columbia have moved to various types of individual fishing quota (IFQ) management by national governments over the years, the IPHC Regulatory Area 2A commercial fisheries have not. The derby-style directed commercial fishery in IPHC Regulatory Area 2A is managed by the IPHC setting fishing period dates, setting fishing period limits in-season by vessel size class, licensing vessels for participation in the fishery, and adopting overall Regulatory Area 2A catch limits in accordance with the Pacific Fishery Management Council's (PFMC's) Pacific halibut Catch Sharing Plan (CSP).

In June 2017, the IPHC Secretariat notified the PFMC via letter that the IPHC Secretariat sees no compelling reason to maintain a commercial derby fishery and several reasons to move away from it, including increased safety-at-sea, reduced wastage, and increased flexibility for fishers and processors (Appendix I). The PFMC, after considering input from its stakeholder advisory body, informally asked the IPHC Secretariat to provide information on potential vessel fishing period limits for longer fishing periods. The IPHC Secretariat provided that information at the PFMC's September 2017 meeting (Appendix II). At the PFMC's November 2017 meeting, the PFMC considered management options for this fishery but decided not to take further action on this issue at this time given other priorities. At the IPHC's Interim Meeting in November 2017, the Commissioners recommended the following:

IM093–Rec.01	***Report of the IPHC Secretariat (2017)*** The Commission **RECOMMENDED** that the IPHC Secretariat develop a working paper for consideration at the 94th Annual Meeting, containing the following: a) A detailed description of how the Regulatory Area 2A commercial fishery (derby) is managed, including roles and responsibilities of agencies, the PFMC and the IPHC; and b) An update to the analysis of various fishing periods and fishing period limits provided to the PFMC in September 2017, including the addition of 2- and 5-day fishing periods.

REGULATORY AREA 2A DIRECTED COMMERCIAL MANAGEMENT, INCLUDING ROLES & RESPONSIBILITIES

There are four commercial Pacific halibut fisheries in IPHC Regulatory Area 2A:

1) a directed commercial fishery south of Pt Chehalis, WA (46°53.30′ N. lat.);
2) an incidental Pacific halibut fishery to the sablefish fishery north of Pt. Chehalis;
3) an incidental fishery to the salmon troll fishery; and
4) a tribal commercial fishery (for the 13 treaty Indian tribes within a defined geographic location (IPHC Regulatory Subarea 2A-1)).

The PFMC's CSP allocates the IPHC-adopted Regulatory Area 2A catch limit among commercial fisheries and other sectors in IPHC Regulatory Area 2A.

For the directed commercial fishery, the IPHC has primary management responsibility for this derby-style fishery. The specific roles and responsibilities for management during a season are as follows:

Pre-season

- PFMC: considers and adopts changes to the CSP which dictates allocation of the catch limit among sectors (Sep., Nov. of the previous year)
- IPHC: adopts the following limits and management measures for the IPHC Regulatory Area 2A Pacific halibut fishery:
    - catch limits, including endorsement of the PFMC's CSP and the resulting sector allocations. (Jan)
    - fishing periods, including a series of potential dates for the directed commercial fishery and specification that it will operate from 0800 hours to 1800 hours local time on those days (IPHC Regulation Section 8 (2)) (range of potential dates in Jan, closure announced when allocation of limit estimated to be attained).
    - fishing period limits, including limits by vessel size class as specified in IPHC Fishery Regulations (2017) Section 11 (1,2,3,6,7) and 12.
    - license procedures, to issue licenses to vessels as specified at IPHC Regulation Section 4 (no fee, no limit on the number of licenses issued, applications due no later than 2359 on 30 April, or on the first weekday in May if 30 April is a Saturday or Sunday) (Apr/May)
- NMFS: implements the resulting catch limits and management measures in US regulations (Feb/Mar)

Inseason

- IPHC: sets the fishing period limits by vessel size class for the first 10-hr opener based on the sector catch limit and the number of licenses issued by vessel size class. IPHC announces via news release and coordinates with NMFS and State Agencies.
- NMFS: deploys observers using similar coverage rates and approach as is used with the limited entry fixed gear groundfish fleet (first covered in 2017).
- IPHC: gathers biological samples from fishery landings in key ports.
- IPHC: reviews fish ticket information immediately following the opener to estimate if enough of the sector catch limit remains for another opener.
- IPHC, NMFS, Pacific State Marine Fisheries Commission (PSMFC), and the State Fish and Wildlife Agencies (Washington, Oregon, California): coordinate on data.

- If enough sector catch limit remains, the process starts over again with IPHC setting fishing period limits by vessel size class. If not, the fishery closes.

Post-season

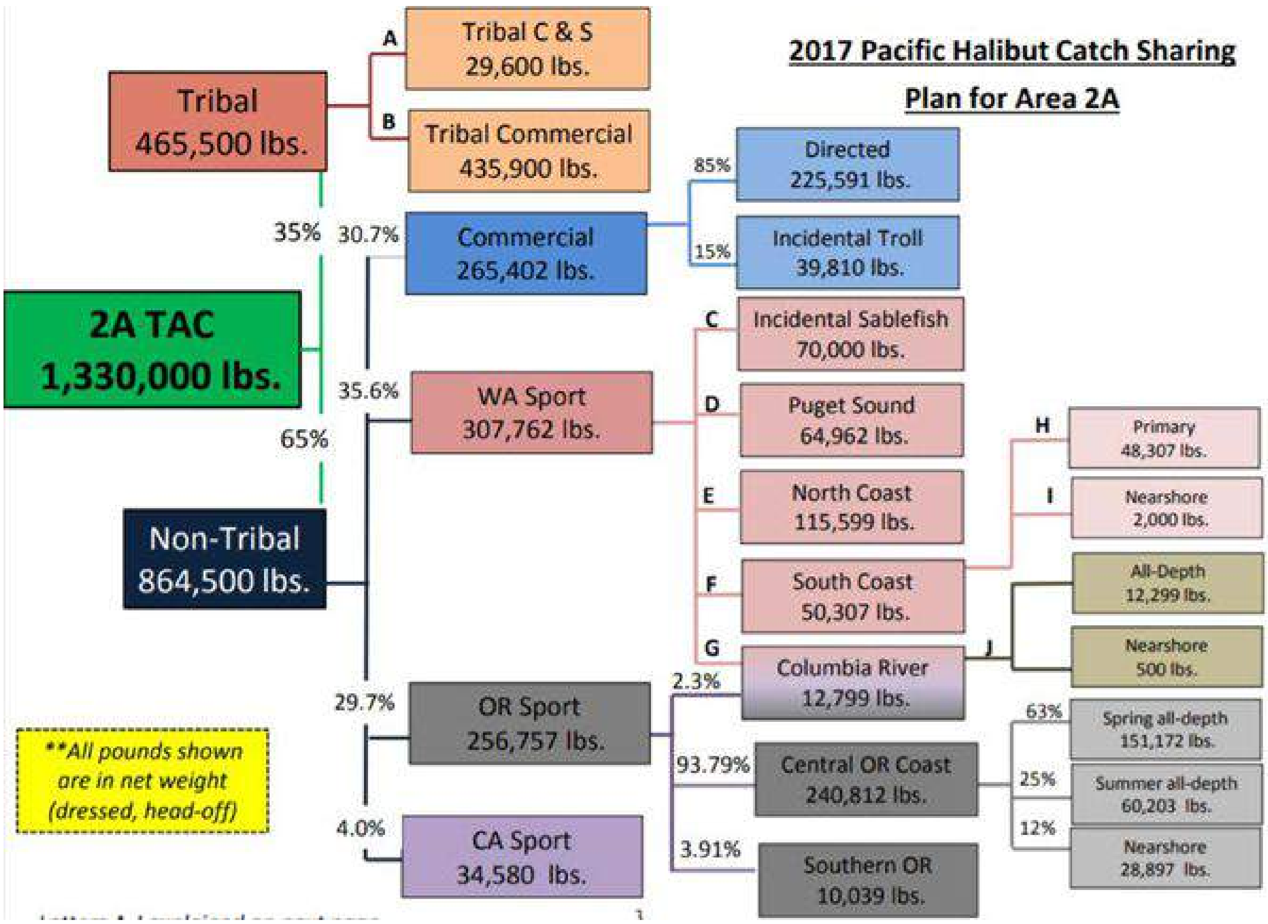
- IPHC, NMFS, PSMFC, and the State Fish and Wildlife Agencies (Washington, Oregon, California): coordinate on data and reporting from the fishery.

At the PFMC's November 2017 meeting under the Pacific halibut agenda item, the PFMC provided a document with a similar exercise of roles and responsibilities under status quo management of the directed commercial fishery as a derby-style fishery (Level 1); as well as how roles and responsibilities would shift under a longer season or an incidental fishery (Level 2), or under limited entry or an IFQ fishery (Level 3) (Agenda Item E.1, Attachment 3, Nov 2017). The table on page 3 of Agenda Item E.1, Attachment 3, summarizes roles and responsibilities under different management scenarios.

Table 1. Scoping Matrix - Management Scenarios for the Non-Indian Directed Commercial Pacific Halibut Fishery

Level	Description	Work Load	Time Demand/ Time Frame	Comment
Level 1 Status Quo	**IPHC** lead in fishery management.	**IPHC**: establishes TAC; issues vessel licenses, identifies vessel classes, vessel limits, fishing periods, conducts biological sampling, data collection & compilation, develops fishery regulations for implementation by **NMFS**. **Council** facilitates preseason public process of developing Area 2A Catch Sharing Plan (CSP) and recommending annual regulations for the upcoming year. **NMFS** implements CSP/ updates regulations compliant with all applicable laws. Coordinates observer coverage with West Coast Groundfish Observer program. **States** monitor fisheries and report landings.	Status Quo **Council** moderate time demand preseason. **IPHC** high time demand throughout. **States** high time demand inseason. **NMFS** moderate time demand preseason and inseason.	Status Quo. Standard Council schedule for Halibut is Sept. and Nov., and sometimes June. Season setting process consistent with Council Operating Procedure (COP). 9
Level 2 Moderate change from Status Quo. (Greater change if include the standard workload for **Council** and **States** involvement, and **NMFS** regulatory process used in incidental retention fisheries).	**Council** to provide greater guidance and recommendations to **IPHC** if no change fishery structure. General framework of CSP intact, with level of revision dependent on level of fishery change. More variability in change at this level.	If changes are moderate: **IPHC:** no change in Status Quo. **Council** works with **NMFS** to develop vessel classes, vessel limits and fishing periods preseason and inseason for recommendation to **IPHC**. **States:** no change in Status Quo, unless want more involvement in developing annual fishery structure, or take over biological sampling. If current fishery structure to change from direct to incidental, **NMFS** take lead for regulations and inseason management, entities follow established pattern of tasks as in other incidental halibut fisheries.	**IPHC** time: No change if fishery structure is status quo. **States** time: no change or slight increase. **Council** time: increase. **NMFS** time increase. TIMEFRAME- *gradual transition potentially over two or three year period.*	Change anticipated in **Council** process and entity workload, but would depend on level of change in current fishery structure. May require change in management schedule (COP 9). Moderate development and implementation costs, and modest to moderate ongoing maintenance costs.
Level 3 Major Change from Status Quo. (Equivalent to FMP amendment to develop programs in terms of workload /process).	**Council** takes lead in fishery management: CSP modified to include detailed framework for fishery and role/responsibilities. Forward plans to **IPHC** for approval.	**NMFS** issues licenses. **Council, NMFS** develop preseason plan for fishery season structure. **NMFS** implements fishery, inseason management. **States** monitor fisheries and report landings, potentially including biological sampling.	**IPHC** time: decrease. **States** time: increase; outreach to develop recommendations. **Council** time: increase. **NMFS** time: increase. TIMEFRAME- *transition potentially over 3-5 year period, perhaps graduating from Level 2.*	Substantial changes for all entities. May require a change in COP 9. **Council** could consider a Halibut Management team or Technical Committee, or increase GAP/GMT membership to account for additional workload. High implementation and on-going maintenance costs.

A diagram of the Regulatory Area 2A CSP for 2017 from a September PFMC meeting document is excerpted below (PFMC, Agenda Item G.1, Attachment 2, Sept 2017)



Additional Analysis of Fishing Periods Options for 2- and 5-days

In September 2017, the IPHC Secretariat provided the PFMC information at their request on how fishing period limits by vessel size class might change with longer fishing periods (Appendix II). The PFMC requested a range of fishing period options to be analyzed from the 10-hr derby (status quo), to a one week, 20-day, or 30-day fishing period. Following the IPHC Interim Meeting in November 2017, the Commissioners requested that the IPHC Secretariat provide additional options of a 2- and 5-day fishing period.

The IPHC's response to the PFMC request, in Appendix II, provides details on licensing the IPHC Regulatory Area 2A fishery, including the number of licenses issued and fished between 2012 – 2017 (Appendix II, Table 1). It also describes the dates of the fishery (Table 2), as well as fishing period limits by vessel size class and estimated landings in recent years (Table 3). The IPHC issues commercial Pacific halibut licenses by the vessel's size (or length) class, which ranges from A to H, with A being the smallest vessels (25 ft and under) and H being the largest (56 ft and over). The heart of the analysis is in Table 4 which provides sample fishing period limits by vessel size class and estimates of landings under each. The table is based on the 2017 directed commercial fishery allocation and the number of licenses IPHC issued for the fishery in 2017. Note that vessels can choose to be licensed in the directed commercial fishery, or in both the directed commercial and the fishery incidental to sablefish. At the bottom of Table 4 in Appendix II, it shows the estimated landings under three scenarios: (1) if all vessels licensed participated and caught their full vessel limit, (2) if only half the licensed vessels participated and landed their full vessel limit, and (3) if only half the licensed vessels participated and only landed half of their vessel limit (this has been the case, generally speaking, under the 10-hr derby). Table 4 from Appendix II has been updated to include estimated fishing period limits under the 2- and 5-day options and is published in this paper as Table 2.

In Appendix II, the 1-week fishery (PFMC Option 1) was expected to have vessel limits for H-class vessels (the largest size class (56+ feet) and used as the reference point when talking about vessel limits) set between 4,000 to 6,000 pounds (1.81 to 2.72 t) (net weight) for the first opening. This was based on using the 2017 allocation of 225,591 pounds (102.33 t) (net weight) and on the number of vessels licensed by size class in 2017. For the 20-day fishery (PFMC Option 2), the IPHC would likely choose fishing period limits based on an H-class limit of 2,000 to 4,000 pounds (0.91 to 1.81 t) (net weight) for the first 20-day fishing period. With a 20-day fishery, as opposed to a 1-week fishery, IPHC would have to be more conservative in setting the vessel limit because with more time to fish, more vessels would likely participate and would more likely catch their vessel limit. For the 30-day fishery (PFMC Option 3), the IPHC would likely choose fishing period limits based on an H-class limit of 2,000 pounds (0.91 t) (net weight) for the first 30-day fishing period. With a 30-day fishery, as opposed to a 1-week or 20-day fishery, IPHC would have to be more conservative in setting the vessel limit because with more time to fish, more vessels would likely participate and would more likely catch their vessel limit.

In summary, based on the 2017 allocation of 225,591 pounds (102.33 t) (net weight) and on the number of vessels licensed by size class, the fishing period limit for H-class vessels in pounds (net weight) of Pacific halibut are estimated to be as follows under a 1-week, 20-day, and 30-day directed commercial fishery with a full breakout by vessel size class in Table 2:

- 1-week 4,000 to 6,000 lbs (1.81 to 2.72 t)
- 20-day 2,000 to 4,000 lbs (0.91 to 1.81 t)
- 30-day 2,000 lbs (0.91 t)

Table 2. Estimated 1-week, 20-day, and 30-day fishing period limits by vessel size class for IPHC Regulatory Area 2A using 2017 allocation and number of licenses.

		1-week				20-day				30-day	
Vessel Size Class		***Vessel Limit (net wt)***									
feet	letter	pounds	metric ton	pounds	metric ton	pounds	metric ton	pounds	metric ton	pounds	metric ton
1-25	A	**335**	0.15	**505**	0.23	**200**	0.09	**335**	0.23	**200**	0.09
26-30	B	**420**	0.19	**630**	0.29	**210**	0.10	**420**	0.29	**210**	0.10
31-35	C	**670**	0.30	**1,010**	0.46	**335**	0.15	**670**	0.46	**335**	0.15
36-40	D	**1,850**	0.84	**2,780**	1.26	**925**	0.42	**1,850**	1.26	**925**	0.42
41-45	E	**1,990**	0.90	**2,990**	1.36	**995**	0.45	**1,990**	1.36	**995**	0.45
46-50	F	**2,385**	1.08	**3,575**	1.62	**1,190**	0.54	**2,385**	1.62	**1,190**	0.54
51-55	G	**2,660**	1.21	**3,990**	1.81	**1,330**	0.60	**2,660**	1.81	**1,330**	0.60
56+	H	**4,000**	1.81	**6,000**	2.72	**2,000**	0.91	**4,000**	2.72	**2,000**	0.91

For a 2- or 5-day fishery, and keeping all other parameters the same (i.e., using 2017 allocation and number of vessels licensed by size class), the fishing period limit for H-class vessels in pounds (net weight) of Pacific halibut are estimated to be as follows with a full breakout by vessel size class in Table 3:

- 2-day 9,000 lbs (4.08 t)
- 5-day ~6,000 lbs (2.72 t)

Table 3. Estimated 2-day and 5-day fishing period limits by vessel size class for IPHC Regulatory Area 2A using 2017 allocation and number of licenses.

		2-day		5-day	
Vessel Size Class		***Vessel Limit (net wt)***			
feet	letter	pounds	metric ton	pounds	metric ton
1-25	A	**755**	0.34	**505**	0.23
26-30	B	**945**	0.43	**630**	0.29
31-35	C	**1,510**	0.68	**1,010**	0.46
36-40	D	**4,165**	1.89	**2,780**	1.26
41-45	E	**4,480**	2.03	**2,990**	1.36
46-50	F	**5,365**	2.43	**3,575**	1.62
51-55	G	**5,985**	2.71	**3,990**	1.81
56+	H	**9,000**	4.08	**6,000**	2.72

With a <u>2-day opener</u> of the directed commercial fishery, the IPHC Secretariat would likely choose fishing period limits based on an H-class limit of 9,000 pounds (4.08 t) (net weight), the same amount generally used for the first 10-hr derby. Given that the 10-hr derby has been open for multiple days (2-3 total days) in recent years, a 2-day opener (i.e., 48-hrs) could be expected to have similar to, but slightly increased landings from recent 10-hr derby openers. Similar to the 10-hr derby, not all licensed vessels would be expected to participate in a 2-day opener. However, they could be expected to catch more of their vessel limit than under a 10-hr derby. With the 2-day opener, the IPHC would expect to have only one opener based on an H-class limit of 9,000 pounds (4.08 t) (net weight).

With a <u>5-day opener</u>, the IPHC Secretariat would likely choose fishing period limits based on an H-class limit of approximately 6,000 pounds (2.72 t) (net weight). The 5-day opener is just slightly shorter than the 1-week fishery (PFMC Option 1) and would therefore be expected to have H-class limits on the higher end of the 1-week option range given that there is less time for all licensed vessels to participate.

Detailed breakouts for each vessel size category under all of these options are provided in Table 4 below. Note that these limits are based on the 2017 allocation and number of licenses issued by size class, both of which will change for 2018. The IPHC Secretariat will set fishing period limits for 2018 before the start of the first opener based on the actual number of licenses issued in 2018 and on the 2018 directed commercial fishery allocation.

Table 4. Estimated fishing period limits by vessel size class and estimated landings (lb, net weight) for IPHC Regulatory Area 2A using 2017 allocation and number of licenses.

				(2-day)		(5-day)		PFMC Option 2 (20-day)			
2017 allocation (lb, net weight)			225,591	Status quo (10-hr derby)		PFMC Option 1 (1-week)				PFMC Option 3 (30-day)	
Vessel Class		***vessel limit ratio***	***2017 # Lic***	***9,000 vessel limit***		***6,000 vessel limit***		***4,000 vessel limit***		***2,000 vessel limit***	
feet	letter			vessel limit	est. landings	vessel limit	est. landings	vessel limit	est. landings	vessel limit	est. landings
1-25	A	0.084	15	**755**	11,325	**505**	7,575	**335**	5,025	**200**	3,000
26-30	B	0.105	11	**945**	10,395	**630**	6,930	**420**	4,620	**210**	2,310
31-35	C	0.168	19	**1,510**	28,690	**1,010**	19,190	**670**	12,730	**335**	6,365
36-40	D	0.463	39	**4,165**	162,435	**2,780**	108,420	**1,850**	72,150	**925**	36,075
41-45	E	0.498	43	**4,480**	192,640	**2,990**	128,570	**1,990**	85,570	**995**	42,785
46-50	F	0.596	36	**5,365**	193,140	**3,575**	128,700	**2,385**	85,860	**1,190**	42,840
51-55	G	0.665	14	**5,985**	83,790	**3,990**	55,860	**2,660**	37,240	**1,330**	18,620
56+	H	1	31	**9,000**	279,000	**6,000**	186,000	**4,000**	124,000	**2,000**	62,000
			208								
If 100% of licenses participate & land 100% of vessel limit					961,415		641,245		427,195		213,995
If 50% of licenses participate & land 100% of vessel limit					480,708		320,623		213,598		106,998
If 50% of licenses participate & land 50% of vessel limit					240,354		160,311		106,799		53,499

RECOMMENDATION/S

That the Commission:

1) **NOTE** paper IPHC-2018-AM094-INF02 which provides a description of the IPHC Regulatory Area 2A Pacific halibut directed commercial fishery management, and an update of fishing period options in response to the Commission recommendation at the 2017 Interim Meeting (IM093-Rec.01).

APPENDICES

Appendix I: Letter to PFMC (Jun 2017)

Appendix II: IPHC Fishing Period Analysis for PFMC (Sept. 2017)

REFERENCES

PFMC 2017. Pacific Halibut Catch Sharing Plan for Area 2A

http://www.pcouncil.org/wp-content/uploads/2017/02/Final_2017_PACIFIC_HALIBUT_CATCH_SHARING_PLAN_FOR_AREA_2A.pdf

PFMC 2017. Visual Representation of the 2017 Area 2A Catch Sharing Plan for Pacific Halibut. Agenda Item G.1, Attachment 2, Sep 2017.

http://www.pcouncil.org/wp-content/uploads/2017/08/G1_Att2_CSP_Visual_SEPT2017BB.pdf

PFMC 2017. Non-Indian Directed Pacific Halibut Fishery Management - Scoping Exercise. Agenda Item E.1, Attachment 3, Nov 2017.

http://www.pcouncil.org/wp-content/uploads/2017/10/E1_Att3_Scoping-Matrix_NOV2017BB.pdf

Appendix I: Letter to PFMC (Jun 2017)

COMMISSIONERS:
ROBERT ALVERSON
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INTERNATIONAL PACIFIC HALIBUT COMMISSION

ESTABLISHED BY A CONVENTION BETWEEN CANADA

AND THE UNITED STATES OF AMERICA

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EL2017066
30 May 2017

Mr. Herb Pollard
Chair, Pacific Fishery Management Council
7700 NE Ambassador Place, Suite 101
Portland, OR 97220-1384

Re: Commercial derby fishery in IPHC Regulatory Area 2A

Dear Mr. Pollard:

The International Pacific Halibut Commission (IPHC) notes that the Pacific Fishery Management Council (Council) is reviewing the Pacific halibut Catch Sharing Plan (CSP) for Regulatory Area 2A during the remainder of this year.

In conjunction with reviewing the CSP, the IPHC recommends for the Council's consideration a change in the management of the non-tribal, directed commercial Pacific halibut fishery in Regulatory Area 2A. This fishery is one of the few remaining derby-style commercial fisheries in the United States of America, concentrating effort into as few as two days of fishing each year at current stock levels.

The IPHC sees no compelling reason to retain the directed commercial Pacific halibut fishery as a derby-style fishery, but a number of advantages in shifting to a management system that reduces the concentration of fishing effort and eliminates or reduces the race to fish. Potential advantages include:

1. Safety. The current derby system offers no flexibility as to when fishing takes place, creating pressure to attempt fishing even in poor weather and dangerous conditions. The U.S. Coast Guard has frequently commented at IPHC meetings in support of moving away from the derby fishery for this reason, and the Coast Guard provided similar input at the Council's March 2017 meeting. We believe that a system offering more flexible fishing opportunities is inherently safer for everyone on the water, and that this is the primary reason for change.

2. Reduced wastage. The current derby system is essentially a race for fish, where fishers have an incentive to set as much gear as possible during the short time available for fishing. When the fishing is good, this leads to more regulatory discards as trip limits are reached than would be the case under a system where the fishers had time to more carefully calibrate their effort to applicable limits. Mortality from these regulatory discards (termed 'wastage' in IPHC management) represents an unnecessary loss to the resource.

3. Flexibility for fishers and processors. Under the current derby system, fresh Pacific halibut from Regulatory Area 2A is delivered and comes to market in a tightly defined period of time, limiting the ability of fishers and processors to influence or react to market forces. A management system with more flexibility regarding fishing days would allow fishers and processors more latitude in managing their industry sector.

1

Other than maintaining access to the resource by the commercial Pacific halibut fishery, the IPHC does not recommend a particular management system to replace the derby for the 2A non-tribal, directed commercial Pacific halibut fishery. The IPHC supports a reduction in the concentration of fishing effort, and eliminating the race to fish, as a guiding principle for any changes that are made.

We recognize the challenges that shifting to a new management system would entail in order to ensure equitable use and effective management of the resource, and that it would take some time to develop and implement changes. In addition to the Council, action would be required by IPHC, the U.S. National Marine Fisheries Service, and the various State agencies. For our part, IPHC stands ready to engage in the process and to support it with scientific advice.

The IPHC looks forward to working with the Council and Council staff to continue our strong partnership for sustainable management of the Pacific halibut resource.

Sincerely,

Dr. David T. Wilson
Executive Director, IPHC

cc: IPHC Commissioners
Charles Tracy, PFMC
Michael Burner, PFMC
Kelly Ames, PFMC

Appendix II: IPHC Analysis for PFMC (Sep 2017)

INTERNATIONAL PACIFIC HALIBUT COMMISSION

Agenda Item G.1.a
IPHC Report 1
September 2017

IPHC Report September 2017

IPHC Regulatory Area 2A Directed Commercial Pacific Halibut Fishery
Sample Vessel Fishing Period Limit Options for Longer Fishing Periods

Purpose

This paper provides input from the International Pacific Halibut Commission (IPHC) for the discussion of Pacific halibut fishery management in IPHC Regulatory Area 2A. Specifically, the Pacific Fishery Management Council (PFMC) requested information on how vessel fishing period limits might change with longer fishing periods for Pacific halibut.

Background

The IPHC submitted a letter to the PFMC recommending a move away from derby-style management for the directed commercial Pacific halibut fishery in IPHC's Regulatory Area 2A (Agenda Item G.1.a, Supplemental IPHC Letter 2, June 2017). The IPHC noted concerns over safety and discards, as well as limitations on fishers and processor flexibility. At the PFMC's June 2017 meeting, the PFMC reviewed the IPHC's letter and heard further input from the PFMC's Groundfish Advisory Subpanel (GAP) regarding possible alternatives to the commercial derby fishery (Agenda Item G.1.b, Supplemental GAP Report, June 2017). In response, the PFMC informally asked the IPHC to provide examples of vessel fishing period limits for longer fishing periods.

Current Management of the Directed Commercial Fishery

In the management of the Pacific halibut fishery, the IPHC sets the overall catch limit for IPHC Regulatory Area 2A and then endorses the PFMC's Pacific Halibut Catch Sharing Plan, which further allocates the IPHC Regulatory Area 2A catch limit among user groups, including the directed commercial fishery (Agenda Item G.1, Attachment 1, June 2017). The National Marine Fisheries Service (NMFS) then implements the resulting catch limits by user groups in domestic regulations, which may be more restrictive than IPHC regulations. All agencies work closely together to facilitate each step of the annual process.

For the non-Indian directed commercial Pacific halibut fishery in IPHC Regulatory Area 2A, the IPHC is responsible for issuing licenses and setting the fishing periods and individual vessel fishing period limits. The IPHC sets the directed commercial fishery fishing periods and fishing period limits to match the Catch Sharing Plan allocation for this sector.

Licenses

The IPHC issues licenses to participate in Pacific halibut fisheries in IPHC Regulatory Area 2A, as specified in IPHC Regulation Section 4 (Licensing Vessels for Area 2A), including:

- the directed commercial fishery,
- retention of Pacific halibut incidental to the sablefish fishery,
- retention of Pacific halibut incidental to the salmon troll fishery, and
- sport charter fisheries.

These are annual licenses, for which an application must be submitted to the IPHC each year by the specified deadline. There is no set maximum number of licenses allowed, and the number of licenses issued from year to year may vary. If a vessel chooses to participate in the sport charter fishery or to retain Pacific halibut incidental to the salmon troll fishery, it may not participate in any other Pacific halibut fisheries in IPHC Regulatory Area 2A. However, vessels may apply for two separate licenses to participate in both the directed commercial fishery and the Pacific halibut fishery incidental to the sablefish fishery. Not all vessels issued a license for a given year actually participate in the Pacific halibut fishery.

Commercial Pacific halibut licenses specify the vessel's length class, which ranges from A to H, with A being the smallest vessels (25 ft and under) and H being the largest (56 ft and over).

Table 1 provides a summary of commercial Pacific halibut licenses issued by IPHC each year between 2012 and 2017, along with how many vessels actually participated in the Pacific halibut fishery that year. About half of the vessels issued licenses to participate in the directed commercial fishery actually fished. The number of licenses issued for the directed commercial range from a low of 143 in 2013 to a high of 208 in 2017. The greatest number of vessels that actually participated in the directed commercial derby was 97 in 2012.

Table 1. Number of vessels issued an IPHC commercial Pacific halibut license and percent fished in IPHC Regulatory Area 2A between 2012 and 2017 by commercial license type. Data on the 2017 licenses fished are not yet available.

2A LICENSES (#s)		*2012*	*2013*	*2014*	*2015*	*2016*	*2017*
Total commercial derby	*Issued*	*175*	*143*	*162*	*144*	*169*	*208*
	Fished	*97*	*68*	*71*	*77*	*93*	
	% fished	*55%*	*48%*	*44%*	*53%*	*55%*	
Directed commercial	Issued	156	123	138	129	159	192
	Fished	81	55	54	65	85	
	% fished	*52%*	*45%*	*39%*	*50%*	*53%*	
Licensed for both directed and incidental to sablefish	Issued	19	20	24	15	10	16
	Fished	16	13	17	12	8	
	% fished	*84%*	*65%*	*71%*	*80%*	*80%*	
Incidental to sablefish	Issued	2	6	5	7	8	8
	Fished	1	6	3	6	6	
	% fished	*50%*	*100%*	*60%*	*86%*	*75%*	
Incidental to salmon	Issued	311	333	424	364	310	222
	Fished	104	101	181	151	128	
	% fished	*33%*	*30%*	*43%*	*41%*	*41%*	
Total commercial	*Issued*	*488*	*482*	*591*	*515*	*487*	*438*
	Fished	*202*	*175*	*255*	*234*	*227*	
	% fished	*41%*	*36%*	*43%*	*45%*	*47%*	

Fishing Periods

The IPHC sets the fishing period dates as a series of potential 10-hour (0800-1800 hours local time) fishing periods specified in IPHC Regulation Section 8 (Fishing Periods), paragraph (2). In recent years, the potential fishing period dates have been on Wednesdays in late June and early July. The fishing period dates are decided each year through the IPHC's Annual Meeting process. Table 2 shows the potential dates for the commercial fishery between 2012 and 2017, along with the total number of days the fishery was open. From 2012 to 2015, the commercial fishery was open for two 10-hour fishing periods; in 2016 and 2017, there were three.

Table 2. Potential directed commercial Pacific halibut fishing period dates for IPHC Regulatory Area 2A between 2012 and 2017 and total number of days open.

FISHING PERIODS	*2012*	*2013*	*2014*	*2015*	*2016*	*2017*
Total open days	2	2	2	2	3	3
Potential open days (bold dates were open)	**27 Jun**	**26 Jun**	**25 Jun**	**24 Jun**	**22 Jun**	**28 Jun**
	11 Jul	**10 Jul**	**9 Jul**	**8 Jul**	**6 Jul**	**12 Jul**
	25 Jul	24 Jul	23 Jul	22 Jul	**20 Jul**	**26 Jul**
	8 Aug	7 Aug	6 Aug	5 Aug	3 Aug	9 Aug
	22 Aug	21 Aug	20 Aug	19 Aug	17 Aug	23 Aug
	5 Sep	4 Sep	3 Sep	2 Sep	31 Aug	6 Sep
	19 Sep	18 Sep	17 Sep	16 Sep	14 Sep	20 Sep
					28 Sep	

Vessel Fishing Period Limits

Along with announcing open dates for the directed commercial fishery, the IPHC announces what the per-vessel catch limits will be by vessel class in accordance with IPHC Regulation Section 12 (Fishing Period Limits). IPHC determines the fishing period limits before each 10-hour fishing period opens, based on the number of vessels in each length class, the average performance of vessels in that length class, and the amount of catch allocated to (or remaining for) the directed commercial fishery for that year. The IPHC vessel length classes range from A to H, with A being the smallest vessels (25 ft and under) and H being the longest (56 ft and over). The IPHC first set limits by vessel class size to address the concern that having a single limit would disadvantage larger vessels while smaller vessels would be unaffected. The IPHC adopted the relative vessel size limits at its Annual Meeting in 1988.

In recent years the IPHC has set fishing period limits for the first 10-hour fishing period of the year that range from 9,000 lbs (4.08 mt)(net weight[1]) for the H-class vessels down to a limit of 755 lbs (0.34 mt) for the smallest A-class vessels. After each open fishing period, IPHC reviews available fish tickets and contacts processors and state biologists to estimate the Pacific halibut landings by vessel. This landings and participation information is used to determine how much of the directed commercial fishery allocation remains, whether there can be another open fishing period, and what the fishing period limits should be for the next open fishing period.

In addition to the fact that not all vessels with licenses traditionally participate in the open derby fishing periods, most vessels also do not come close to their full vessel limit during a fishing period. On average among all vessel size classes in 2016 and 2017, vessels caught from 20 to 40 percent of the fishing period limit for their vessel size class. In general, only a handful of vessels come close to or achieve their full vessel limit during a fishing period.

[1] "Net weight" is defined in IPHC Regulation 3 as the weight without gills and entrails, head-off, washed, and without ice and slime. All weights in this paper are expressed in terms of "net weight."

Table 3 provides the vessel length overall and the corresponding vessel class, along with the fishing period limits for each open fishing period from 2012 through 2017. Table 3 also provides the estimated landings by open fishing period compared to the overall directed fishery catch limit for that year.

Table 3. Vessel limits by vessel class and estimated landings (lbs, net weight) by open fishing period for IPHC Regulatory Area 2A between 2012 and 2017. Note: 2017 landing estimates are preliminary.

Vessel Class		Fishing Period & Limits (lb, net weight)					
feet	*letter*	*27 Jun 2012*	*11 Jul 2012*	*26 Jun 2013*	*10 Jul 2013*	*25 Jun 2014*	*9 Jul 2014*
1-25	A	755	200	755	250	755	200
26-30	B	945	200	945	315	945	210
31-35	C	1,510	250	1,510	505	1,510	335
36-40	D	4,165	695	4,165	1,390	4,165	925
41-45	E	4,480	745	4,480	1,495	4,480	995
46-50	F	5,365	895	5,365	1,790	5,365	1,190
51-55	G	5,985	1,000	5,985	1,995	5,985	1,330
56+	H	9,000	1,500	9,000	3,000	9,000	2,000
estimated landings		150,000	29,000	118,000	54,000	133,000	30,000
total estimated landings			**179,000**		**172,000**		**163,000**
catch limit			173,216		173,390		168,137
difference			-5,784		1,390		5,137

Vessel Class		Fishing Period & Limits (lb, net weight)							
feet	*letter*	*24 Jun 2015*	*8 Jul 2015*	*22 Jun 2016*	*6 Jul 2016*	*20 Jul 2016*	*28 Jun 2017*	*12 Jul 2017*	*26 Jul 2017*
1-25	A	755	505	755	755	210	755	755	590
26-30	B	945	630	945	945	265	945	945	735
31-35	C	1,510	1,010	1,510	1,510	420	1,510	1,510	1,175
36-40	D	4,165	2,780	4,165	4,165	1,160	4,165	4,165	3,240
41-45	E	4,480	2,990	4,480	4,480	1,245	4,480	4,480	3,485
46-50	F	5,365	3,575	5,365	5,365	1,490	5,365	5,365	4,170
51-55	G	5,985	3,990	5,985	5,985	1,665	5,985	5,985	4,655
56+	H	9,000	6,000	9,000	9,000	2,500	9,000	9,000	7,000
estimated landings		105,000	75,000	89,800	83,200	25,000	83,000	77,500	69,500
total estimated landings			**180,000**			**198,000**			**230,000**
catch limit			164,529			193,364			225,591
difference			-15,471			-4,636			-4,409

Fishing Period Options under Discussion

In response to the PFMC's informal request, the IPHC details below information regarding examples of fishing period limits for the directed commercial Pacific halibut fishery for the 3 requested fishing period durations of 1 week, 20 days, or 30 days, compared to the current 10-hour derby-style fishing periods. These examples are built using the 2017 allocation and 2017 license numbers as the most recent year with complete information. **NOTE**: THE IPHC DOES NOT RECOMMEND OR ENDORSE ANY OF THE 3 OPTIONS DETAILED BELOW.

While only about half of the licenses issued have actually participated in open derby-style fishing periods since 2012 (Table 1) and most vessels only catch between 20 and 40 percent of their fishing period limit, the IPHC assumes for this analysis that more licensed vessels would likely participate and that more vessels would catch their limits during a longer fishing period.

Using 2017 numbers, these examples assume 208 licensed vessels would participate, and that each vessel's fishing period limit could be fished at any time during the fishing period. The fishing period limits are based on the 2017 non-treaty directed commercial fishery catch limit of 225,591 lbs (102.33 mt) (net weight). These options assume that IPHC Regulations would allow vessels to also fish for other species while fishing for Pacific halibut, subject to the U.S. domestic regulations and license requirements for those species.

***Option 1** – 1-week fishing period*

Option 1 assigns a 1-week fishing period limit by vessel size class. At any time during the 7-consecutive-day fishing period announced by the IPHC, vessels could retain the amount of Pacific halibut associated with their vessel size class.

The IPHC, working with the state agencies and NMFS, would manage the fishery in season, similar to the current derby fishery. If enough allocation remained after the first 1-week fishing period, the IPHC would reopen the fishery for another 1-week period. Any subsequent 1-week fishing periods would likely be two to three weeks after the preceding 1-week fishing period to allow time to gather and review the Pacific halibut landings data and vessel participation.

The IPHC provides several examples of fishing period limits using the 2017 allocation (Table 4). Note that these example fishing period limits are provided only for purpose of discussion.

For comparison with these examples of fishing period limits, Table 4 also lists the recent historical (or status quo) series of fishing period limits based on the 9,000-lb (4.08 mt) (net weight) limit for the H-class vessels used in the current 10-hour fishing periods, with the smaller vessel classes scaled accordingly. This option would not be chosen for a longer fishing period because it is projected to exceed the allocation. Other potential H-class fishing period limits range from 2,000 to 6,000 lbs (0.91 to 2.72 mt) (net weight). The bottom of Table 4 shows three scenarios: 1) the estimated landings if all of the licensed vessels participate and land their full limits, 2) if half of the licensed vessels participate and land their full limits, and 3) if half of the vessels participate and land half of their limits. The third scenario is estimated to be unlikely to occur, given the longer fishing period. The level of participation and attainment of individual vessel limits will more likely fall somewhere between the first and third scenarios. As the season is extended longer in subsequent options, from 1 week to 20 days or 30 days, the IPHC expects there to be a higher likelihood of more licensed vessels participating and landing a higher percentage of their fishing period limits.

Under Option 1, using the 2017 allocation of 225,591 lbs (102.33 mt) (net weight), the IPHC would likely choose fishing period limits based on an H-class limit of 4,000 to 6,000 lbs (1.81 to 2.72 mt) (net weight) for the first 1-week fishing period. This is based on attainment of the H-class fishing period limit when it was 9,000 lbs (4.08 mt) by the vessels in this size class (2012-16). In these years, approximately 40 percent of these vessels attained the trip limit with 60 percent landing 6,000 lbs (2.72 mt) or more, and 90 percent landing 4,000 lbs (1.81 mt) or more.

Table 4. *Vessel limits options by vessel class and estimated landings (lb, net weight) for IPHC Regulatory Area 2A using 2017 allocation and licenses.*

2017 allocation (lb, net weight) 225,591

Vessel Class		*vessel limit ratio*	*2017 # Lic (208 total)*	*status quo*		*6,000 vessel limit*		*4,000 vessel limit*		*2,000 vessel limit*	
feet	letter			vessel limit	est. landings	vessel limit	est. landings	vessel limit	est. landings	vessel limit	est. landings
1-25	A	0.084	15	**755**	11,325	**505**	7,575	**335**	5,025	**200**	3,000
26-30	B	0.105	11	**945**	10,395	**630**	6,930	**420**	4,620	**210**	2,310
31-35	C	0.168	19	**1,510**	28,690	**1,010**	19,190	**670**	12,730	**335**	6,365
36-40	D	0.463	39	**4,165**	162,435	**2,780**	108,420	**1,850**	72,150	**925**	36,075
41-45	E	0.498	43	**4,480**	192,640	**2,990**	128,570	**1,990**	85,570	**995**	42,785
46-50	F	0.596	36	**5,365**	193,140	**3,575**	128,700	**2,385**	85,860	**1,190**	42,840
51-55	G	0.665	14	**5,985**	83,790	**3,990**	55,860	**2,660**	37,240	**1,330**	18,620
56+	H	1	31	**9,000**	279,000	**6,000**	186,000	**4,000**	124,000	**2,000**	62,000
If 100% of licenses participate & land 100% of vessel limit					961,415		641,245		427,195		213,995
If 50% of licenses participate & land 100% of vessel limit					480,708		320,623		213,598		106,998
If 50% of licenses participate & land 50% of vessel limit					240,354		160,311		106,799		53,499

***Option 2** – 20-day fishing period*

Option 2 assigns a 20-day fishing period limit by vessel size class. At any time during the 20-consecutive-day fishing period announced by the IPHC, vessels could retain the amount of Pacific halibut associated with their vessel size class.

The IPHC, working with the state agencies and NMFS, would manage the fishery in season, similar to the current derby fishery. If enough allocation remained after the first 20-day fishing period, the IPHC would reopen the fishery for another 20-day period. A sub-option could allow subsequent fishing periods of less than 20 days but not shorter than one week. Any subsequent fishing periods would likely start at least 10 days after the preceding fishing period to allow enough time to gather and review the Pacific halibut landings data and vessel participation.

The IPHC provides several examples of fishing period limits using the 2017 allocation (Table 4). Note that these example fishing period limits are provided only for purpose of discussion.

For comparison with these examples of fishing period limits, Table 4 also lists the recent historical (or status quo) series of fishing period limits based on the 9,000-lb (4.08 mt) (net weight) limit for the H-class vessels used in the current 10-hour fishing periods, with the smaller vessel classes scaled accordingly. This option would not be chosen for a longer fishing period because it is projected to exceed the allocation. Other potential H-class fishing period limits range from 2,000 to 6,000 lbs (0.91 to 2.72 mt) (net weight). The bottom of Table 4 shows three scenarios: 1) the estimated landings if all of the licensed vessels participate and land their full limits, 2) if half of the licensed vessels participate and land their full limits, and 3) if half of the vessels participate and land half of their limits. The third scenario is estimated to be unlikely to occur, given the longer fishing period. The level of participation and attainment of individual vessel limits will more likely fall somewhere between the first and third scenarios. As the season is extended, the IPHC expects there to be a higher likelihood of more licensed vessels participating and landing a higher percentage of their fishing period limits.

Under Option 2, using the 2017 allocation of 225,591 lbs (102.33 mt) (net weight), the IPHC would likely choose fishing period limits based on an H-class limit of 2,000 to 4,000 lbs (0.91 to 1.81 mt) (net weight) for the first 20-day fishing period. With a 20-day fishery, as opposed to a 1-week fishery, IPHC would have to be more conservative in setting the vessel limit because with more time to fish, more vessels would likely participate and would more likely catch their vessel limit.

***Option 3** – 30-day fishing period*

Option 3 assigns a 30-day fishing period limit by vessel size class. At any time during the 30-consecutive-day fishing period announced by the IPHC, vessels could retain the amount of Pacific halibut associated with their vessel size class.

The IPHC, working with the state agencies and NMFS, would manage the fishery in season, similar to the current derby fishery. If enough allocation remained after the first 30-day fishing period, the IPHC would reopen the fishery for another 30-day period. A sub-option could allow subsequent fishing periods of less than 30 days but not shorter than one week. Any subsequent fishing periods would likely start at least 10 days after the preceding fishing period to allow enough time to gather and review the Pacific halibut landings data and vessel participation.

The IPHC provides several examples of fishing period limits using the 2017 allocation (Table 4). Note that these example fishing period limits are provided only for purpose of discussion.

For comparison with these examples of fishing period limits, Table 4 also lists the recent historical (or status quo) series of fishing period limits based on the 9,000-lb (4.08 mt) (net weight) limit for the H-class vessels used in the current 10-hour fishing periods, with the smaller vessel classes scaled accordingly. This option would not be chosen for a longer fishing period because it is projected to exceed the allocation. Other potential H-class fishing period limits range from 2,000 to 6,000 lbs (0.91 to 2.72 mt) (net weight). The bottom of Table 4 shows three scenarios: 1) the estimated landings if all of the licensed vessels participate and land their full limits, 2) if half of the licensed vessels participate and land their full limits, and 3) if half of the vessels participate and land half of their limits. The third scenario is estimated to be unlikely to occur, given the longer fishing period. The level of participation and attainment of individual vessel limits will more likely fall somewhere between the first and third scenarios. As the season is extended, the IPHC expects there to be a higher likelihood of more licensed vessels participating and landing a higher percentage of their fishing period limits.

Under Option 3, using the 2017 allocation of 225,591 lbs (102.33 mt) (net weight), the IPHC would likely choose fishing period limits based on an H-class limit of 2,000 lbs (0.91 mt) (net weight) for the first 30-day fishing period. With a 30-day fishery, as opposed to a 1-week or 20-day fishery, IPHC would have to be more conservative in setting the vessel limit because with more time to fish, more vessels would likely participate and would more likely catch their vessel limit.

Other Considerations for Longer Fishing Periods

The IPHC expects the overall attainment of the directed commercial fishery allocation would be approximately the same with longer fishing periods, with the management target of attaining but not exceeding the allocation. There might be some shift in the spatial distribution of fishing with an extended fishing period as fishers have more time to explore fishing grounds without the pressure of a short deadline to catch their vessel fishing period limits.

For the IPHC, longer fishing periods would require revisions to the biological sampling program that provides age, length, and weight data for the annual Pacific halibut stock assessment. Historically, the IPHC has focused biological sampling effort around the first two or three 10-hour open fishing periods, in the port where the highest number of pounds are landed. In 2017, in response to changes in landing patterns, the IPHC increased this effort and collected biological samples in three separate ports over the three open fishing periods. With longer fishing periods, the landings would likely be spread over a longer period of time and the individual landings may be smaller. Therefore, in order to obtain the necessary biological data for the Pacific halibut stock assessment, the IPHC would likely need to staff more ports for a greater length of time or coordinate with state agencies to obtain biological samples.

Conclusions

As noted in the discussion of the suggested options above, the IPHC expects that fishing period limits for individual vessels would be lower with longer fishing periods under the current management system in place for the directed commercial Pacific halibut fishery in IPHC Regulatory Area 2A.

The IPHC noted in its letter to the PFMC (Agenda Item G.1.a, Supplemental IPHC Letter 2, June 2017) that it sees no compelling reason to maintain the directed commercial Pacific halibut fishery in IPHC Regulatory Area 2A as a derby-style fishery, and that there may be a number of advantages in shifting to a management system that reduces the concentration of fishing effort and eliminates or reduces the race to fish.

The primary potential advantage of longer fishing periods is improved safety as fishers experience less pressure to fish in poor weather or dangerous conditions. The IPHC believes that this is the strongest rationale for change, and this position has been supported by the U.S. Coast Guard. Other potential advantages include reduced Pacific halibut mortality from regulatory discards and increased flexibility for fishers and processors as they manage their industry sector.

The IPHC desires to understand the views of those affected by longer fishing periods and reduced fishing period limits in IPHC Regulatory Area 2A before making any such changes, and appreciates the opportunity to discuss possible changes with the PFMC, its advisory bodies, and the relevant state and federal agencies. The IPHC also welcomes other suggestions or recommendations to improve the management of the directed commercial Pacific halibut fishery in IPHC Regulatory Area 2A.

Bycatch data summary

PREPARED BY: IPHC SECRETARIAT (21 DECEMBER 2017)

PURPOSE

To provide a response to the Commissioners' recommendations (AM093-Rec.09 and IM093-Req.01) for a detailed examination of changes in commercial bycatch levels among all gears and sectors by IPHC Regulatory Areas.

BACKGROUND

At the 93rd Session of the IPHC Annual Meeting (AM093) in January 2017, the Commission made a call for additional fishery statistics on bycatch as follows:

AM093–Rec.09 (para. 110) ***NOTING*** *that the Commission had previously requested the IPHC Secretariat to examine bycatch reduction by the Amendment 80 sector versus other sectors in the Bering Sea, by regulatory area (see AM92.10), which was yet to be undertaken, the Commission* ***RECOMMENDED*** *that the IPHC Secretariat undertake a detailed examination of changes in bycatch levels among all gears/sectors, and for results to be presented to the Commission at its 93rd Interim Meeting (in November 2017).*

At the 93rd Session of the IPHC Interim Meeting (IM093) in November 2017, the Commission made a further request of the IPHC Secretariat as follows:

IM093–Req.01 (para. 8) ***NOTING*** *Appendix I of paper IPHC-2017-IM093-05 Rev_1 was provided the evening prior to the Interim Meeting, and detailed information available on bycatch levels among all gears/sectors, as requested by the Commission at its 93rd Annual Meeting (AM093-Rec.09), the Commission* ***REQUESTED*** *that the IPHC Secretariat facilitate consideration of the information inter-sessionally, so that the Commission may provide further guidance on the type of information it requires, for consideration at the 94th Annual Meeting in January 2018.*

DISCUSSION

Appendix I details trends in bycatch by sector and IPHC Regulatory Area in the Bering Sea and Aleutian Islands.

IPHC Circular 2017-21 was communicated to the Commission on 05 December 2017 calling for additional feedback on the bycatch information presented to the IM093. Feedback was received requesting similar data on bycatch would be desirable from the Canadian fleets.

Appendix II details trends in bycatch by sector in IPHC Regulatory Area 2B (Canada).

RECOMMENDATION/S

That the Commission:

1) **NOTE** paper IPHC-2018-AM094-INF03 which provides a response to the Commissioners' recommendations (AM093-Rec.09 and IM093-Req.01) for a detailed examination of changes in commercial bycatch levels among all gears and sectors by IPHC Regulatory Areas.

APPENDICES

Appendix I: Commercial Bycatch in the Bering Sea (U.S.A.).

Appendix II: Bycatch by sector in IPHC Regulatory Area 2B (Canada).

Appendix I

COMMERCIAL BYCATCH IN THE BERING SEA

AM093–Rec.09 (para. 110)	***Exempted Fishing Permit (EFP) updates*** **NOTING** that the Commission had previously requested the IPHC Secretariat to examine bycatch reduction by the Amendment 80 sector versus other sectors in the Bering Sea, by regulatory area (see AM92.10), which was yet to be undertaken, the Commission **RECOMMENDED** that the IPHC Secretariat undertake a detailed examination of changes in bycatch levels among all gears/sectors, and for results to be presented to the Commission at its 93rd Interim Meeting (in November 2017).

The information provided in this Appendix shows trends in bycatch by sector and IPHC Regulatory Area in the Bering Sea and Aleutian Islands.

The IPHC defines bycatch as follows: *Incidentally caught fish by fisheries targeting other species and that cannot legally be retained. Bycatch mortality, or bycatch removals, refers only to those fish that subsequently die due to capture.*

Bycatch of Pacific halibut has been an ongoing management issue since the 1960s. For perspective, the trend in total removals of Pacific halibut, including bycatch, coastwide for all IPHC Regulatory Areas is shown in Figure 1.

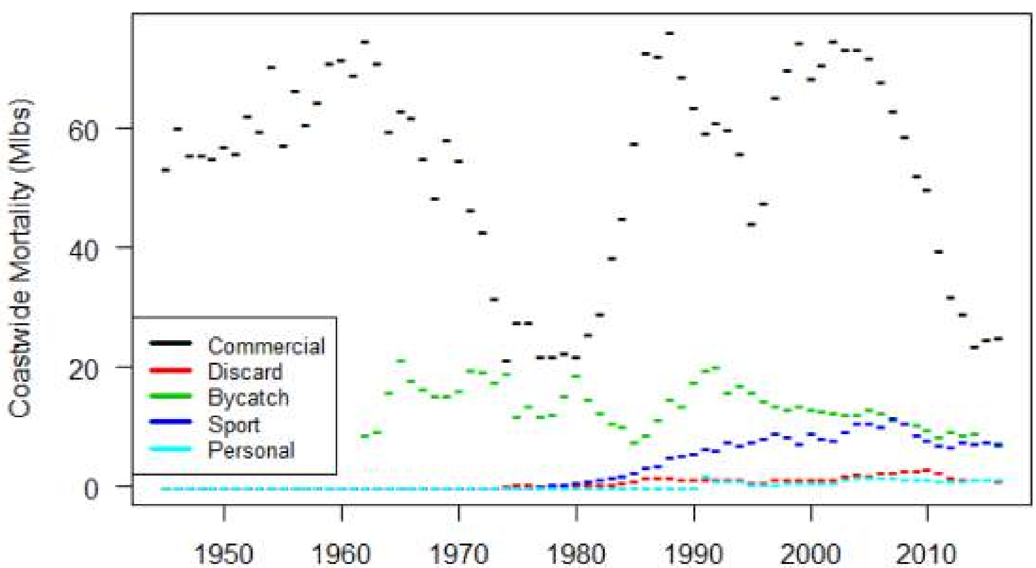

Figure 1. Trend in Pacific halibut total removals coastwide (millions of lbs). Commercial is the directed longline fishery, Discard is the discard mortality from the directed commercial fishery, Bycatch is mortality from non-directed fisheries, Sport (Recreational) is guided and unguided recreational fisheries, and Personal is personal use and subsistence. *(Source: Abundance-based Management (ABM) discussion paper, Figure 2, p.8 (see references))*

ESTIMATING BYCATCH

Bycatch of Pacific halibut is estimated because not all fisheries have 100% monitoring and not all Pacific halibut that are discarded are assumed to die. Agencies estimate the amount of bycatch that will not survive, called discard mortality.

The 2016 Report on Assessment and Research Activities (RARA) (Chapter 2.6) provides previous sources of bycatch information, as well as the estimated bycatch mortality by Regulatory Area. For Alaska, NMFS Alaska Region provides the bycatch estimates by fishery for most fisheries. The Alaska Department of Fish and Game (ADFG) provides estimates of Pacific halibut bycatch in scallop dredge and crab fisheries, although not every year. Several fishery programs have a mandatory 100% monitoring requirement, including the Bering Sea Aleutian Islands (BSAI) community Development Quota (CDQ) fisheries, the American Fisheries Act (AFA) pollock cooperatives, and the BSAI Amendment 80 (A80) fishery cooperatives. The NMFS Alaska Fisheries Science Center provides an annual deployment plan with scientific guidelines on the amount of coverage and the selection criteria for vessels without 100% monitoring, including vessels in the directed Pacific halibut individual fishing quota fishery.

Further information on discard mortality rates (DMRs) and estimating bycatch can be found in the 2016 RARA (Chapter 2.6, p.73), the ABM discussion paper, and Amendment 111 to the BSAI Groundfish Fishery Management Plan (AM 111)(p.78 – 79).

AREA EXAMINED – BERING SEA AND ALEUTIAN ISLANDS

The area of focus for this paper is the Bering Sea and Aleutian Islands. The Bering Sea is north of Alaska's Aleutian Island chain and south of Alaska's western mainland. The Bering Sea and Aleutian Islands includes IPHC's Regulatory Areas 4A, 4B, 4C, 4D, 4E, and the IPHC Closed Area.

DESCRIPTION OF COMMERCIAL FISHERIES WITH BYCATCH

In the Bering Sea and Aleutian Islands, several commercial fisheries, or sectors, have bycatch of Pacific halibut to varying degrees, including trawl (midwater/pelagic and bottom trawl), hook and line, pot (or trap), and dredge fisheries. For this examination, the BSAI fisheries are grouped as follows:

- Groundfish Trawl
- Hook & Line (non-IFQ)
- Hook & Line (IFQ)
- Groundfish Pot
- Scallop Dredge
- Crab Pot

Four fisheries that catch Pacific halibut as bycatch in the Bering Sea and Aleutian Islands are restricted by what the NPFMC has termed PSC limits. They are the Amendment 80 cooperatives, the BSAI trawl limited access fisheries, the Pacific cod longline fisheries (catcher/processors and catcher vessels), and the CDQ fisheries. Within the IPHC reported categories of commercial fisheries, the fisheries with PSC limits (defined in regulation at 50 CFR §679.21) (listed in the right side of the table) are:

BSAI commercial fishery categories	PSC limited fisheries

Groundfish Trawl	• Am80 cooperatives
	• BSAI trawl limited access
	  – Yellowfin sole
	  – Rockfish
	  – Pacific cod
	  – Pollock, atka mackerel, other
	• CDQ (trawl)

Hook & Line (non-IFQ)	• longline fishery
	  – Pacific cod
	    o Catcher/processors
	    o Catcher vessels
	  – Other fisheries

Hook & Line (IFQ)	• CDQ (non-trawl)
Groundfish Pot	
Scallop Dredge	
Crab Pot	

The four fishery sectors in the BSAI with Pacific halibut PSC limits are described further below. Much of these descriptions are excerpted from the ABM discussion paper, pages 15-18.

- **Amendment 80 cooperatives (trawl) –**
  Trawl catcher/processors in the BSAI active in groundfish fisheries other than Bering Sea pollock (i.e., the head-and-gut fleet or Amendment 80 vessels). The Amendment 80 species are the following six species: BSAI Atka mackerel, Aleutian Islands Pacific ocean perch, BSAI flathead sole, BSAI Pacific cod, BSAI rock sole, and BSAI yellowfin sole (§ 679.2). The Amendment 80 sector can be divided between vessels that focus primarily on flatfish (i.e., Alaska plaice, arrowtooth flounder, flathead sole, rock sole, and yellowfin sole) and those vessels that focus on Atka mackerel. The flatfish-focused vessels have higher rates of halibut bycatch than the Atka mackerel vessels. The Amendment 80 cooperatives include the Alaska Seafood Cooperative (AKSC) and the Alaska Groundfish Cooperative (AGC).

- **Bering Sea Aleutian Island (BSAI) trawl limited access (TLA) fisheries -** *The BSAI trawl limited access sector comprises all the trawl vessels in the BSAI except Amendment 80 catcher/processors. This includes both pelagic and non-pelagic (bottom) trawls. Pelagic trawl generally targets pollock. NMFS apportions this sector's PSC limit into PSC allowances (some have seasonal releases) among the following trawl fishery categories: 1) yellowfin sole fishery, 2) rock sole/flathead sole/"other flatfish" fishery, 3) Greenland turbot/arrowtooth flounder/Kamchatka flounder/sablefish fishery, 4) rockfish fishery, 5) Pacific cod fishery, and 6) pollock/Atka mackerel/"other species" fishery, which includes the midwater pollock fishery. This sector includes the following cooperatives: Pollock Conservation Cooperative, and United Catcher Boast and Midwater Trawlers Association.*

- **Longline fisheries (also called BSAI Non-trawl) –**
  The BSAI non-trawl sector comprises all the non-trawl vessels in the BSAI except vessels fishing for groundfish in the community development quota (CDQ) sector. However, the Council and NMFS have exempted pot gear, jig gear, and the sablefish IFQ hook-and-line gear fishery categories from halibut PSC limits. Therefore, only the hook-and-line catcher/processor vessels (primarily targeting Pacific cod and to a lesser extent Greenland turbot) and hook-and-line catcher vessels (exclusively targeting Pacific cod) are subject to PSC limits. All but one hook-and-line catcher/processor fishing in the BSAI participates in a voluntary cooperative, the Freezer Longline Conservation Cooperative (FLCC). The FLCC has allowed hook-and-line catcher/processors to fish as a coordinated group and has allowed less efficient vessels to decrease fishing or stop entirely.

- **Community Development Quota (CDQ) fisheries –**
  The CDQ sector includes all trawl and non-trawl vessels that harvest groundfish under the CDQ Program. CDQ vessels primarily target pollock using trawl gear and target Pacific cod using hook-and-line gear. Other species such as yellowfin sole, several flatfish species, Atka mackerel and Pacific ocean perch allocated to the CDQ sector are targeted by vessels using trawl gear.

The Pacific halibut PSC limits among these four fishery sectors was implemented through AM 111. AM 111 further reduced PSC limits for these sectors as follows (adapted from ABM discussion paper, p.15):

	Previous PSC limit (mt)	PSC limit reduction	Current PSC limit (mt)
Am 80 cooperatives	2,325	-25%	1,745
BSAI trawl limited access fisheries	875	-15%	745
Longline fisheries	833	-15%	710
CDQ fisheries	393	-20%	315
TOTAL	4,426	-21%	3,515

The ABM discussion paper included the table below showing the trends from 2008-2016 in percent attainment of the PSC limit by fishery compared to Pacific halibut mortality estimates for each fishery (ABM discussion paper, p.19). The table shows that, in general, most fisheries have remained well below their PSC limits. In 2012, the BSAI trawl limited access fishery exceeded its PSC limit.

Table 4. Pacific halibut mortality estimates (top rows) and mortality relative to the limits (bottom rows) by sector for 2008-2016.

	Am80	BSAI TLA	Longline fisheries	CDQ	Total PSC mortality
2008	1,869	838	593	215	3,515
2009	1,985	815	597	155	3,552
2010	2,154	584	526	162	3,426
2011	1,722	717	498	243	3,179
2012	1,890	1,012	570	272	3,744
2013	2,089	784	471	266	3,611
2014	2,106	717	408	247	3,478
2015	1,362	527	299	130	2,318
2016	1,333	650	197	174	2,354
2017*	699	524	124	92	1,439
	Am80	**BSAI TLA**	**Longline fisheries**	**CDQ**	**% of Total PSC limit**
2008	74%	96%	71%	63%	77%
2009	80%	93%	72%	45%	78%
2010	89%	67%	63%	41%	76%
2011	72%	82%	60%	62%	71%
2012	81%	116%	68%	69%	85%
2013	90%	90%	57%	68%	82%
2014	91%	82%	49%	63%	79%
2015	59%	60%	36%	33%	52%
2016	76%	87%	28%	55%	67%
2017*	40%	70%	17%	29%	41%

* Halibut mortality to date week of 8/14/2017

TRENDS IN BYCATCH BY SECTOR AND IPHC REGULATORY AREA

The IPHC reports Pacific halibut bycatch mortality from commercial fisheries by year, sector, and IPHC Regulatory Area in the RARA. The table below provides the bycatch mortality in the BSAI from 2007-2017.

IPHC Reg Area and Gear	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
AREA 4A											
Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0
Crab Pot	2	7	5	22	14	12	27	0	0	0	0
Groundfish Trawl	1,418	1,021	1,315	800	789	1,314	606	615	483	466	288
Hook & Line (non-IFQ)	153	178	220	213	145	130	204	160	149	99	104
Hook & Line (IFQ)	15	15	15	15	15	5	4	3	3	2	2
Groundfish Pot	3	8	2	7	8	10	32	27	7	5	7
Total	1,591	1,229	1,557	1,058	971	1,472	873	805	642	572	400
AREA 4B											
Crab Pot	2	2	0	0	1	0	3	0	0	0	0
Groundfish Trawl	293	206	299	371	402	215	116	101	202	137	175
Hook & Line (non-IFQ)	139	114	119	65	32	27	6	24	20	5	18
Hook & Line (IFQ)	40	40	40	40	40	12	10	5	2	2	0
Groundfish Pot	3	2	1	1	1	1	5	2	0	0	2
Total	477	364	459	477	476	255	140	132	223	144	195
AREA 4CDE+CL											
Scallop Dredge	0	0	0	0	0	0	0	0	0	0	0
Crab Pot	43	54	33	63	49	29	29	0	37	37	37
Groundfish Trawl	4,145	3,469	3,160	3,429	2,496	3,458	4,110	4,205	3,003	2,895	2,427
Hook & Line (non-IFQ)	609	978	821	684	472	768	668	538	384	311	281
Hook & Line (IFQ)	5	5	5	5	5	1	151	11	0	0	0
Groundfish Pot	1	2	1	1	2	4	18	13	2	2	2
Total	4,804	4,508	4,021	4,182	3,024	4,260	4,977	4,767	3,425	3,245	2,747
AREA 4 Subtotal											
Scallop Dredge	0	0	1	0	0	0	0	0	0	0	0
Crab Pot	48	63	39	85	65	41	59	0	37	37	37
Groundfish Trawl	5,856	4,696	4,774	4,600	3,687	4,987	4,832	4,921	3,687	3,499	2,890
Hook & Line (non-IFQ)	901	1,270	1,160	962	649	925	878	722	552	415	403
Hook & Line (IFQ)	60	60	60	60	60	18	165	19	5	3	2
Groundfish Pot	7	12	4	9	11	15	55	42	8	7	10
Total	6,872	6,101	6,037	5,717	4,472	5,987	5,989	5,704	4,290	3,961	3,342

Figure 9 from the 2016 RARA, Chapter 2.6, shows the Pacific halibut bycatch mortality for all of Area 4 by gear type from 2007-2016.

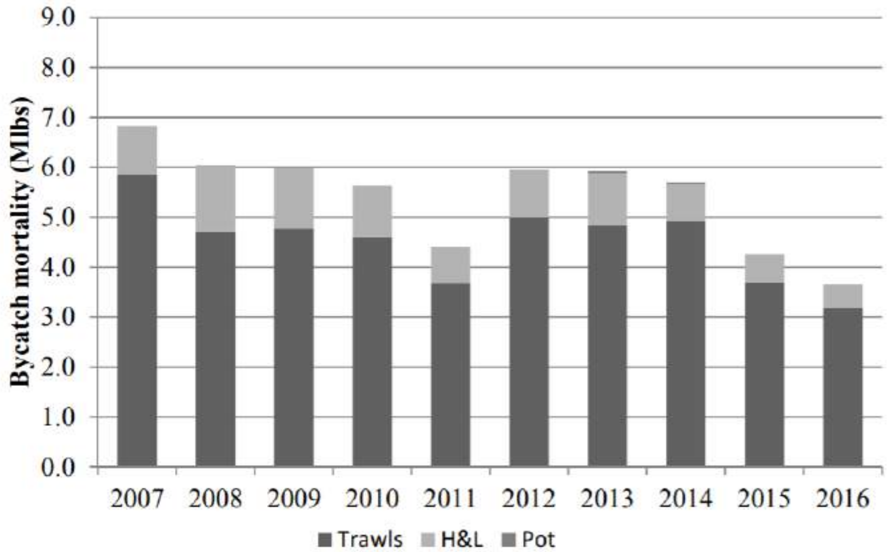

Figure 9. Bycatch mortality (millions of pounds, net weight) in Area 4 by gear type during 2007-2016.

Figure 10 from the 2016 RARA, Chapter 2.6, shows the Pacific halibut bycatch mortality for all gears by IPHC Regulatory Area (Area 4A, 4B, and 4CDE plus the Closed Area combined) from 2007-2016.

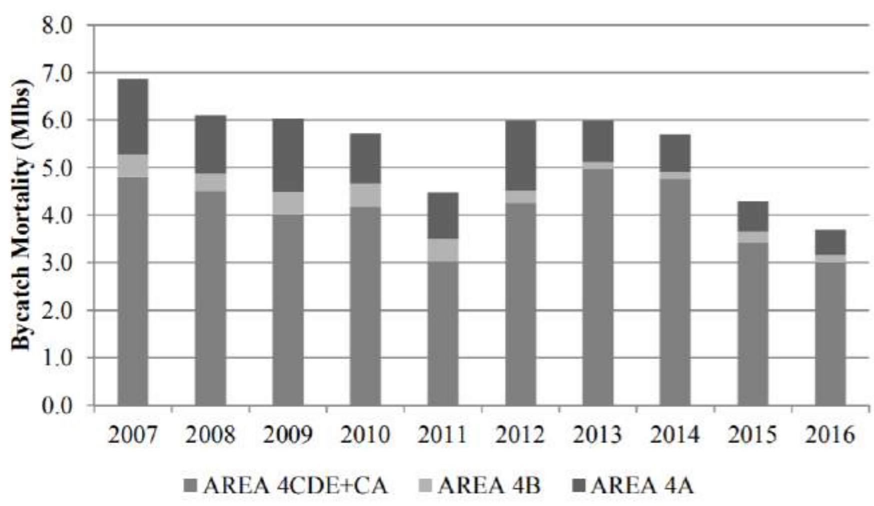

Figure 10. Bycatch mortality among the Bering Sea IPHC regulatory areas since 2007. ("CA" = Closed Area)

In addition to the information available from the IPHC, the North Pacific Fishery Management Council's (NPFMC) ABM working group has produced an ABM discussion paper that provides bycatch mortality for Area 4 combined for PSC-limited fisheries. Figures 12 and 13 from the ABM discussion paper show the trawl fleet had a steady decline in Pacific halibut CPUE in both number and weight. Figure 15 shows the non-IFQ groundfish longline fleet decline in Pacific halibut CPUE (weight) in recent years.

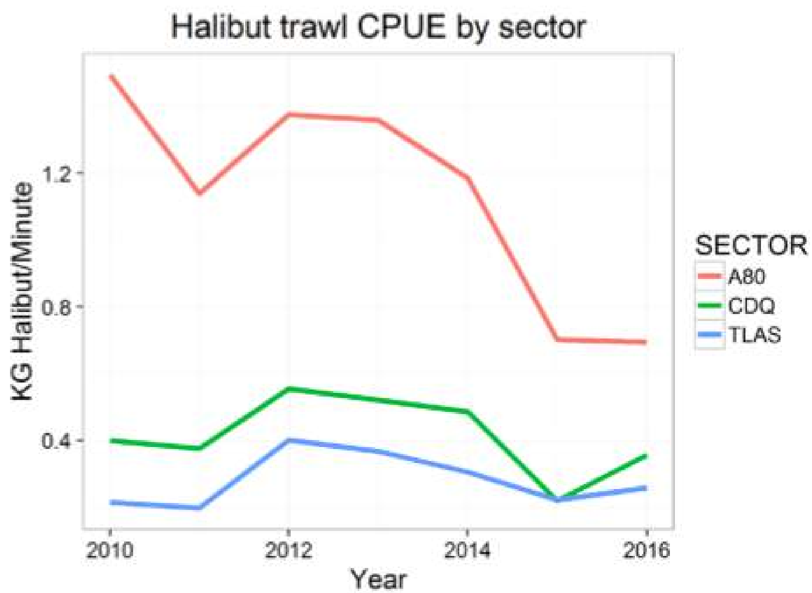

Figure 12. Catch per unit effort (weight) of halibut by trawl sector from 2010-2016.

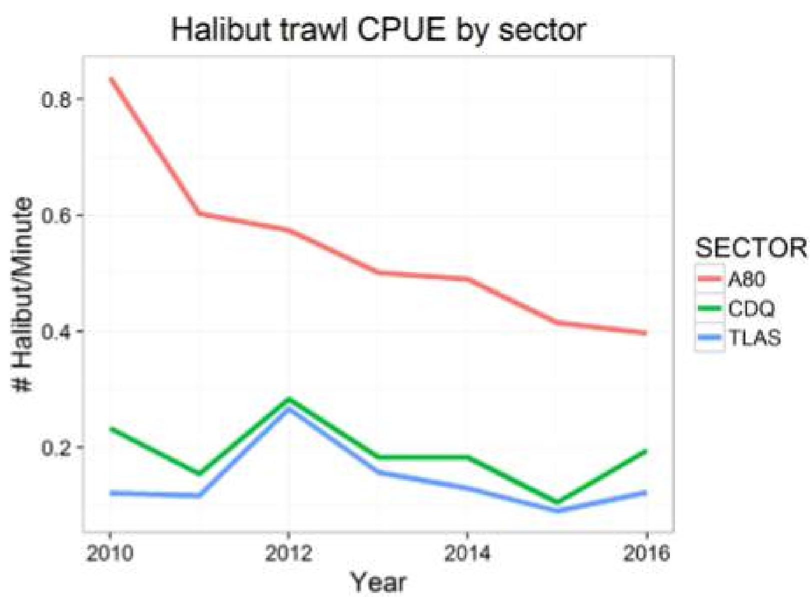

Figure 13. Catch per unit effort (numbers) halibut by trawl sector from 2010-2016.

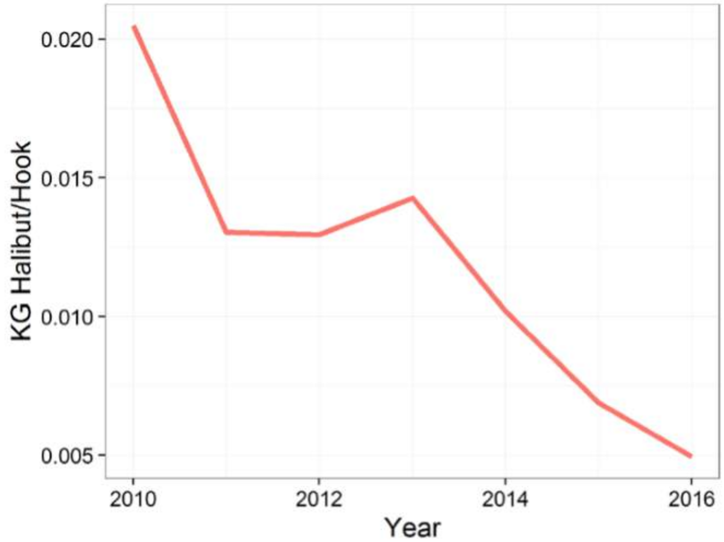

Figure 15. Catch per unit effort (weight) of halibut for longline gear (non-IFQ) in the EBS from 2010 – 2016.

An additional view of the data below, from NMFS inseason management report (see references) to the NPFMC at their December 2016 meeting, shows the reduction in halibut mortality by PSC limited fisheries in 2016 compared to the previous 5-year average (2011-2015) in the BSAI.

B2 NMFS BSAI Inseason Mgt Report
DECEMBER 2016

2016 BSAI Reduction in Halibut Mortality Compared to 5 year Average

Sector	2011-2015 Average (mt)	2016 (mt)	% Change (mt)	2011-2015 Rate*	2016 Rate*	% Change (Rate)
Hook-and-line						
Catcher/Processors	437	181	-59%	3.20	1.37	-57%
Catcher Vessels	3	0	-100%	2.68	1.33	-50%
Total	439	181	-59%	3.20	1.37	-57%
Non-Pelagic Trawl						
Amendment 80 Catcher/Processors	1,946	1,327	-32%	6.00	4.33	-28%
AFA Catcher/Processors	123	109	-11%	3.96	5.29	34%
Catcher Vessels	349	410	18%	6.19	6.64	7%
Total	2,418	1,846	-24%	5.87	4.75	-19%
Pelagic Trawl						
AFA Catcher/Processors	133	64	-52%	0.30	0.13	-55%
AFA Catcher Vessels	80	19	-76%	0.12	0.03	-78%
Total	214	83	-61%	0.19	0.07	-63%
CDQ						
Hook-and-line Vessels	49	23	-52%	2.30	1.26	-45%
Non-pelagic Trawl Vessels	163	113	-31%	4.47	2.83	-37%
Pelagic Trawl Vessels	18	9	-52%	0.14	0.06	-56%
Total	230	145	-37%	1.25	0.74	-41%
** Rate is kg of halibut / mt of groundfish* **TOTAL**	**3,301**	**2,255**	**-32%**	**1.79**	**1.19**	**-34%**

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IPHC's Assessment of the Pacific halibut stock at the end of 2016 (I. Stewart and D. Wilson), Presentation from the 93rd Annual Meeting, January 2017. IPHC-2017-AM093-07
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http://www.iphc.int/publications/rara/2016/IPHC-2016-RARA-26-R-2.6_Incidental_catch_of_halibut.pdf

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https://alaskafisheries.noaa.gov/sites/default/files/analyses/finalbsai111earirirfa0116.pdf

NMFS's BSAI inseason management report, Agenda Item B2 at NPFMC December 2016 meeting.
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NPFMC's October 2017 meeting, Agenda Item C9. Halibut Abundance-based PSC Limits - Discussion paper. C9 Halibut ABM Discussion Paper 9-8-17.
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NPFMC's Fishery Management Plan for Groundfish of the Bering Sea and Aleutian Islands Management Area. October 2017.
https://www.npfmc.org/wp-content/PDFdocuments/fmp/BSAI/BSAIfmp.pdf

Appendix II

BYCATCH IN REGULATORY AREA 2B (CANADA)

The information provided in this Appendix shows trends in bycatch mortality by sector for IPHC Regulatory Area 2B in British Columbia, Canada.

The IPHC defines bycatch as follows: *Incidentally caught fish by fisheries targeting other species and that cannot legally be retained. Bycatch mortality, or bycatch removals, refers only to those fish that subsequently die due to capture.*

Bycatch of Pacific halibut has been an ongoing management issue since the 1960s. For perspective, the trend in total removals of Pacific halibut, including bycatch, coastwide for all IPHC Regulatory Areas is shown in Figure 1.

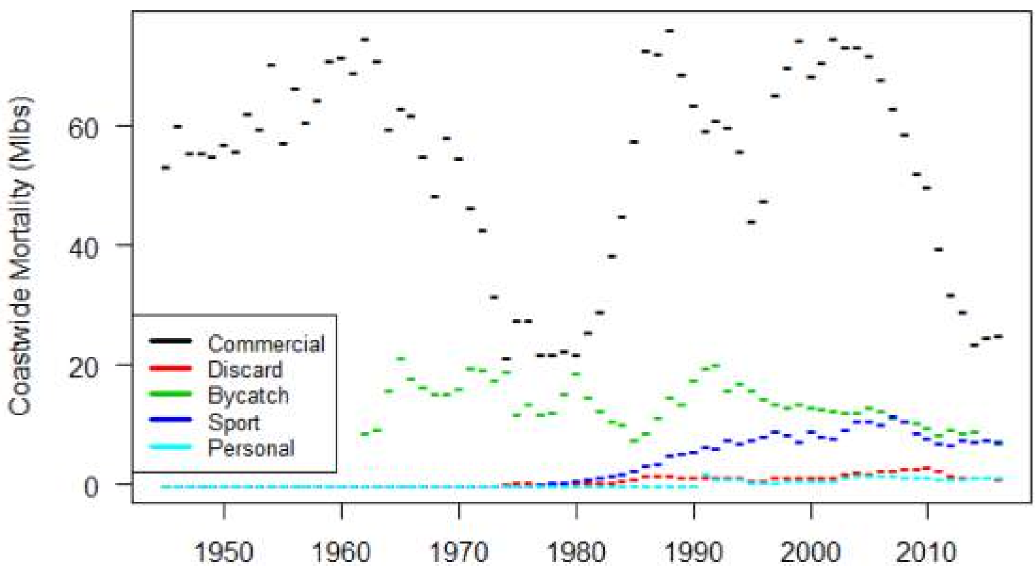

Figure 1. Trend in Pacific halibut total removals coastwide (millions of lbs). Commercial is the directed longline fishery, Discard is the discard mortality from the directed commercial fishery, Bycatch is mortality from non-directed fisheries, Sport (Recreational) is guided and unguided recreational fisheries, and Personal is personal use and subsistence. *(Source: Abundance-based Management (ABM) discussion paper, Figure 2, p.8 (see references))*

ESTIMATING BYCATCH

Bycatch of Pacific halibut is estimated because not all fisheries have 100% monitoring and not all Pacific halibut that are discarded are assumed to die. Agencies estimate the amount of bycatch that will not survive, called discard mortality.

The IPHC's Fisheries Statistics paper (IPHC-2018-AM094-05) for IPHC's Annual Meeting provides sources of bycatch information, as well as the estimated bycatch mortality by Regulatory Area. For British Columbia, the amount of information varies by fishery. Trawl groundfish fisheries are comprehensively monitored and bycatch information is provided to IPHC by DFO. Bycatch in the trawl groundfish fishery is managed with an individual bycatch quota program implemented by DFO in 1996. Fishery observers sample the catch on each bottom trawler, collecting data to estimate bycatch and discard mortality. Bycatch in other fisheries, such as the shrimp trawl, sablefish pot, and rockfish hook-and-line fisheries, was largely unknown until the inception of the Integrated Fisheries Management Program in 2006. The program has requirements for full accounting and accountability of all bycatch, and includes 100% at-sea monitoring, either by human observers or electronic monitoring. Estimates of trawl bycatch were provided by DFO staff at the Pacific Biological Station, based on data collected by observers. Reporting of bycatch from the non-trawl programs is being developed with DFO staff and will be provided in future reports.

In IPHC Regulatory Areas 2B, observers deployed on the bottom trawl vessels examine each Pacific halibut to determine release viability. The bycatch mortality reported to IPHC incorporates these release viability observations.

DESCRIPTION OF COMMERCIAL FISHERIES WITH BYCATCH

In waters off British Columbia, several commercial fisheries, or sectors, have bycatch of Pacific halibut to varying degrees according to the IPHC's definition of bycatch, including trawl groundfish fisheries, salmon troll, shrimp trawl. Canadian Integrated Fisheries Management allows licensed vessels in the quota fishery to harvest a suite of species. For example, a vessel fishing for sablefish with a category K "Sablefish" licence, may land their halibut catch. Furthermore, if legal-sized halibut is discarded, it counts towards the available halibut quota via a deduction of discard mortality (average weight multiplied by gear-specific discard mortality rate). However, this discarded amount is not tracked as bycatch mortality.

Some of what IPHC considers bycatch (Pacific halibut caught in non-halibut fisheries and discarded at sea) may be reported as landed catch for IPHC Regulatory Area 2B. IPHC and DFO staff are coordinating on better defining and reporting Pacific halibut discard mortality (whether as bycatch or incidental mortality to commercial fisheries) for IPHC's catch accounting purposes.

In Canada, Pacific halibut bycatch in trawl fisheries are capped at 750,000 pounds net weight (453.6 t round weight) by DFO. Non-trawl bycatch is handled under an IFQ system within the directed Pacific halibut fishery cap.

TRENDS IN BYCATCH BY SECTOR FOR IPHC REGULATORY AREA 2B

The IPHC reports Pacific halibut bycatch mortality from commercial fisheries by year, sector, and IPHC Regulatory Area in the Annual Meeting Fisheries Statistics paper (IPHC-2018-AM094-

05) and prior to that in the IPHC's Report of Assessment and Research Activities (RARA). For 2017, bycatch mortality in the BC bottom trawl fishery was estimated at 251,000 pounds (113.9 t). The reported bycatch mortality data were complete through September. Projections for the full calendar year 2017 were made by extrapolating to the full 12 months. The table below provides the bycatch mortality in Regulatory Area 2B from 2008-17.

IPHC Reg Area and Gear	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
AREA 2B										
Groundfish Bottom Trawl	143	213	181	232	189	225	245	326	271	251
Total	143	213	181	232	189	225	245	326	271	251

Figure 3 from the 2016 RARA (IPHC-2016-RARA26-R), Chapter 2.6, shows the Pacific halibut bycatch mortality by IPHC Regulatory Area region from 1990-2016. The figure shows Regulatory Area 2 bycatch is proportionally smaller than Areas 3 or 4.

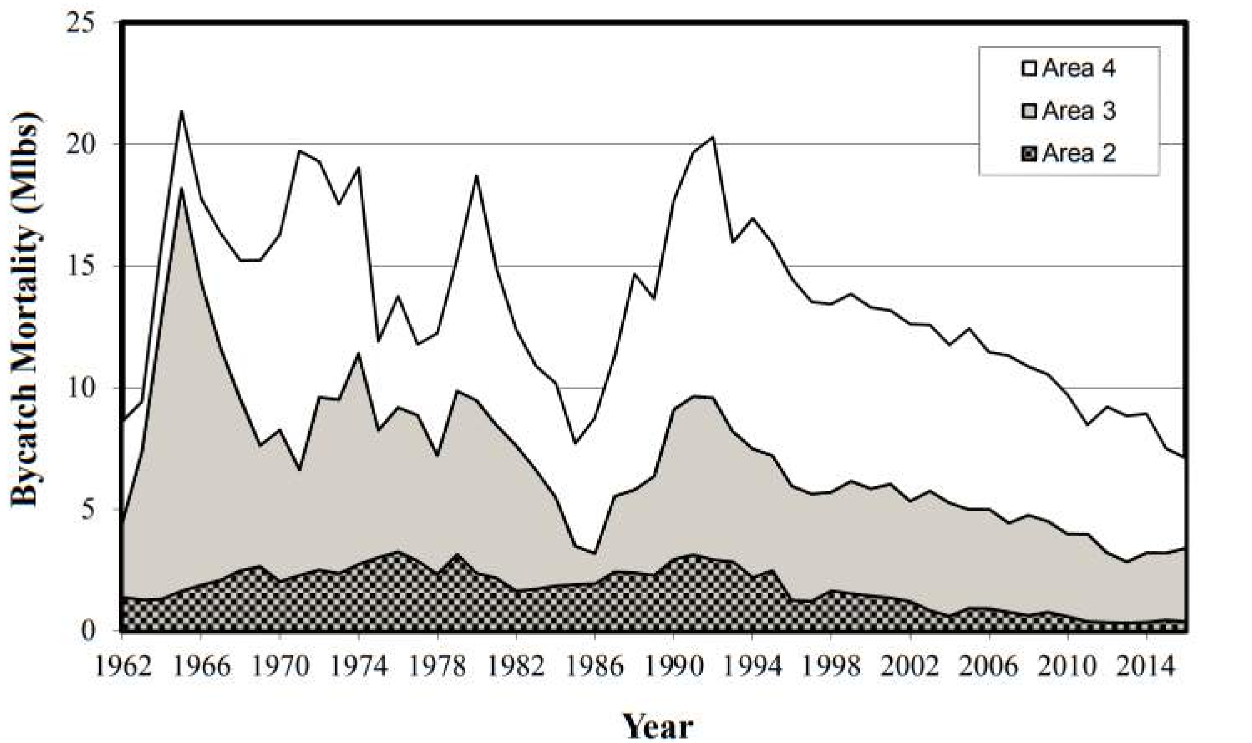

Figure 3. Bycatch mortality estimates of Pacific halibut by IPHC regulatory area (millions of pounds, net weight), 1990-2016.

Figure 5 from the 2016 RARA (IPHC-2016-RARA26-R), Chapter 2.6, shows the Pacific halibut bycatch mortality by calendar quarter for IPHC Regulatory Area 2B from 2007-16.

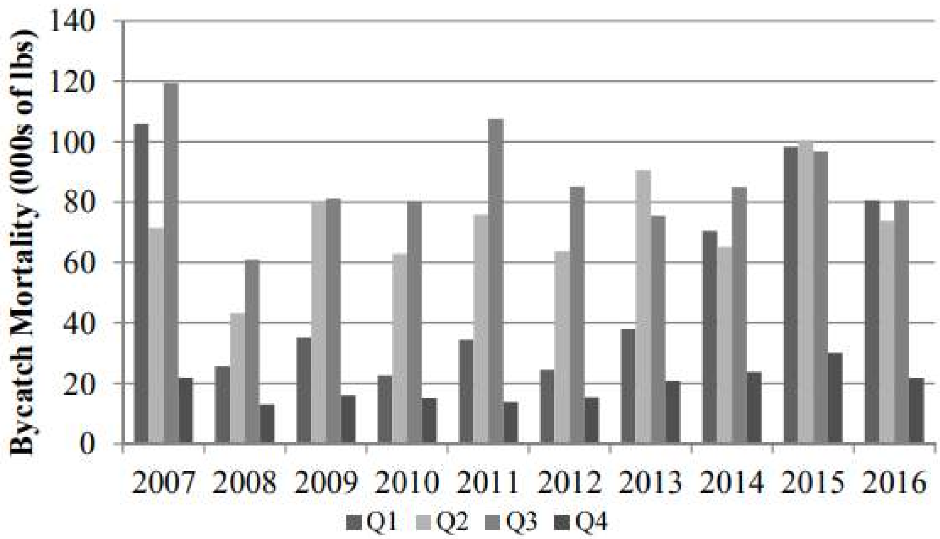

Figure 5. Pacific halibut bycatch mortality (thousands of pounds, net weight) by calendar quarter in the 2007-2016 Area 2B (BC) bottom trawl groundfish fishery.

Figure 6 from the 2016 RARA (IPHC-2016-RARA26-R), Chapter 2.6, shows the Pacific halibut bycatch mortality by gear type from 2007-2016 in Regulatory Area 2B.

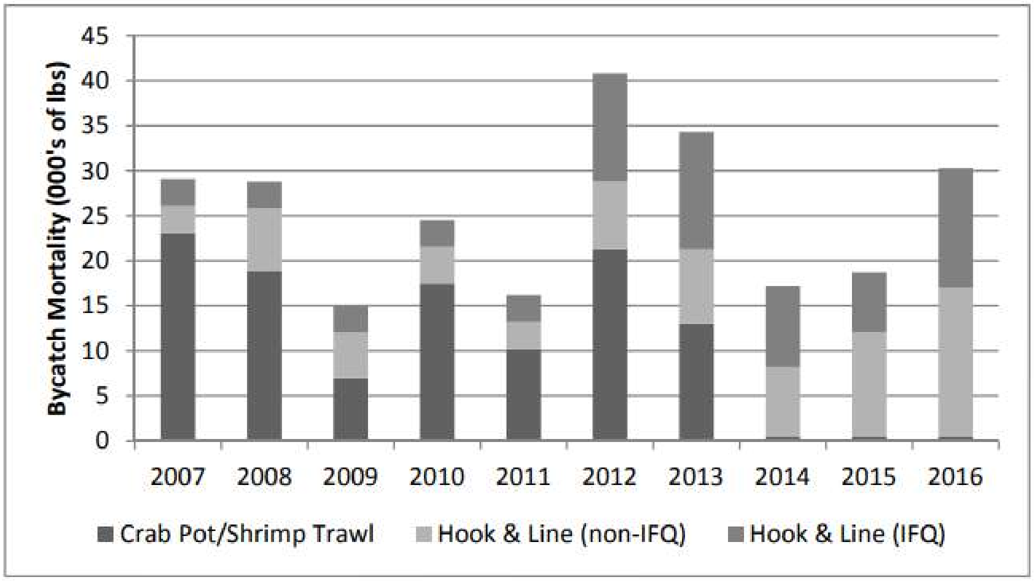

Figure 6. Pacific halibut bycatch mortality (thousands of pounds, net weight) in IPHC Area 2B during 2007-2016 by gear.

REFERENCES

NPFMC's October 2017 meeting, Agenda Item C9. Halibut Abundance-based PSC Limits - Discussion paper. C9 Halibut ABM Discussion Paper 9-8-17. http://legistar2.granicus.com/npfmc/meetings/2017/10/965_A_North_Pacific_Council_17-10-02_Meeting_Agenda.pdf

IPHC's Report of Assessment and Research Activities. 2016. Chapter 2.6 Incidental catch and mortality of Pacific halibut, 1990-2016. Claude Dykstra. p.71-89. http://iphc.int/library/documents/category/report-of-research-assessment-and-research-activities-rara

Stakeholder statements on regulatory proposals

PREPARED BY: IPHC SECRETARIAT (28 DECEMBER 2017)

PURPOSE

To provide the Commission with a consolidated document containing 'Statements' from stakeholders on the range of Regulatory Proposals submitted to the Commission for its consideration at the 94th Session of the IPHC Annual Meeting.

BACKGROUND

On 26 June 2017, the IPHC Secretariat announced (via IPHC Circular 2017-11) a new avenue for Stakeholders to submit comments on the range of Regulatory Proposals submitted to the Commission for its consideration. Specifically the Circular indicated that:

> "*Informal Statements by stakeholders should be submitted as an email to the following address, which will then be provided to the Commissioners as Stakeholder Statements: Statements@iphc.int at each Session."*

The new IPHC website contains further details on the process: http://iphc.int/the-commission/fishery-regulations/

DISCUSSION

Table 1 provides a list of the Stakeholder Statements received by the deadline of 23 December 2017, which are provided in full at Appendix I. The IPHC Secretariat does not provide commentary on the Statements, but rather, simply provides a collations for the Commissions consideration.

Table 1. Regulatory proposals received from Contracting Parties and stakeholders by the proposal deadline of 23 December 2017.

Appendix No.	Title and author	Date received
Appendix I	Regulatory Proposals C2, C4, C6, C9, C11, C12 (Paul Olson)	20 November 2017
Appendix II	Comments on Patty Phillip's Nov. 2017 proposals to IPHC (James Mackovjak)	17 December 2017
Appendix III	Written comment from Puffin Fishing Charters (Leslie Pemberton)	18 December 2017
Appendix IV	Comment on a Proposal to IPHC (Judy Brakel)	19 December 2017
Appendix V	Nil. (David A. Croonquist)	21 December 2017
Appendix VI	Nil. (James S. Kearns)	22 December 2017
Appendix VII	Comment on Regulatory Area 2C(James Whitethorn)	22 December 2017

APPENDICES

As follows and listed in Table 1.

Paul Olson, Attorney At Law
606 Merrell St
Sitka, AK 99835
(907) 738-2400
polsonlaw@gmail.com

November 20, 2017

Re: Informal Statement re: Regulatory Proposals C2, C4, C6, C9, C11, C12

International Pacific Halibut Commission:

I submit the following comments on behalf of The Boat Company, which provides guided halibut fishing opportunities in IPHC regulatory area 2C (Southeast Alaska). The Boat Company supports the intent of 2018 Regulatory Proposals C2, C4, C6, C9, C11 and C12 which would carve out exceptions to the IPHC's 2017 regulation 28(1)(d) that prohibits filleting of sport caught halibut in Alaska. The Boat Company conducts multi-day tours in southeast Alaska aboard two larger vessels, the 145' M/V Liseron and the 157' M/V Mist Cove and deploys smaller vessels for sport fishing activities. Its tours combine freshwater and saltwater sport fishing opportunities with eco-tour activities such as kayaking, hiking, and beachcombing. The total numbers of harvested halibut by clients are small relative to full-time charter operations, but an important part of the tour package involves processing and preserving halibut onboard the larger vessels for future client consumption.

The Boat Company requests that the IPHC move forward with consideration of exceptions to the regulation and evaluate reporting requirements that would meet enforcement needs while increasing processing flexibility as sea for multi-day charter operators. Regulation 28(1)(d) provides that:

> no person shall possess on board a vessel, including charter vessels and pleasure craft used for fishing, halibut that have been filleted, mutilated or otherwise disfigured in any manner, except that each halibut may be cut into no more than 2 ventral pieces, 2 dorsal pieces, and 2 cheek pieces, with skin on all pieces.

The purpose of the regulation was to enable enforcement officers to determine compliance with maximum and minimum size limits and bag limit possession requirements. The enforcement concern was that allowing filleting at sea would prevent enforcement officers from determining either the numbers or lengths of fish. The existing regulation balances enforcement needs and utilization of harvested halibut most effectively for the majority of charter operations that harvest halibut at sea in a single day and return to process the fish onshore or at a lodge. However, it is problematic for live-aboard vessel owners, unguided fishermen and multi-day charter operators.

In general, the 2018 regulatory proposals would create exceptions for live-aboard vessels or private pleasure craft with processing or preservation facilities. As explained by Andrew Cooper and Steve Riehemann in Proposals C2 and C4, the existing regulation does not provide adequate processing options for vessels that do multi-day trips or operate in remote areas far from port facilities. Three of the proposals suggest or specifically add reporting mechanisms to address enforcement needs, such as additional logbook data entry and photo documentation.

The IPHC has previously received regulatory proposals requesting changes to the regulation (2010 – 2012 meeting cycles), including earlier proposals from individual charter operators who conduct multi-day fishing trips or other vessel operators who deploy catcher vessels from one larger vessel that operates as a "floating lodge." As explained in a regulatory proposal submitted by another multi-day charter operator in 2011, current regulation 28(1)(d) limits the processing options available to multi-day tour operators relative to charter operators that conduct daily trips. A particular problem shared by live-aboard vessel owners, private cruise vessels and multi-day tour operators is the inability to process and preserve halibut into meal-size packages.

The Boat Company would thus appreciate the IPHC moving forward with enforceable exceptions that include multi-day charter operators. An exception would be particularly useful if there was a small increase in the maximum size limit in future years or possibly even 2018. Specifically, the 2015 – 2017 maximum size limits of 42, 43, and 44 inches, respectively, are readily reduced to fletches as required under the regulation because they are small enough – about the size of a coho fillet – for standard vacuum packing. Even at this size, clients would prefer chunking but at least the processing is feasible onboard. But the Area 2C catch limits have gradually increased over the past five years such that it is possible to anticipate a 45 – 46 inch maximum size limit in the near future. This size limit is roughly the threshold at which onboard processing becomes challenging. 45 – 46 inch fish are roughly the threshold at which vacuum sealing is problematic and increased processing flexibility becomes necessary.

An improved regulation would identify and create an exception to the filleting prohibition for the three halibut resource stakeholders negatively affected by the filleting prohibition – (1) owners of live-aboard vessels; (2) private vessel owners with preservation facilities who do not return to port daily and (3) charter operators who conduct multi-day trips. The resource stakeholders share one common feature – the ability to process and preserve (i.e. vacuum pack and freeze) halibut onboard. Thus, as suggested by Proposals C4 and C11, the regulatory language could identify halibut harvesters who qualify for the exception by focusing on the processing and preservation capacity of a vessel.[1]

The IPHC could then establish more rigorous reporting requirements to address the enforcement need to verify the number and size of halibut caught and possessed. Proposals C2, C9 and C11 identify potential reporting requirements that would address the enforcement need to determine the minimum size of number of fish. Anglers or multi-day charter operators would first maintain an additional log that identifies the date, time, location and measurement data (weight and/or length) of each halibut caught. They would then photographically document each fish, with processed fish packages marked to correspond to the log and photograph.

The Boat Company currently follows the suggested procedure by documenting each fish in a way that would enable enforcement officers to determine compliance with size and bag limits. Each fish is photographed and weighed, with the frozen fletches labelled by each client. The Boat Company also retains carcasses. In other words, if a regulatory change allowed The Boat Company to process halibut into more than four fletches, an enforcement officer could still weigh the marked pieces which would each correspond to a photograph and a specific carcass. For example, even allowing an option for seven pieces filleted in a specific manner, as is acceptable in Area 2B, would be an improvement.[2]

In sum, the current regulation assumes that sport fishing vessels return to port daily for processing. The Boat Company believes that it is possible for the IPHC to design a regulatory exception for sport-harvested halibut at sea and balance the enforcement need with additional reporting requirements that enable enforcement officers to compare marked halibut packages with logs, photographs or retained carcasses.

Thank you,

Paul Olson, Attorney-at-Law

[1] Proposal C11 references "preserved fish" as defined in the Alaska Administrative Code at 5 AAC § 75.995(21).

[2] http://www.pac.dfo-mpo.gc.ca/fm-gp/rec/finfish-peche-eng.html

From: James Mackovjak
To: Statements
Subject: comments on Patty Phillips"s Nov. 2017 proposal to IPHC
Date: Sunday, December 17, 2017 5:20:46 PM

Alaska Halibut Forever
Gustavus, Alaska
c/o Judy Brakel
P.O. Box 94
Gustavus, AK 99826
(907) 697-2287

COMMENTS ON PATTY PHILLIPS’S NOV. 2017 PROPOSAL TO IPHC

Our Gustavus-based organization, Alaska Halibut Forever, is concerned about the impacts of unguided (self-guided) halibut sportfishing businesses on the halibut resource, communities, and other halibut stakeholders.
We support Patty Phillips’s November 2017 proposal to the IPHC and have several comments to add to the discussion on that proposal. We believe that adopting Ms. Phillips’s proposal and our additions to it (highlighted) would provide managers of Alaska’s halibut fishery with essential information regarding the unguided halibut sport fishing effort and harvest. Thank you for your consideration. Please contact us if you have any questions.

TITLE: FOR UNGUIDED SPORT FISHING
Require logbook-style record keeping and reporting for certain unguided anglers in Alaska. It is a widespread practice of lodges or other businesses to equip unguided anglers with boats, gear, and local knowledge so the unguided angler can fish without the assistance of a licensed guide. There currently is no requirement for unguided anglers to report their sport fishing effort and harvest of halibut, thus it is difficult to assess any trends in effort and harvest.
Purpose and Need:
The growth of unguided halibut rental vessels, which are not constrained by a sector limit, has resulted in an increased halibut harvest. There is a need to identify and track unguided halibut rental vessels to better understand their impacts on the halibut resource, communities, and other halibut stakeholders. This information will help determine whether additional management actions are necessary for this segment of the fishery.

Suggested Regulatory Language:
Section 3. Definitions (u) “unguided angler” with respect to a person sport fishing for halibut, means an angler or anglers sport fishing from a vessel provided by a lodge or other business equipping angler(s) with boats, gear, and local knowledge for the angler(s) to sport fish without the assistance of a licensed guide.
Section 28. Sport Fishing for Halibut (4) For unguided angler sport fishing from a vessel provided by a lodge or other business in Regulatory Areas 2C and 3A:
1) Each unguided angler shall carry a Harvest Record on his or her person while fishing for halibut. Such harvest record must include:
a) name of unguided angler
b) state of residence of unguided angler
c) Alaska sport fishing license number

d) vessel license number or registration number
e) date(s) of sport fishing effort
f) ADF&G 6-digit Logbook Area in which sport fishing effort primarily occurred
g) catch per day
i) number of halibut and total estimated weight retained
ii) number of halibut released
2) The Harvest Record must be returned to the Alaska Department of Fish & Game within 10 days upon completion of angler fishing effort.
3) No person shall make a false entry on the Harvest Record referred to in this section.

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James Mackovjak
P.O. Box 63
Gustavus, Alaska 99826
home: (907) 697-2246
cell: (541) 514-9145
lituya@gmail.com

Appendix III

From: Leslie Pemberton
To: Statements
Subject: Written comment from Puffin Fishing Charters
Date: Monday, December 18, 2017 10:08:22 AM

To IPHC members of the commission and staff,

My name is Leslie Pemberton and I co-own puffin fishing charters with Denise Hawks.
I went to Dutch harbor, Alaska in 1974 when I was 19 to make money to go back to college and never left.
I started working for fish processors and then eventually started working on fishing boats to acquire sea time for my captains license in 1979.
Since then, have ran various types of vessels in the fishing charter and commercial fishing sector.
We own and operate four mid size vessels and been fishing charters out of Seward for over 30 years.
We are commercial ifq recipients that had bought 10,000 lbs of commercial ifq years ago and now have 2800 pounds of quota.
We feel the pinch from both commercial fish and charter fish sectors.

We went to the NPMC advisory panel meeting in Anchorage, Alaska and the NPMC meetings the week of December 4 and it was obvious there are a lot of issues that need more time to be researched, analyzed and resolved.
We sense there is an urgency for something more tangible at this time.
We understand Management Tools are needed to do our part to reduce our allocation in the charter sector.
Therefore, we support additional Tuesday's no retention of halibut if needed along with the already pre existing additional restrictions.
We feel this is enough to to bring us back down below our allocation for now.
We support other restrictions once the other recommendations are analyzed and presented to the council in the future if needed.

We are conservation minded as a company.
We are very concerned about our resource, and have taken steps with our clients to educate them on the changes with the halibut resource.

In the past, Alaskans were a large part of our client base.
Most of our clients now are from the lower 48 and other countries.
Gone are the days of filling their freezers for the locals.
In the past, our clients came aboard expecting to catch two triple digit fish.
We are now selling the fishing experience.
We have lost most of our Alaskan clientele. Many Alaskan recreational halibut anglers has their own boats now or knows someone who does.
This is an effective way to circumvent the restrictions effective on charter boats, especially the annual limit.

We realize there is a crisis in our halibut stocks and EVERYONE has to carry the burden.

Due to the drastic regulation changes in the charter industry in the last several years, the recreational anglers presence has increase substantially with many of them launching from Seward, Alaska and fishing our local waters.
Not all of them are fishing halibut but a lot of them are. They are visually present on the grounds.

There is no way to know how far co-opting of vessels has gone in the recreational sector.
All we have is antidotal evidence on an expanded fleet of mom & pops.

We are having a problem (with the recreational sector mostly in) the larger ports in area 3a Seward, Homer, Whittier with the increased recreational angler presence on the fishing grounds and something has to be done.
They are pinging our spots, fishing those spots on our no halibut day, taking"friends" out on a regular basis.
They are making a major impact on the halibut resource.

Now it's time recreational sector to do their part.
The recreational sector should be held to the same restrictions as the charter halibut industry.
It's imperative that all sectors, the recreational sector as well as trawl fishery work together to sustain our halibut resource.
The burden on conservation of the halibut resource should not fall on one or two user groups.
We are all in this together.
Commercial, charter, recreational, and trawl by catch.
We especially encourage reviewing further restrictions of reducing trawl by catch of halibut.
We also encourage you to review the residential recreational halibut charter fisher catch limit and the possibility that the restrictions for the charter sector coincide with the recreational sector.
We are presenting this issue to IPHC in hope that these two additional sector groups will also be included in doing their part to help sustain the resource.
This needs to be addressed as soon as possible.
Thank you for your consideration and attention in this matter.

Sincerely,
Capt. Leslie Pemberton
Denise Hawks
Puffin fishing charters
Seward, Alaska

Sent from my iPad

From: Judy Brakel [mailto:judybrakel@gmail.com]
Sent: Tuesday, December 19, 2017 11:26 AM
Subject: Comment on a Proposal to IPHC

To the International Pacific Halibut Commission:

This is a comment in support of a proposal submitted by Patty Phillips for the Nov. 2017 and Jan. 2018 meetings. It is a comment in support of Patty Phillips' proposal titled "For Unguided Sport Fishing." Our organization, Alaska Halibut Forever" has suggesting some improvements to that proposal - see comment submitted by Alaska Halibut Forever. These suggested modifications would make the reporting of Self-guided halibut sport fishing parallel to the existing Charter Sport Fishing logbook system. Like the Charter logbooks, it would be limited to Areas 2C and 3A and it would require the same sub-area reporting.

At its early December 2017 meeting the North Pacific Fishery Management Council, responded to a Discussion Paper on the topic of Self-Guided halibut sport fishing. The NPFMC decided to undertake an expanded study of Self-guided halibut sport fishing businesses. See the NPFMC "C3 Motion" titled "Self-Guided Rental Boats," available on the NPFMC's December 2017 "Agenda." One of the Council's stated study objectives is finding means of estimating halibut harvests by clients of Self-guided sport fishing businesses. Passage of Ms Phillips' proposal, ideally with the modifications suggested by Alaska Halibut Forever, would constitute a valuable step forward in assisting this project. As well, it could encourage the Council's effort to assess the size and impacts of Self-Guided halibut sport fishing businesses.

Available information shows this new Self-guided sector expanding considerably, especially in Halibut Area 2C. Businesses have found a way to get around the requirement to have the NPFMC's Charter Halibut Permits (federal limited entry permits),and around the Charter clients' daily bag and size limits, etc., and around the Charter logbook reporting requirement. The halibut harvest of this growing sector comes off the top before the allowable directed catch is determined for Halibut Areas 2C and 3A under the Catch Sharing Plan installed by the NPFMC several years ago. This puts both the commercial setline fishery and the halibut charter sport fishing industry at a disadvantage. It also increases fishing pressure on near-shore halibut populations near Alaska coastal communities, making halibut less available as an important local food for these communities. Our community of Gustavus has watched this development with concern for the future of the resource.

Thank you for your attention.

Judy Brakel, Box 94, Gustavus, Alaska 99826 phone 907-697-2287 email judybrakel@gmail.com

Appendix V

December 21, 2017

International Pacific Halibut Commission
2320 W Commodore Way,
Salmon Bay, Suite 300
Seattle, WA 98199-1287

Dear Commissioners:

The Pacific Halibut Convention between the United States and Canada was signed in 1923 to administer the commercial fisheries for halibut between both countries. It wasn't until 1973 that the first regulations governing the sport fishery were drafted. It is time to recognize that commercial fishing and recreational fishing need different management protocols. We believe the sport fleet halibut fishery should be managed separately from the commercial, Alaska subsistence, and tribal/First Nation fisheries.

The International Pacific Halibut Commission (IPHC) currently sets harvest poundage quotas for the various halibut fisheries in the waters off the US and Canadian coasts. Areas 2A (Southern US) and 2B (Canada) have assigned quotas that are divided between sport, commercial, and tribal fisheries. In 2017, the 2A sport quota was 528,998 lbs and the 2B sport fishery had 1.117M lbs. In Alaska, the charter fleet had a 2.8M lb quota and the private boat fleet had *no quota* and took an estimated 2.8M lbs. We believe it is time to re-structure the sport halibut fishery to be managed on an equitable basis for both countries. We feel that it can be done on numbers of fish landed, not pounds landed. This can be done with a standardized season of February 1 to December 31; a daily bag limit of one fish; a field possession limit of two fish; and an annual limit of up to six fish.

Recreational halibut anglers are a critical component in the coastal economies of the US and British Columbia. They spend tens of millions of dollars which support many businesses from motels and gas stations to restaurants, grocery stores, bait dealers, fishing lodges, and tackle shops. Loss of halibut fishing opportunities can and is causing severe economic impacts to coastal communities in both countries.

A consistent season structure with a daily limit, a field possession limit, and an annual limit would have far reaching impacts not only for the coastal economies of our two countries but would also allow for a safer fishery. Assigned fishing dates have created a derby mentality, forcing anglers to go fishing when they shouldn't be on the water. Lives and property have been lost. First responders including the US and Canadian Coast Guard are put at risk when called out for search and rescue activities. Having an extended season would allow the sport angler to pick the days and sea/weather conditions for a safer fishery.

We would like to work with the IPHC, and the NPFMC, PFMC, and the Canadian DFO to establish regulations that would be consistent for the sport fishing communities of both countries starting with the 2019 season.

Sincerely,

David A. Croonquist

Sequim, WA

For the Olympic Peninsula Salmon and Halibut Coalition, Port Angeles Salmon Club, Puget Sound Anglers, Coastal Conservation Association, City of Port Angeles, Port of Port Angeles, Clallam County Commissioners, Port of Port Townsend, halibut anglers from Oregon and California, and coastal businesses with direct and indirect links to the sport fishing community.

IPHC

NPFMC at npfmc.comments@noaa.gov

To whom it may concern:

I am sending these comments in response to the discussions about the self guided sport fishing(recreational fishing) impacts and possible actions; the RQE CHP buy up, and the CHP latency potential and actions.

You have heard from me before, so what I have to say is not new. However as the issues and the myriad of scenarios become more complex and with continuous effort to regulate the next concern, it seems to me that there is a very simple fix.

Get rid of the CSP, the GAF, and anything else that connects recreational fishermen to commercial fishermen; make a separate recreational halibut fishing allocation; provide for accountability in that allocation(logbooks and punchcards); and regulate the participants of that allocation. I know this may seem to be going backwards on the road that we have all so laboriously decided to follow; however it is a better way.

Should you decide to do so; it nullifies the self guided advantage and impact on the halibut(all recreational fishermen would have the same rules); it simplifies regulatory rhetoric and paperwork; reduces enforcement confusion and costs; removes competitive issues between commercial fisherman and charter boat operators; and brings equity to all recreational users of the resource. It turns an RQE, if implemented, into a benefit to all recreational sports fishermen and it has no impact on the CHP(limited entry) requirement for charter boats but it does impact the latency issue of those permits by including all recreational fishermen in the allocation.

So again, I say, put all recreational halibut fishing into a single recreational allocation that is separate from the commercial allocation. Then use the science to regulate that allocation to be sustainable. Oh, and make the allocation equitable to the number of users.

And if we want to support the halibut resource even better, vote to implement Kent Huff's "Bycatch use in lieu of area IFQ for commercial fishermen" proposal.

Thankyou for your service on the council and thankyou for considering my comments. I welcome your feedback.

Sincerely,

James S Kearns

Comment on Regulatory Area 2A, 2B, 2C, 3A, 4A, 4B, 4CDE

Name : James Whitethorn

Affiliation : West Brothers Group

Address : Box 94

City : Petersburg State/Prov. Alaska Zip Code : 99833

Telephone : 760-464-1543 Fax : E-Mail :

Signature

1) What is your recommended catch limit or proposal?

   West Brothers Group recommends a total removal of 9.22 million lbs for the 2018 season for 2C. Same as 2016.
   The commercial catch would be 6.03 million.

2) What is the supporting information for this recommendation, (eg catch rates, biomass, trends
   Recruitment, ect.) Please be specific where possible.

   See below

3) Attach any supporting materials

1) We feel that all areas should be run on an area by area model for apportionment.

a) With our increase in the setline survey from 104.3 lbs in 2008 to 209.0 lbs in 2015, and 12% up for 2016. We can justify the total Removals of 9.22 million and a commercial catch of 6.03 million.

b) We feel that our biomass is under estimated by 60 million lbs in 2C.

c) With our survey increases, it pretty well proves that the fish don't migrate back west from 2C. That must mean that they are coming to spawn and because our size, being the largest at 3lbs. In the total fisheries, don't seem to be showing up anywhere else. Also, the the 1925 – 1976 survey show out of 9729 tags, only five fish west and four of those went only to 3A, 85 went to Charlotte South, while 1945 were caught in 2C. (See attached Survey)

d) We are concerned with our Eco system in 2C, with the overstock of halibut. Our brown crab, red crab and now we are finding halibut with full size dungy crab in their stomach.

e) Maybe our risk factor should separate for each AAF regional datasets.

f) Also we feel because of the catch wastage of 0.5%, our commercial catch of 6.03 million is justified. We cannot figure out how we are responsible for 14% wastage because of coastwide average. How can we any better than 0.5% wastage. We think that the observer coverage should match the bio-catch wastage of Halibut in each area. Let's solve the problem, where needed.

2) Setline Survey
    a) Average from 1977 – 2014 in 2C is 185.3 lbs per skate
    b) 2014 2C was 186.5 lbs per skate
    c) 2015 2C was 209.0 lbs per skate
    d) 2016 2C is about 235 lbs per skate (over twice that of your best area)
    e) 2017 2C is about 250 lbs per skate

3) Total Removals
    a) 1995-2014 2C was at an average of 10.96 million lbs of total removals.
    b) 2015 total removals for 2C were 5.65 million lbs.
    c) 2016 total removals for 2C were 6.366 million lbs.
    d) 2017 total removals for 2C were 7.04 million lbs.

4) If (by using area model) we take 75% of the 1995-2014 average of 10.96 Million lbs, we would harvest 9.22 million lbs of total removals.

a) Total removals = 9.22 million

b) Charter 16 to 17 % = 1.48 million

c) Non Charter = 1.19 million

d) Subsistence and Wastage = .26 million

e) Total other uses = 2.93 million

5) 2016 Removals = 9.22 million

   a) Minus other uses = 2.93 million

   b) 2016 Commercial Catch = 6.03 million

6) Best fishing ever in 2C

   a) My personal catch was 380 skate in the 2017 season.

   b) Biggest average size at 31 lbs

   c) We would like to see the Charter Fleet to get one fish without a slot size.

   d) Our bycatch is lower than 0.5%

   e) We feel that 9.22 million total removals would be a number that could be used for a long term without decreasing our survey.

f) This proposal 8.22 was passed by PAG in 2016 and not considered by The commission.

Thank You.

Release and Recovery location of Tagged Adult Halibut
1925 -1976

Release Region	# Released	Bering Sea	Shumagin	Chitikof	Kodiak	Yakutat	South/East	Charlotte S.	Total	Unknown
Bering Sea	20,435	756	21	69	125	116	83	53	1223	40
Shumagin	5992	0	202	104	35	20	24	11	396	10
Chitikof	9193	0	37	473	91	20	17	10	648	31
Kodiak	16501	0	17	119	1294	40	36	25	1531	31
Yakutat	11431	0	31	122	428	1078	62	52	1773	5
South/Eastern	9729	0	0	0	1	4	1945	85	2035	46
Charlotte South	59361	0	1	0	7	39	194	17288	17529	254
Total	132642	756	309	887	1981	1317	2361	17524	25135	417

Mostly Adult Halibut in this Survey

IPHC-2018-AM094-INF05
Received: 08 January 2018

THE MAGNUSON-STEVENS ACT

CONTINUING OUR NATION'S LEGACY OF STRONG, SCIENCE-BASED FISHERIES MANAGEMENT

A Legacy of Success

Since 1976, the Magnuson-Stevens Fishery Conservation and Management Act (MSA) has been a critical tool in rebuilding America's fisheries and coastal fishing communities.

In addition to establishing the exclusive economic zone, the MSA also established eight regional fishery councils, each tasked with setting its own uniquely tailored fish population targets and given the power to develop and implement its own fishery management system. In 2006, the reauthorized MSA established annual catch limits and accountability measures as additional tools for addressing overfishing and rebuilding local fish populations.

The overall effectiveness of the MSA has hinged on engaging local stakeholders in the management, monitoring, and enforcement of regional harvest targets. These efforts have resulted in the rebuilding of dozens of fish stocks around the country, which has translated into increased economic activity and jobs for Americans.

MSA AT A GLANCE

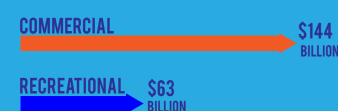
41 Fish stocks rebuilt since 2000

Rebuilding all US fish stocks would lead to:

$31 BILLION Estimated increase in annual sales

Support for half a million new US jobs

Estimated sales by sector in 2015:



Charting a New Course

While the MSA has successfully rebuilt depleted fish populations and encouraged science-based fishery management, the current reauthorization of the MSA is an opportunity to continue this legacy and establish an even stronger tool for America's fishing communities. In light of changing ocean conditions and climate change, all fishing sectors must come together and work collaboratively to conserve fish populations so that future Americans have access to healthy fisheries and thriving marine ecosystems.

The Alaska Longline Fishermen's Association (ALFA) and others around the country are urging Congress to uphold policies in the MSA reauthorization that will require: **accurate and timely fish stock assessments and harvest monitoring; enforcement of annual catch limits; and shared accountability across all fishing sectors.**

The current reauthorization of the MSA is a chance to ensure that all can fully realize and benefit from the bounty of our shared marine waters. **Visit alfafish.org or call 907-747-3400 to learn more.**

Take Action: All Hands on Deck

Whether you're a commercial fisherman, sport fisherman, seafood buyer, or resident of a coastal fishing community, you can help shape the future of America's fishing legacy. **Here's how to contact your member of Congress:**

Alaska: Senator Dan Sullivan (202) 224-3004

Washington: Senator Maria Cantwell (202) 224-3441

All other offices: (202) 224-3121

IPHC-2018-AM094-INF06
Received: 17 January 2018

2017 2A Treaty Tribal Halibut Season Summary

The 2017 treaty halibut allocation was 465,500 pounds of which 435,900 pounds was the treaty commercial Total Allowable Catch (TAC) and 29,600 pounds was set aside for the Ceremonial and Subsistence (C&S) fishery based off the actual C&S harvest from the 2016 fishing season. There are thirteen federally recognized treaty tribes that exercise treaty fishing rights within International Pacific Halibut Commission (IPHC) marine area 2A are: **Coastal Tribes:** the Hoh Indian Tribe, Makah Tribe, Quileute Indian Tribe, Quinault Indian Nation; **Puget Sound Tribes:** the Jamestown S'Klallam Tribe, Lower Elwha Klallam Tribe, Lummi Nation, Nooksack Tribe, Port Gamble S'Klallam Tribe, Skokomish Tribe, Suquamish Tribe, Swinomish Tribe, and Tulalip Tribes.

For the 2017 halibut season the tribes managed the fishery using the same management plan as they had used in previous years. The tribal halibut season structure consists of three sub-fishery components: an "unrestricted fishery", "restricted fishery" and a "late season" or "mop-up" fishery.

Season Structure and Outcomes

In the unrestricted fishery, a tribe could harvest halibut starting at noon on March 11 for 39 hours. This fishery does not have landing limits. The weather did not meet the Treaty Management Measures criteria for the unrestricted fishery to open on March 11. Weather calls were then set up for every 24 hours, to check if weather was meeting the set criteria. The weather looked good in the Puget Sound area; on March 20 the Puget Sound Tribes opened their unrestricted fishery. The fishery was open for 11 hours and temporally suspended. The landed catch during the initial 11 hour opener was 32,820 pounds of halibut from 106 landings. The Treaty weather criteria was met on April 15th for all the halibut tribes to open the unrestricted fishery. The Coastal Tribes fished for 39 hours and the tribes that opened on March 20 fished for 28 hours. The Unrestricted fishery landed a total of 264,005 pounds of halibut or 61.0 percent of the overall TAC in 306 landings (Figure 1).

The restricted fishery opened on May 1 for 35 hours with a 500-pound per vessel per day limit. The expected harvest of the restricted fishery is 19.0 percent of the treaty commercial TAC or 82,821 pounds. The total poundage harvested during the restricted fishery was 41,608 pounds or 10.4 percent of the overall treaty TAC with 172 landings.

After the first two treaty commercial sub-fishery components, 130,053 lbs. remained to be harvested during the late season/mop-up fishery. The late season fishery opened on May 19 for 34-hours for the Coastal Tribes, and opened on May 22 with a 34-hour opening period for the Puget Sound Tribes. Both fisheries were operated with a 2,500 pound per vessel landing limit for the entire opening period. The total harvest of halibut in that fishery was 92,401 lbs. with 133 landings. A second mop-up fishery was scheduled with a 1,000 pounds per vessel landing limit for the entire opening period. This fishery opened on June 18 for the Coastal Tribes and July 21 for the Puget Sound Tribes. During the second mop-up fishery treaty commercial fishermen landed 34,469 lbs. of halibut with 54 landings. The total treaty harvest of halibut during the mop-up fishery was 126,870 pounds with 187 landings.

The 2017 tribal halibut commercial season closed on July 23, 2017. The total tribal commercial halibut catch in 2017 was 432,483 dressed pounds, leaving 3,417 pounds of halibut in the Tribal commercial TAC (Table 1). The C&S halibut fishery continued through December 31, 2017.

Table 1. Summary of the three commercial fishery components in dressed pounds, landings, and dates (hours) of the fishery season.

Fishery Component	lbs (dressed)	Landings	Dates
Unrestricted	264,005	306	March 20 (Puget Sound Tribes - 11 hrs); April 15-16 (Coastal Tribes - 39 hrs; Puget Sound Tribes - 28 hours)
Restricted	41,608	172	May 1-2 (35 hrs)
Late Season #1	92,401	133	May 19-20/22-23 (34 hrs)
Late Season #2	34,469	54	June 18-19/July 21-22 (34 hrs)
Total	432,483	665	

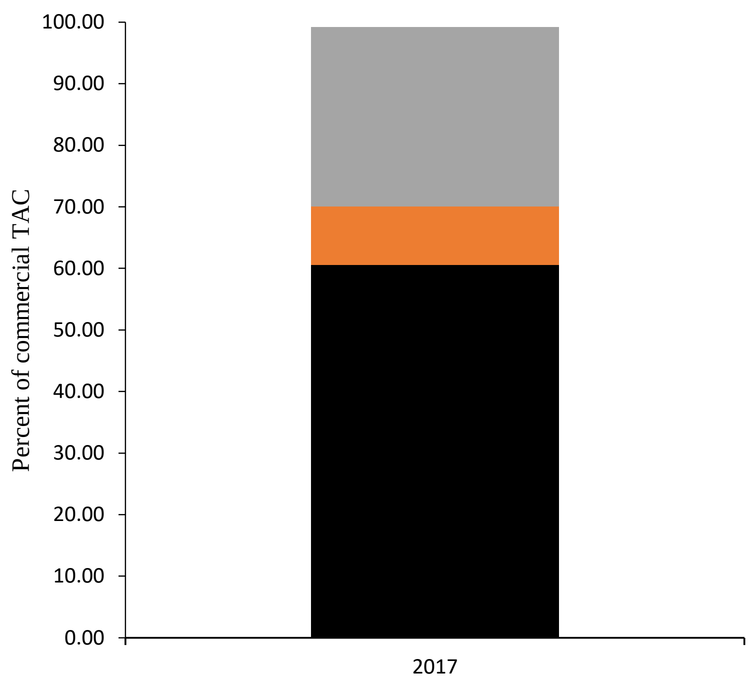


Figure 1. Percent composition of tribal TAC by unrestricted (black), restricted (orange) and late season (gray) during the 2017 commercial season; the unharvested 3,417 fish were 0.78% of the commercial TAC and are not visible on this graph.

Fishery Performance over Time

The performance of the commercial fishery is measured using weight-per-unit-effort (WPUE) from the unrestricted component of the fishery – it comprises the majority of the commercial fishery catch, has the greatest, most widespread participation among the three sub-fisheries, and is considered optimal for measuring fishery performance. For the Coastal Tribes, WPUE is modeled using the number of dressed lbs. (reduced by 10% for head off, and 2% for ice and slime), divided by the number of landings divided by the number of hours fished – The Coastal Tribes do not tend to make multiple landings per day (Eq. 1). For the Puget Sound Tribes, multiple landings may be made on each day, so dressed lbs. are divided by the number of vessels participating and divided by the number of hours (Eq. 2).

Equation 1.
$$WPUE_{Coastal} = \frac{lbs/_{landings}}{hours}$$

Equation 2.
$$WPUE_{PS} = \frac{lbs/_{vessels}}{hours}$$

Total WPUE was approximately 23 lbs. per unit of effort per hour during the 2013 – 2015 commercial seasons, and rose to 30 lbs./effort/hr during the 2016 – 2017 seasons. Coastal Tribes' WPUE has risen each year during 2014 - 2017. Puget Sound Tribes' WPUE has generally fluctuated about the mean WPUE of 12 lbs./effort/hr but increased to 17.16 lbs./effort/hr during the 2017 season (Table 2, Figure 2).

Table 2. WPUE for the unrestricted component of the commercial fishery during 2013 – 2017 commercial seasons.

Year	Total WPUE	Ocean WPUE	Puget Sound WPUE
2013	23.08	66.70	11.34
2014	23.66	54.08	13.52
2015	23.08	70.98	11.11
2016	30.28	96.84	12.39
2017	30.63	100.30	17.16

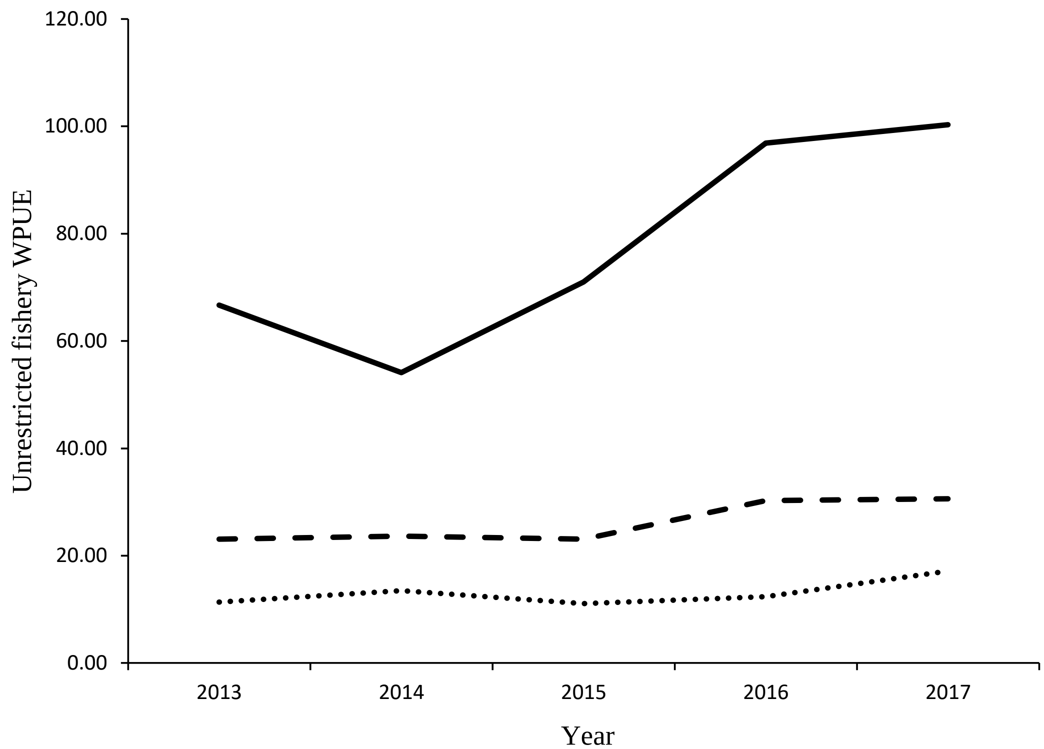


Figure 2. Total weight-per-unit-effort (WPUE) for the unrestricted component of the tribal commercial fishery (solid line), Coastal Tribes WPUE (dashed line), and Puget Sound Tribes WPUE (dotted line) achieved during 2013 – 2017 commercial seasons.

INTERNATIONAL PACIFIC HALIBUT COMMISSION

IPHC-2017-RARA27-R

Report of Assessment and Research Activites: 2017

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Note regarding information reported in this volume:

This document contains a series of reports on current research that may still be in progress, and the data contained within may have been updated since publication. Prior to using data from these reports, it is suggested that you contact the primary author for the latest developments. Staff contact information can be found on the IPHC webpage:https://iphc.int/staff

Foreword

This Report of Assessment and Research Activities (RARA) document is intended to supply progress reports on current projects and monitoring that are underway at the International Pacific Halibut Commission (IPHC). In past years, this document included fishery information, monitoring activities, stock assessment, and research reports about the previous year's activities. Many of the reports that have been routinely included in the past (e.g. the suite of stock assessment documents) are now provided as detailed papers for the Annual Meeting and as such, are listed and linked here with unique document numbers, e.g. IPHC-2018-AM094-01. This allows us to update our documents in real time as data become available ensuring that Commissioners and stakeholders have access to the most recent information possible for the decision-making process at the Annual Meeting. Continuing to be included in their entirety here are summaries of an expanded research effort that has taken place in the past year, as well as pieces of supporting information for the annual meeting documents now on the webpage.

Note that the meeting webpage is organized such that logistical information is at the top and the documents are listed and linked below.

Acronyms commonly used in IPHC reports

ADEC - Alaska Department of Environmental Conservation
ADF&G - Alaska Department of Fish and Game
BBEDC - Bristol Bay Economic Development Corporation
BSAI - Bering Sea and Aleutian Islands
CDFW - California Department of Fish and Wildlife
CDQ - Community Development Quota
CGOARP - Central Gulf of Alaska Rockfish Program
COAC - Clean Otolith Archive Collection
C&S - Ceremonial and Subsistence
CSP - Catch Sharing Plan
CVRF - Coastal Villages Regional Fund
DFO - Fisheries and Oceans Canada
DMR - Discard Mortality Rate
DO - Dissolved Oxygen
EBS - Eastern Bering Sea
EM - Electronic Monitoring
GAF - Guided Angler Fish
HCR - Harvest Control Rule
HARM - Halibut Angler Release Mortality
IFMP - Integrated Fisheries Management Plan
IFQ - United States Individual Fishing Quota
IPHC - International Pacific Halibut Commission
IQ - Individual Quota
IVQ - Canadian Individual Vessel Quota
MP - Management Procedure
MPR - Mortality Per Recruit
MSAB - Management Strategy Advisory Board
MSE - Management Strategy Evaluation
NMFS - National Marine Fisheries Service
NOAA - National Oceanic and Atmospheric Administration
NPFMC - North Pacific Fishery Management Council
NPUE - Numbers-Per-Unit-Effort
NSEDC - Norton Sound Economic Development Corporation
ODFW - Oregon Department of Fish and Wildlife
PAT - Pop-up Archival Transmitting
PDO - Pacific Decadal Oscillation
PFMC - Pacific Fishery Management Council
PHI - Prior Hook Injury
PSC - Prohibited Species Catch
PSMFC - Pacific States Marine Fisheries Commission
QS - Quota Share
RARA - IPHC Report of Assessment and Research Activities
RDE - Remote Data Entry
RI - Rockfish Index
RSL - Reverse Slot Limit
SRB - Scientific Review Board
SPR - Spawning Potential Ratio
WDFW - Washington Department of Fish and Wildlife
WPUE - Weight-Per-Unit-Effort
XRQ - Experimental Recreational Halibut

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1.1 Executive Summary

Jamie Goen

The data collected by the International Pacific Halibut Commission (IPHC) each year from the Pacific halibut fishery add to the time-series stretching back to the beginning of the modern fishery in 1888 and are a vital component of the management of the stock in accordance with the IPHC's mandate. In the fisheries statistics section, we report on Pacific halibut removals from all sectors of the fishery, the sampling and analysis of the commercial catch, and other information related to fishery removals.

Chapter 1.2 documents removals by the different sectors of the Pacific halibut fishery, including the commercial fishery, recreational fishery, subsistence fishery, and bycatch in other fisheries. The commercial and recreational fishery chapters include both landings and estimated discard mortality. The subsistence fisheries are those that are non-commercial and traditionally use Pacific halibut for direct personal, family, or community consumption or sharing as food, or customary trade. Subsistence fisheries include: 1) ceremonial and subsistence removals in the IPHC Regulatory Area 2A treaty Indian fishery, 2) the sanctioned First Nations Food, Social, and Ceremonial (FSC) fishery conducted in British Columbia, 3) federal subsistence fishery in Alaska, and 4) Pacific halibut retained by the Community Development Quota fishery in IPHC Regulatory Areas 4D and 4E for personal use that are less than 32 in or 81.3 cm (i.e., U32).

Chapter 1.3 details the IPHC's program for sampling commercial landings in 2017. The IPHC's port sampling program collects information such as Pacific halibut otoliths, lengths, individual fish weights, tissue samples, vessel logbook information, and final landing weights. This information is used to inform IPHC's stock assessment and other research by providing data on the size, age, and sex composition of the commercial landings; size-at-age; weight per unit effort; and genetics. The IPHC's port sampling improves our understanding of the Pacific halibut resource by providing fishery-dependent information which is used in conjunction with information from the IPHC's annual fishery-independent setline survey.

1.2 Fishery Statistics 2017 (IPHC-2018-AM094-05)

Lara Erikson and Jamie Goen

The following subjects were described in a paper that was prepared for the 2018 International Pacific Halibut Commission Annual Meeting (Paper IPHC-2018-AM094-05). This paper can be found on the IPHC website Annual Meeting page .

Subjects include:

- Commercial fisheries
- Recreational fisheries
- Subsistence fisheries
- Bycatch in other fisheries

1.3 Sampling commercial landings in 2017

Lara M. Erikson and Thomas M. Kong

Abstract

The International Pacific Halibut Commission's commercial catch sampling program for Pacific halibut in Alaska, British Columbia, Washington, and Oregon involves collecting Pacific halibut otoliths, fork lengths, individual fish weights, and tissue samples for genetic sampling, logbook information, and final landing weights. The collected data are used in stock assessment and other research and the collected otoliths provide age composition. Lengths and weights of sampled Pacific halibut provide the basis for size-at-age and sex-at-age analyses. Mean weights are combined with final landing weights to estimate catch in numbers. Logbook information provides weight per unit effort data, fishing location for the landed weight, and data for research projects. Finally, recovered tags provide information on migration, exploitation rates, and natural mortality.

Introduction

The commercial fishery for Pacific halibut takes place off of Alaska, British Columbia, Washington, Oregon, and California. It is managed via an individual fishing quota system in Alaska and British Columbia. While the commercial fishery off of Washington, Oregon, and California is managed with 10-hr derby style openers, as well as an allowance for fisheries targeting salmon or sablefish to retain Pacific halibut caught incidentally. To gather information for the stock assessment and for other research, IPHC Secretariat field staff, called port samplers, sample offloads of Pacific halibut in ports where landings are made and collect logbook information from vessel captains.

Sampling objectives and procedures

One of the primary objectives in sampling landings of commercially caught Pacific halibut is to obtain samples composed of sagittal otoliths and corresponding fork length, and weight measurements, which are representative of all commercial Pacific halibut landings. To accomplish this, random sampling techniques are applied, and an equal proportion of the catch (by weight) is sampled, within each IPHC Regulatory Area over the entire landing period, using prescribed sampling rates that vary among areas and sometimes ports. In addition to sampling the catch, other objectives include collecting recovered tags, and copying information from fishing logs along with the respective landed weights, for as many Pacific halibut trips as possible throughout the entire season.

Inherent in the sampling program is the positioning of field sampling staff in ports where there is an opportunity to sample a majority of the catch for each IPHC Regulatory Area. To ensure that proportional sampling occurs by IPHC Regulatory Area and port, landing patterns are reviewed annually, sampling protocols are established based on the weights landed, and sampling days are assigned to each port. In some cases, different sampling rates for a given IPHC Regulatory Area are assigned by port. Finally, sampling priorities by IPHC Regulatory Area are assigned on a port level to address situations in which multiple concurrent landings preclude the IPHC port sampler's ability to obtain samples from all landings.

Selection of sample days

Sampling protocols maximize the number of landings available for sample selection and ensure that the sampled Pacific halibut are representative of the population of landed Pacific halibut. To this end, the randomized weekly sampling schedule (six days a week; one day off) ensures that catch landed on each day has an equal chance of being selected for sampling. A restriction to the weekly sampling schedule is that one day per week is set aside for logbook collection only.

Small landings

Small landings contribute a substantial proportion of the total landed catch in some ports. The potential impact of not sampling what is considered a small landing (which differs by port) was assessed, differences identified (see Webster et al. 2014), and small landings sampled. For reference, small landings were defined and sampled in the following Alaskan ports: Petersburg, Sitka, and Juneau landings less than 2,000 lb (907 kg); and St. Paul less than 1,000 lb (454 kg).

Sampling rates and priorities

Sampling rates for each IPHC Regulatory Area are port specific (Table 1). The sampling rates are applied to the hailed weight from each trip prior to offload to determine the sample size (in pounds) for that offload. The number of days per week on which sampling should occur for landings from an IPHC Regulatory Area are also port specific. Differences in sampling rates among ports within IPHC Regulatory Areas were due to uneven distributions of projected landings among those ports. Small landings in Petersburg, Sitka, Juneau, and St. Paul, Alaska were sampled on assigned days at 10% of the hailed weight.

Samplers used their own judgment, based on a hierarchy of objectives, to determine which landings to sample when there were conflicts that precluded sampling all of the landings prescribed by their sampling schedule. For example, more than one boat may unload simultaneously from the same IPHC Regulatory Area within a port. In such cases, the vessel with the higher poundage was usually sampled. In instances when this did not occur, a sampler may have been working at a facility where there was a constant stream of Pacific halibut offloads. The sampler may therefore opt to stay at the one plant rather than travel to another location. Sampling conflicts also arose from simultaneous landings of Pacific halibut from different IPHC Regulatory Areas within a port. Sampling priorities by IPHC Regulatory Area were assigned to address these conflicts (Table 1).

Otolith sampling targets

An objective of the catch sampling program is to collect a target number of otoliths and corresponding fish lengths and weights from each IPHC Regulatory Area. Otolith sampling rates are established to optimize work effort and achieve target sample sizes. A target of 1,500 ± 500 otoliths and Pacific halibut fork lengths and lengths was set for each of IPHC Regulatory Areas 2B, 2C, 3A, 3B, 4A, 4B, and Areas 4C and 4D combined (Tables 2a and 2b). In IPHC Regulatory Area 2A, the target was 1,000 otoliths with corresponding fork lengths and weights. The IPHC Regulatory Area 2A target was further subdivided to obtain adequate sample sizes from the Area 2A treaty Indian fisheries and the directed commercial fishery, relative to each fishery component's proportion of the overall Area 2A catch limit. This division resulted in a target of 650 otoliths/

lengths/weights from the treaty Indian fishery and 350 otoliths/lengths/weights from the non-treaty directed commercial fishery and incidental retention of Pacific halibut in the sablefish fishery. The sampling rates detailed above were calculated to meet sampling targets and to obtain otoliths and data from an equal proportion of the catch within areas.

Weight measurements

There is a need to collect data coastwide throughout the season in order to estimate spatial and seasonal variation in the length to weight relationship (Webster and Erikson 2017). Fish may be weighed head-on, washed and unwashed.

In 2017, all samplers were provided with an Intelligent Weighing Technology's[1] TitanH 300/250-16 or 24 scale. All samplers used the same protocol, which integrated weighing into the standard otolith sampling procedure, i.e., for every fish from which an otolith was collected, an associated fork length and weight were also collected. This was an expansion of the 2016 coverage of the weighing procedure coastwide, to include Newport and all tribal samplers in IPHC Regulatory Area 2A.

Commercial sex-marking

A key element missing from the IPHC's stock assessment is the sex ratio of the Pacific halibut in the commercial landings. By regulation, Pacific halibut are to be dressed (eviscerated) before delivery; gonads are therefore unavailable for visual inspection of sex. In 2014, a system of external marking was developed to denote sex: two knife cuts in the dorsal fin for female, a single cut in the white-side gill plate for male (McCarthy 2015). After a small trial in Homer in 2015, which involved three vessels, the project was expanded to the Regulatory Area scale in 2016 and coastwide in 2017. The IPHC approached the fleet and asked its members to voluntarily mark their catch. Port samplers in all ports recorded the external sex mark and took a tissue sample, in addition to the length/weight measurement and otolith collection, during the standard market sampling procedure when possible. A total of 84 sex-marked landings were sampled (Table 7).

Tissue samples

In order to monitor sex ratios within the commercial catch and more accurately model population characteristics, tissue samples were collected coastwide along with otoliths and length and weight measurement data from commercial landings (Loher et al. 2017). The tissue samples will be analysed to assign sex information to each sampled fish.

Electronic log remote data entry (RDE)

Port sampling vessel data collection methods are still based on pencil and paper technology. With recent advancements in the field of ruggedized computing, the IPHC has integrated the new technology to enhance this data collection program in order to eliminate or reduce the need for post-collection data entry and increase the timeliness of data editing. Consequently, the data are provided to the end users (i.e., stock assessment and research scientists) earlier than in the past, allowing more time for data analysis. This also provides greater precision, verification, and timeliness in the collected log data.

[1] Intelligent Weighing Technology, 4040 Adolfo Road, Camarillo, CA 93012, USA.

An electronic tablet was provided to port samplers in each Alaskan port and in Bellingham, WA, for entry of fishing data from the IPHC hard cover logbooks directly into the remote data entry (RDE) application that was designed by IPHC programmers to capture all necessary logbook details. Samplers were tasked with entering data from as many of the logs they collected as priorities and time allowed during the course of their regular port sampling duties. Modifications and enhancements to the application continue.

In British Columbia, samplers were provided with a field version of the log entry program used by the IPHC's data transcription staff in Seattle. The samplers were tasked with entering as many Canadian paper logs as time permitted, though priority was given to other tasks such as biological sampling. In addition, samplers were supplied with Bluetooth-enabled tablets for collection of electronic logs from vessels using Archipelago Marine Research's FLOAT Fishing Log Application for Android.

Modifications to sampled ports

Prior to the season, landings for past years were reviewed, comparing deliveries into sampled and unsampled ports by IPHC statistical area, to ascertain whether any statistical areas were being under-sampled. Good coverage was found in IPHC Regulatory Areas 2B, 2C, 3A, 4C, and 4D. However, there were statistical areas in IPHC Regulatory Area 3B where the proportion of landings into sampled ports was lower than their total contribution to the Area 3B harvest. An additional port, receiving landings from this Area, has been covered in the past and this has proven to be problematic as landings are low and sporadic.

Sampling rate calculations

Sampling rate calculations, the 2017 average Pacific halibut weight, and the proportion of catch landed in sampled ports for 2017 for the different IPHC Regulatory Areas are shown in Tables 2a and 2b. The rates were calculated using the following equations:

$$PG = (TSS \cdot \overline{w}) / (PS \cdot CL)$$

where PG = the overall ratio of the landings to be sampled by IPHC Regulatory Area in sampled ports;
TSS = the otolith target for each respective IPHC Regulatory Area;
$\overline{w}$ = the average Pacific halibut weight for each IPHC Regulatory Area;
PS = the proportion of landings that were expected to be landed in sampled ports;
CL = the available catch limit set by the IPHC; and

$$sr = PG / ps$$

where sr = the sampling rate to be used for each IPHC Regulatory Area;
PG = the overall ratio of the landings to be sampled by IPHC Regulatory Area in sampled ports;
ps = the previous year's proportion of landed weights with otolith sampling.

Sampling results

Alaskan Individual Fishing Quota fishery

To meet Alaskan sampling objectives, the ports of Dutch Harbor, Kodiak, Homer, Seward, Juneau, Sitka, Petersburg, and Bellingham were staffed throughout the entire 2017 Individual Fishing Quota (IFQ) season (11 March through 7 November). St. Paul was staffed from 26 June through 19 August, during the height of the IPHC Regulatory Area 4C Community Development Quota (CDQ) and IFQ fisheries. A sampling effort summary is presented in Table 3. Otolith and length samples for each Alaskan IPHC Regulatory Area met the targets.

Table 4 presents the proportion of sampled weight to landed weight in each sampled port. IPHC Regulatory Area information on a Prior Notice of Landing (PNOL) list aids in minimizing this variation. The PNOL list was compiled from National Oceanic and Atmospheric Administration (NOAA) Restricted Access Management Division data on vessels notifying NOAA's Office of Law Enforcement of their intention to land IFQ fish. The PNOL list included poundage of Pacific halibut and sablefish to be landed by vessel name, along with the accompanying Alaska Department of Fish and Game number, the unloading port, and the unloading location, date, and time. The advance knowledge of which IPHC Regulatory Area the catch was coming from helped samplers set sampling priorities. For landings of catch taken from multiple IPHC Regulatory Areas, the knowledge of the amount of catch from each Regulatory Area for a given landing would further reduce these variations in proportions.

IPHC samplers copied approximately 2,700 Alaskan fishing logs from ports where the IPHC had a presence, and another 300 logs for Alaskan landings delivered to other ports (Table 5). Samplers had an opportunity to collect logs from other locations when they encountered transient Pacific halibut vessels in their own ports.

Canadian Individual Vessel Quota fishery

IPHC samplers staffed the ports of Vancouver, Port Hardy, and Prince Rupert from 11 March through 7 November 2017. Most of the IPHC Regulatory Area 2B catch (94%) was landed in the three sampled Canadian ports combined (Table 2a). The samplers collected otoliths and fork length samples, within the target range of 1,000-2,000 (Table 3). Table 4 presents the proportion of sampled weight to landed weight in each sampled port. IPHC samplers collected 410 Canadian logs from ports where the IPHC has a presence, and few logs for Canadian landings delivered to other ports in British Columbia (Table 5).

Washington and Oregon

Treaty Indian managers worked cooperatively with the IPHC and sampled IPHC Regulatory Area 2A tribal landings. In 2017, the Jamestown S'Klallam, Port Gamble S'Klallam, Swinomish, Lummi, Makah, Quileute, and Quinault tribes in Washington State participated in the IPHC's sampling program. Sampling rates were calculated for each tribe based on the sampling rate calculation used for all non-tribal ports. The sampling rates for the tribes are listed in Table 1. The 2017 otolith/tissue-sample and length/weight collections totaled 670, which were just over the target of 650 otoliths, and the tribal samplers collected otoliths from 50% of the total tribal commercial catch (Table 3). Sampling by the tribes is done opportunistically and is dependent on availability of tribal fisheries staff. The number of fishing logs collected from the treaty Indian fisheries decreased from 161 in 2016 to 111 in 2017 (Table 5).

In 2017, the IPHC Regulatory Area 2A non-treaty commercial sampling collections were 105 above the target of 350 otoliths/tissue-samples (Table 3). The majority (55%) of the IPHC Regulatory Area 2A non-treaty commercial sampling was conducted in Charleston, Oregon, during the 12 and 26 July directed commercial fishery openings. The rest of the samples were obtained in Newport, Oregon during the first directed commercial opener (28 June) and in Bellingham, Washington during the incidental retention of Pacific halibut in the sablefish fishery.

In 2017, samplers collected 66 logs from the directed commercial fishery (Table 5), 30 more than in 2016. In 2017, 15 logs were collected from the incidental retention of Pacific halibut in the sablefish fishery north of Point Chehalis, Washington.

Pacific halibut tag collection

Port samplers collected tags from 14 tagged Pacific halibut. Five of these recoveries were from the 2017 setline U32 wire tagging project; three were recovered in Prince Rupert, and one each in Bellingham and Port Hardy. Two tagged Pacific halibut from the 2015 NMFS trawl survey wire tagging pilot were recovered: one in Petersburg and one in Kodiak. Six tagged fish from the 2013 dummy archival study were recovered in Seward (four fish) and Kodiak (two fish). Lastly, one Pacific halibut from the 2010 Aleutian wire tagging study was recovered in Kodiak. Tag data collected dockside included fork lengths, otoliths, and capture location of the recovered tagged fish. Additional tag information can be found within this volume (Forsberg 2017a, Forsberg 2017b).

Additional biological sampling and data collection projects

This section describes biological sampling projects for which the port samplers were tasked with outside of their typical port sampling collection duties. Details on each project are presented below.

Clean otolith archive collection (COAC)

Otoliths for the Clean Otolith Archive Collection (COAC) will not be used for age determination, but are cleaned, dried, and stored whole in climate-controlled conditions for future analysis (Tobin at al. 2017). The COAC is primarily supplied via the IPHC fishery-independent setline survey; however, in IPHC Regulatory Areas 2A and 4CD the otolith sampling rate for the 2017 survey is 100%. For this reason, samples from the commercial fleet were collected in these three IPHC Regulatory Areas to supply the COAC. In 2017, the target of 100 otoliths was attained or exceeded in IPHC Regulatory Areas 2A and 4CD (Table 6).

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Table 1. 2017 sampling rates and days by IPHC Regulatory Area and port.

Regulatory Area	Sampling Rate (%)	Port(s)	No. Sampling Days Per Week	Priority by Port (1 = highest)
2A Non-tribal	10	Bellingham, Newport	All days	4
2A Tribal	10	Bellingham	As many as possible	4
	10	LaConner		4
	5	Neah Bay, Sequim, Port Angeles		4
	5	Taholah, Westport		4
2B	3.5	Prince Rupert	5 days	4
	1.5	Port Hardy, Vancouver		4
2C	4	All ports	5 days	4
3A	1	Bellingham	3 days	6
	1.5	Sitka	5 days	6
	1	Seward, Kodiak	4 days	6
	1	All other ports	5 days	6
3B	10	Seward, Dutch Harbor	5 days	5
	2.5	All other ports		5
4A	5	All ports	5 days	3
4B	15	Dutch Harbor	5 days	1
	10	All other ports		1
4C&D	6	St. Paul	4 days	2
		All other ports	5 days	2

Table 2a. 2017 otolith targets and data used in determining the sampling rates for IPHC Regulatory Areas 2B, 2C, 3A, and 3B.

	Regulatory Areas			
	2B	2C	3A	3B
Otolith target (no.) (*TSS*)	1,500	1,500	1,500	1,500
2016 Average Pacific halibut weight (lbs) ($\overline{w}$)	22.76	29.81	19.41	22.03
Sample size (000 lb) ($TSS*\overline{w}$)	34.1	44.7	29.1	33.0
2017 Catch limit (000 lb) (*CL*)	6,199	4,212	7,739	3,140
2016 Landings into sampled ports (000 lb)	5,767	2,725	6,227	1,922
Proportion landed in 2016 sampled ports (*PS*)	0.937	0.722	0.828	0.796
Overall ratio to be sampled in 2017 (*PG*)	0.006	0.015	0.005	0.013
Proportion of 2016 landed weight with otolith sampling (*ps*)	0.362	0.452	0.449	0.559
Sampling ratio for estimated weight available for sampling in 2017 (*sr*)	0.016	0.033	0.010	0.024
2017 Final sampling rates (%)	2.0	3.0	1.0	2.5
2017 Average Pacific halibut weight	22.9	30.5	19.5	22.0
2017 proportion landed in sampled ports	0.930	0.701	0.813	0.826

Table 2b. 2017 otolith targets and data used in determining the sampling rates for IPHC Regulatory Areas 2A, 4A, 4B, and 4C&D.

	Regulatory Areas				
	2A Tribal	2A Non-tribal	4A	4B	4C&D[1]
Otolith target (no.) (*TSS*)	650	350	1,500	1,500	1,500
2016 Average Pacific halibut weight (lbs) ($\overline{w}$)	19.37	19.77	23.81	22.56	22.09
Sample size (000 lb) ($TSS*\overline{w}$)	12.6	6.9	35.7	33.8	33.1
2017 Catch limit (000 lb) (*CL*)	436	296	1,390	1,140	1,504
2016 Landings into sampled ports (000 lb)	318	102	976	532	1,040
Proportion landed in 2016 sampled ports (*PS*)	.90	0.26	0.713	0.489	0.801
Overall ratio to be sampled in 2017 (*PG*)	0.032	0.090	0.036	0.061	0.028
Proportion of 2016 landed weight with otolith sampling (*ps*)	0.488	0.595	0.790	0..464	0.501
Sampling ratio for estimated weight available for sampling in 2017 (*sr*)	0.066	0.151	0.046	0.131	0.055
2017 Final sampling rates (%)	5	10	5.0	15.0	5.0
2017 Average Pacific halibut weight	19.9	17.3	22.4	21.4	25.5
2017 proportion landed in sampled ports	0.930	0.839	0.689	0.375	0.773

[1]4C&D includes CDQ

Table 3. Summary of 2017 otolith targets, collected otoliths, landings sampled, and the percentage of the total landed weight, represented by the weight of landings, from which otoliths were sampled.

Regulatory Area	Otolith Target	Collected otoliths	No. landings sampled	Percent of catch sampled
2A Tribal	650	670	101	35
2A Non-tribal	350	455	72	88
2B	1,500	1,347	92	26
2C	1,500	1,405	142	29
3A	1,500	1,466	127	37
3B	1,500	1,467	48	44
4A	1,500	1,038	56	33
4B	1,500	1,816	17	26
4C&D	1,500	1,632	50	41
Totals	**11,500**	**11,296**	**705**	**34**

Table 4. Proportion of total 2017 Pacific halibut landings represented by the weight of landings from which otoliths were sampled, separated by IPHC Regulatory Area, and listed by key ports.

	2A	2B	2C	3A	3B	4A	4B	4C	4D
Charleston	0.55								
Newport	0.40								
Bellingham	1.12			1.27					
Treaty Tribe[1]	0.36								
Port Hardy		0.43							
Prince Rupert		0.23							
Petersburg			0.47	0.31					
Sitka			0.42	0.45					
Juneau			0.38	0.30					
Seward				0.40	0.34				
Homer				0.56	0.69	0.48			
Kodiak				0.50	0.66	0.47	0.59		0.96
Dutch / Unalaska					0.28	0.55	0.80	0.07	0.81
St Paul								0.46	0.86

[1]IPHC Regulatory Area 2A tribes that participated in the commercial sampling program.

Table 5. The number of Pacific halibut fishing logs collected by IPHC port samplers from landings into key ports in 2017, and the total number of logs collected from all ports.

Key Ports	US	Canada	
Charleston	41		
Newport	25		
Bellingham	45		
Treaty Indian[1]	111		
Port Hardy		157	
Prince Rupert		251	
Vancouver		2	
Petersburg	254		
Sitka	473		
Juneau	185		
Seward	352		
Homer	382		
Kodiak	510		
Dutch Harbor	258		
St. Paul	229		**Grand total**
Total key ports	**2,865**	**410**	**3,275**
Total all ports	**3,175**	**412**	**3,587**

[1]IPHC Regulatory Area 2A tribes that participated in the commercial sampling program.

Table 6. Summary of 2017 COAC targets and collections.

Regulatory Area	Otolith Target	Collected otoliths
2A	100	100
4CD	100	151

Table 7. Number of sex-marked landings that were sampled, number of biological samples taken (with sex-mark) for those trips, the weight of offloaded fish represented, and the proportion of sampled weights that were sex-marked, as sampled by IPHC port samplers during 2017.

Regulatory Area	Sex-marked offloads	Sex-marked samples	Sex marked weight (000 lb; t)	Percent sex-marked by weight
2A	36	87	18; 8	6.2
2B	5	70	91; 41	5.3
2C	16	102	110; 50	9.0
3A	10	79	219; 99	7.6
3B	9	237	285; 129	20.3
4A	2	69	34; 15	7.4
4B	2	93	32; 15	10.7
4C	3	79	18; 8	9.1
4D	1	19	16; 7	3.7

2.1 Executive Summary

Josep V. Planas

The research activities performed by the International Pacific Halibut Commission (IPHC) Secretariat staff during 2017 and that are reported here highlight several of the research topics that IPHC has been investigating over the last few years and that are now being contemplated within the 5-year Biological and Ecosystem Science research program. It is worth noting that a great majority of these studies are conducted using the fishery-independent setline survey (FISS) that IPHC conducts annually covering the distribution range of the Pacific halibut and this underscores the importance of the FISS as an essential research platform for IPHC. One of the landmark activities that is performed annually (since 2009) in the FISS is the environmental monitoring effort aimed at collecting oceanographic data from all survey stations in the form of depth, salinity, temperature, dissolved oxygen, pH, and chlorophyll *a* concentration information. In 2017, oceanographic data were successfully collected from 1,281 stations (Sadorus and Walker 2017). The FISS has also allowed for the collection of biological data from Pacific halibut in order to understand the biology of this species, with emphasis on growth, physiological condition, reproduction, and migration, as well as investigating the relationship between capture-related events, physiological condition, and survival of discarded Pacific halibut.

In the present Report of Assessment and Research Activities we report on current studies devoted to describing the changes in reproductive development that take place throughout an entire annual reproductive cycle in female and male Pacific halibut (Planas et al. 2017). The described studies are intended to improve our current staging of reproductive status and update current estimates of maturity-at-age, to provide estimates of skipped spawning, and ultimately to improve our estimates of the effective spawning stock biomass (SSB). Also in relation to improving our estimates of SSB, given that uncertainties regarding the proportion of female and male Pacific halibut captured by the commercial fleet can strongly influence estimates of SSB, we report on the results of a field sex-marking program and the parallel development of genetic methods used for sex identification (Loher et al. 2017). These studies will determine the feasibility and accuracy of sex-marking at sea by commercial vessels in order to estimate the sex ratio of the commercial catch.

In parallel with ongoing studies aimed at understanding the effects of environmental temperature on somatic growth and at developing methods to evaluate different growth trajectories in Pacific halibut, in the present report we provide the age distribution by sex and size of Pacific halibut caught in the FISS and by the directed fishery (Forsberg 2017a, 2017b, respectively). Also, efforts to collect clean otoliths for future trace element studies (Tobin et al. 2017) and to monitor Pacific halibut for contaminants and parasites have continued in 2017 (Dykstra 2017).

We also report on the progress in the sequencing of the Pacific halibut genome and its future importance in providing genomic resolution to genetic markers identified in other projects and in understanding potential genomic regions that determine growth, reproductive, and behavioral characteristics, and that could be subject to evolutionary or direct environmental pressures (Planas 2017).

Continuing our efforts to improve our understanding of the movement and distribution of Pacific halibut, we report on studies on Pacific halibut migration, including a summary of past tagging efforts and current tag recovery success (Forsberg 2017c), the results of the first year of a coastwide effort to tag small Pacific halibut (< 82 cm fork length or "U32") in the FISS (Forsberg 2017d) and a description of the continuation of wire-tagging efforts on the National Marine Fisheries Service trawl survey that is contained in summaries provided in the Report of Assessment and Research Activities Chapter 3 (Sadorus et al. 2017b; Sadorus et al. 2017c). We also report on the first efforts to identify winter spawning locations and seasonal movements of adult fish caught on Bowers Ridge (Regulatory Area 4B) with the use of pop-up archival transmitting (PAT) tags (Loher 2017). In addition, we report on the results of ongoing studies to describe distribution of Pacific halibut larvae and the connectivity of larvae between the Gulf of Alaska and the Bering Sea (Sadorus et al. 2017a).

Finally, we report on our efforts to investigate the relationship between Pacific halibut release practices, physiological condition, injury levels, and post-release mortality in the directed Pacific halibut longline fishery (Dykstra et al. 2017). This study, which also incorporates an electronic monitoring component in its design, will be important for improving current discard mortality rate estimates.

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2.2.1 Reproductive assessment of female and male Pacific halibut

Josep V. Planas, Claude L. Dykstra, Tracee Geernaert, Timothy Loher

Abstract

Current maturity estimates in female Pacific halibut are derived from macroscopic visual examination of the ovaries collected in the field. In order to improve maturity estimates and to provide updated estimates of maturity-at-age, the International Pacific Halibut Commission (IPHC) is conducting studies destined to improve our knowledge on reproductive development in female and male Pacific halibut. In this ongoing study, Pacific halibut of both sexes will be collected on a monthly basis during an entire annual reproductive cycle from the central Gulf of Alaska region. A description of the sample collection protocols and the various reproductive parameters that will be measured, as well as an update on the progress in sample collection, is provided in this report.

Introduction

Each year, the fishery-independent setline survey (FISS) collects biological data on the maturity of female Pacific halibut that are used in the stock assessment. In particular, the female maturity schedule is used to estimate spawning stock biomass. Currently-used estimates of maturity-at-age indicate that the age at which 50% of female Pacific halibut are sexually mature is 11.6 years on average. However, maturity is estimated with the use of macroscopic visual criteria, implying a relative level of uncertainty associated with the employed semi-quantitative assessment, but the maturity schedules for both sexes have not been revised in recent years and may be outdated. For this reason, efforts need to be put in place to further understand reproductive maturity in female Pacific halibut. Unfortunately, relatively little is known regarding the physiological changes that take place in the ovary during reproductive development leading to spawning in this species. This study aims at describing the progression of reproductive development in both female and male Pacific halibut during an entire annual reproductive cycle. The present study aims at collecting morphological, histological, endocrine, and functional data that will provide us with a better understanding of the temporal and spatial progression of sexual maturation in Pacific halibut, and to better estimate maturity for stock assessment purposes.

Materials and Methods

Sampling schedule and location

Adult male and female Pacific halibut are currently being collected on a monthly basis in the Portlock region in the central Gulf of Alaska on chartered commercial vessels. Fish collection occurs at the beginning of each month, began in September 2017, and will continue until August 2018. The September 2017 and October 2017 fish collection trips were conducted on the *F/V Saint Nicholas* out of Homer, AK. The November 2017 and December 2017 fish collection trips were conducted on the *F/V Kema Sue* out of Kodiak, AK; the *Kema Sue* will continue the monthly collection trips until May 2018. Fish collection trips between June 2018 and August 2018 will be conducted by chartered commercial vessels that will be selected in early 2018. Two experienced sea samplers are placed on board each vessel to record biological measurements and collect biological samples.

Sample collection

Approximately 30 male (>70 cm in length) and 30 female (>90 cm in length) Pacific halibut are sampled per month. From each fish, round weight and fork length are recorded. Blood samples are taken by caudal puncture using heparinized 1 cc syringes with 22G heparinized hypodermic needles and are kept on ice until transferred to a heparinized Eppendorf tube for centrifugation. Blood is centrifuged in a field centrifuge (MiniSpin, Eppendorf, Germany) at 3,000 rpm for 15 min. Once separated, the plasma is removed with the use of a plastic Pasteur pipette, transferred to a separate, non-heparinized Eppendorf tube and stored at - 20C. Fish are sacrificed and the gonads are removed and weighed using a small motion compensated scale in order to calculate the gonadosomatic index (GSI; gonad weight/round weight X 100). Gonadal staging is visually assessed following the same protocols that are used in the FISS and each of the sampled gonads is individually photographed. Small pieces (approx. 1 cm^3) of ovary and testis are excised from the gonad and fixed in 10 ml of 10% formalin in a 15-ml conical tube. In addition, smaller pieces of ovary and testis (approx. 0.5 cm^3) are excised from the gonad and are placed in a 2-ml screw-cap microcentrifuge tube containing 1 ml of RNAlater, an RNA-preserving solution, and stored at - 20C. The pituitary gland is extracted by accessing the base of the brain and is placed in a tube containing RNAlater and stored at - 20C for future extraction of total RNA. Like the gonads, the liver is excised and weighed in order to calculate the hepatosomatic index (HSI; gonad weight/round weight X 100). Fish are measured for fat content using the Fatmeter (Distell, Scottland, UK) device by taking to readings from the musculature above the sharp curvature of the lateral line on the blind side of the fish as described in Briones Ortiz (2017). Finally, the left otolith of each fish is removed for aging.

Results

Female and male Pacific halibut were successfully collected from September 2017 through December 2017. In September 2017, 30 females and 27 males were collected, whereas in October, November and December 2017, 30 females and 30 males were collected. Biological samples collected from these fish are currently being stored at the Kodiak Marine Science Center in Kodiak, AK.

The photographic images of all staged gonads, when combined with GSI and histological data will allow us to revise the morphological criteria currently used for staging the maturity status of the gonads (ovary and testis). The histological assessment of gonadal development will be performed by processing fixed gonad (ovary and testis) samples for histology in paraffin-embedded blocks. Histological blocks will be cut and histological sections will be stained with hematoxylin and eosin to visualize the developmental stage of collected ovaries and testes.

Collected plasma samples will allow us to conduct a thorough endocrinological assessment of reproductive status and development in order to correlate levels of hormones and reproductive genes with morphological and histological assessment of the gonads. The endocrine system is tasked with transmitting environmental information on light and temperature captured by the sensory systems throughout the changing seasons to the organs involved in reproduction: the pituitary gland (also named hypophysis), as the site of the production of gonadotropic hormones; the gonads (ovaries and testes), as the site of the production of sexual steroids (estradiol, testosterone, progesterone, etc.) and, importantly, the gametes (eggs and sperm). Therefore, collected blood samples will be used to measure the levels of reproductive hormones (gonadotropic hormones and sex steroids) throughout the entire reproductive cycle of male and female Pacific halibut. Total RNA extracted from gonadal and pituitary samples collected in RNAlater will be used to measure the transcript (mRNA) levels of important reproductive genes that are expressed in these tissues and that encode key proteins controlling the reproductive process and, therefore, can be used as molecular markers of reproductive function.

Finally, we are collecting functional data on the energy stored in the fish in order to relate energy storage to sexual maturity. Energy storage will be determined by the hepatosomatic index (HSI; liver weight/round weight X 100) and the muscle lipid content as measured with the Fatmeter device.

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2.3.1 Age distribution of Pacific halibut in the 2017 commercial catch

Joan E. Forsberg

Abstract

Pacific halibut (*Hippoglossus stenolepis*) otoliths are collected annually by International Pacific Halibut Commission port samplers to provide age data for use in the stock assessment. Otoliths collected from the commercial catch provide age data that are representative of the directed fishery removals. The age distribution of Pacific halibut sampled from the 2017 commercial catch is summarized from 10,771 otoliths aged thus far. Fish from five to 40 years old were captured, with 12-year-olds comprising the largest age group in the overall catch. Average age for all Regulatory Areas combined was 13.2 years, representing a slight decrease from 2016.

Otolith sampling

Pacific halibut otoliths are collected to provide age data for use in the International Pacific Halibut Commission's (IPHC) stock assessment. IPHC age readers only use the left- or blind-side otolith of the sagittal pair for age determination because the growth patterns of right- or eyed-side otoliths are harder to interpret and the ages derived from right-side otoliths are less accurate (Forsberg 2001). Left-side sagittal otoliths are obtained from Pacific halibut caught on the IPHC's fishery-independent setline survey (setline survey) and on National Marine Fisheries Service (NMFS) trawl surveys, as well as from the commercial fishery. The annual setline survey, which uses standardized methods, gear, and bait, provides catch and biological data (including ages) that are independent of the commercial fishery and can be used to monitor changes in the catch over time, while otoliths from the NMFS trawl survey provide age data for small Pacific halibut that are not captured on longline gear. Age distributions for the setline and NMFS trawl survey collections are presented in Forsberg (2017) and Sadorus et al. (2017a, b).

Otoliths collected from the commercial catch (also called market samples) provide age data that are representative of the directed fishery removals. The commercial otolith-collection target is 1,000 otoliths for IPHC Regulatory Area 2A and 1,500 (±500) per Regulatory Area for each of Regulatory Areas 2B, 2C, 3A, 3B, 4A, and 4B, and Regulatory Areas 4C/4D combined. Otolith targets were met in all Regulatory Areas in 2017. Commercial catch-sampling procedures, including port- and area-specific otolith sampling rates, are detailed in Erikson and Kong (2017).

In 2017, IPHC port samplers reported collecting 11,339 market sample otoliths for stock assessment; however, only 11,296 otoliths had been received in the office at the time of writing. Of the latter, ages could not be determined for 525 otoliths because they were crystallized (i.e., composed of vaterite), right-sided, or badly broken.

An additional 251 sagittal otolith pairs were collected by port samplers for the clean otolith archive collection. These otoliths were not aged but were dried and stored for future elemental or isotopic studies (Tobin et al. 2017). The otolith collection numbers presented in the text and tables of this report do not include clean otolith archive samples.

Age distribution

The 2005 year class (12-year-olds) accounted for the largest proportion (in numbers) of the sampled commercial catch (20%) for all Regulatory Areas combined in 2017 (Table 1). The next most abundant year classes for all Regulatory Areas combined were 2004 and 2006, accounting for 16 and 12% of the sampled catch, respectively. Twelve-year-olds were also the most abundant age class in individual Regulatory Areas in 2017.

The average values for age, length, and estimated weight by Regulatory Area for 2017 are presented in Table 2. Average fork length of sampled Pacific halibut increased in Regulatory Areas 2B, 2C, 3A, 4B, 4C, and 4D in 2017, but decreased in all other Regulatory Areas. Average fork length for all Regulatory Areas combined increased by 0.5 cm in 2017.

The average age of fish sampled from Regulatory Areas 2B, 2C, and 4B increased in 2017 relative to 2016, while average ages from all other Regulatory Areas decreased (Table 3). The average age from all Regulatory Areas combined in 2017 (13.2 years) was slightly lower than it was in 2016.

The youngest and oldest Pacific halibut in the 2017 commercial samples were determined to be five and 40 years old, respectively. One Pacific halibut was determined to be five years old: a 93-cm fish from Regulatory Area 4B. Two fish were aged at 40 years: a 117-cm fish from Regulatory Area 4A and a 131-cm fish from Regulatory Area 4B. The largest Pacific halibut in the 2017 commercial sample was a 208-cm fish from Regulatory Area 3B, which was determined to be 23 years old. The smallest Pacific halibut in the 2016 commercial catch sample was a 74-cm fish from Regulatory Area 4C, aged at 13 years old. Length frequencies by regulatory area for Pacific halibut sampled in the 2017 commercial catch are presented in Table 4.

Quality control

Table 5 contains percent agreement values for quality control (QC) readings. All QC readings from 2002 through 2016 were conducted on burned or baked otolith sections (Forsberg 2001). QC readings for years prior to 2002 were read from either surface ages or burned/baked section ages. Ten percent of each year's market samples are read twice for QC. At the time of writing, QC readings for the 2017 commercial samples were not complete. The remainder of the QC readings of 2017 market samples will be performed over the winter of 2017-18.

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Table 1. Age distribution of commercial catch of Pacific halibut by IPHC Regulatory Area in 2017.

Age	Regulatory Area									
(years)	2A	2B	2C	3A	3B	4A	4B	4C	4D	Total
5							1			1
6		7	5	4	17	1			1	35
7	1	3	6	9	37	15	1			72
8	28	17	26	7	53	25	1	16	6	179
9	115	60	56	44	119	112	23	87	58	674
10	136	89	77	61	138	90	55	66	71	783
11	179	137	163	138	185	110	165	94	90	1,261
12	247	280	269	272	279	160	325	163	117	2,112
13	168	252	219	207	227	142	292	151	101	1,759
14	72	133	144	154	127	124	202	129	103	1,188
15	40	91	142	127	81	52	119	75	76	803
16	25	58	82	93	61	47	95	23	27	511
17	25	61	64	92	33	18	79	8	20	400
18	7	46	46	71	25	16	62	9	15	297
19	8	26	24	36	12	14	39	3	11	173
20	9	24	24	42	8	5	22	1	9	144
21	2	6	9	16	4	4	20	1	5	67
22	5	3	4	15	4	5	17	1	2	56
23	1	6	5	11	3		18	1	5	50
24		3	1	11	2	3	24		2	46
25	3	3	4	7		3	14			34
≥26		4	5	13	3	11	86		4	126
Total	1,071	1,309	1,375	1,430	1,418	957	1,660	828	723	10,771

Table 2. Statistic associated with 2017 commercial Pacific halibut fishery samples by IPHC Regulatory Area: mean age, mean length, mean net weight, and the number of otoliths collected and aged.

Regulatory Area	Mean age (years)	Mean length (cm)	Mean weight (lbs)[1]	Mean weight (kg)[1]	Otoliths collected[2]	Otoliths aged[3]
2A	12.0	94.6	18.4	8.3	1,119	1,071
2B	13.3	100.5	23.3	10.6	1,396	1,309
2C	13.4	109.8	31.3	14.2	1,405	1,375
3A	14.1	98.2	21.1	9.6	1,466	1,430
3B	12.2	98.9	21.9	9.9	1,467	1,418
4A	12.6	99.8	22.6	10.3	1,038	957
4B	14.9	100.8	23.2	10.5	1,816	1,660
4C	12.4	103.9	25.9	11.8	869	828
4D	13.1	102.4	24.8	11.2	763	723
All Areas	**13.2**	**101.0**	**23.6**	**10.7**	**11,339**	**10,771**

[1]Weights calculated from measured fork lengths for fish aged through December 5, 2017 (excludes otoliths collected for clean archive and extra otoliths collected for sex-marking project).

[2]From market sample data entered through November 30, 2017 (excludes otoliths collected for clean archive and extra otoliths collected for sex-marking project).

[3]Numbers of otoliths aged by December 5, 2017.

Table 3. Mean age (in years), mean length (in centimeters fork length), and estimated mean net weight[1] (in pounds and kilograms) of sampled commercially-caught Pacific halibut by IPHC Regulatory Area, 2008-2017.

Reg. Area		Year 2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
2A	**Age**	12.1	11.5	11.4	11.7	11.5	11.6	11.2	11.1	12.1	12.0
	Length	93.5	95.5	94.2	93.2	92.9	96.1	94.7	93.9	96.9	94.6
	Wgt (lbs)	17.7	19.1	18.3	17.7	17.4	19.6	18.6	18.2	19.9	18.4
	Wgt (kg)	8.0	8.6	8.3	8.0	7.9	8.9	8.4	8.3	9.0	8.3
2B	**Age**	12.2	11.7	11.6	11.9	12.0	12.6	12.6	12.1	12.8	13.3
	Length	97.0	97.2	98.9	97.9	99.4	103.0	100.8	102.5	99.7	100.5
	Wgt (lbs)	21.2	21.4	22.5	21.5	22.8	25.7	23.9	25.4	22.6	23.3
	Wgt (kg)	9.6	9.7	10.2	9.8	10.3	11.6	10.8	11.5	10.2	10.6
2C	**Age**	13.1	12.9	12.2	12.7	12.4	13.0	12.9	13.0	13.3	13.4
	Length	106.7	107.5	105.1	106.5	109.2	109.4	110.0	109.1	108.5	109.8
	Wgt (lbs)	28.9	29.6	27.3	28.6	31.0	31.2	31.6	30.7	29.8	31.3
	Wgt (kg)	13.1	13.4	12.4	13.0	14.1	14.1	14.3	13.9	13.5	14.2
3A	**Age**	15.9	15.1	15.2	15.0	15.0	15.1	14.5	14.7	14.3	14.1
	Length	100.3	99.1	97.5	95.7	95.6	96.7	96.4	96.5	95.9	98.2
	Wgt (lbs)	22.9	22.1	20.9	19.4	19.2	20.2	20.0	20.0	19.4	21.3
	Wgt (kg)	10.4	10.0	9.5	8.8	8.7	9.2	9.1	9.1	8.8	9.7
3B	**Age**	14.0	12.8	12.7	12.7	12.6	12.8	12.8	12.1	12.6	12.2
	Length	97.1	97.2	96.0	95.2	95.2	95.4	94.2	95.8	99.1	98.9
	Wgt (lbs)	20.3	20.6	19.7	19.1	19.1	19.2	18.4	19.5	21.8	22.0
	Wgt (kg)	9.2	9.3	8.9	8.7	8.7	8.7	8.3	8.8	9.9	10.0
4A	**Age**	15.6	15.4	13.9	15.6	15.7	15.0	13.8	14.0	13.3	12.6
	Length	103.4	101.2	99.8	103.4	104.1	100.9	98.4	98.8	101.1	99.8
	Wgt (lbs)	25.9	24.0	22.8	26.0	26.3	23.7	21.5	21.7	23.7	22.4
	Wgt (kg)	11.7	10.9	10.4	11.8	11.9	10.7	9.8	9.8	10.7	10.2
4B	**Age**	15.5	16.7	16.4	16.0	16.3	15.8	15.9	15.1	14.9	14.9
	Length	110.6	107.2	107.5	109.0	105.5	104.4	100.9	100.5	100.1	100.8
	Wgt (lbs)	33.3	29.2	29.6	31.1	27.4	26.8	23.5	23.5	22.8	23.2
	Wgt (kg)	15.1	13.2	13.4	14.1	12.4	12.1	10.7	10.7	10.3	10.5
4C	**Age**	11.7	12.2	13.2	12.9	12.6	12.5	12.0	12.1	12.9	12.4
	Length	103.8	102.4	101.4	100.4	99.6	99.3	96.8	96.1	102.7	103.9
	Wgt (lbs)	26.3	25.4	23.8	23.3	22.9	23.3	21.0	20.2	25.5	25.9
	Wgt (kg)	11.9	11.5	10.8	10.6	10.4	10.6	9.5	9.2	11.6	11.8
4D	**Age**	16.1	15.9	16.1	14.7	14.9	15.9	13.8	14.1	14.2	13.1
	Length	103.2	104.3	102.7	99.3	99.2	100.3	98.3	97.7	98.4	102.4
	Wgt (lbs)	25.5	26.5	25.3	22.1	21.7	22.8	21.6	20.6	21.2	24.8
	Wgt (kg)	11.6	12.0	11.5	10.0	9.8	10.4	9.8	9.4	9.6	11.2
Total	**Age**	14.3	13.7	14.0	13.7	13.8	13.8	13.3	13.3	13.4	13.2
	Length	101.2	100.6	100.8	99.1	100.2	101.1	99.0	99.5	100.5	101.0
	Wgt (lbs)	24.2	23.6	23.8	22.4	23.2	24.0	22.3	22.6	23.1	23.7
	Wgt (kg)	11.0	10.7	10.8	10.1	10.5	10.9	10.1	10.3	10.5	10.7

[1]Weights calculated from measured fork lengths. Excludes samples not aged and samples collected for clean archive.

Table 4. Number of Pacific halibut sampled by 5-cm length category in the 2017 commercial catch by IPHC Regulatory Area (not including samples collected for the clean otolith archive). The 80-84-cm category is further divided to designate the U32/O32 split within that category.

Fork length	Regulatory Area									
(cm)	2A	2B	2C	3A	3B	4A	4B	4C	4D	Total
70-79	2	7			2	1		9		21
[1]80-81	21	27	9	29	28	16	8	15	4	157
[2]82-84	166	130	39	144	189	76	90	53	50	937
85-89	278	243	121	317	279	205	286	107	112	1,948
90-94	222	201	149	277	235	158	327	103	114	1,786
95-99	128	155	162	194	162	133	300	109	126	1,469
100-104	102	128	138	141	144	95	265	96	81	1,190
105-109	69	101	132	105	110	97	171	78	77	940
110-114	55	95	118	73	93	68	126	79	64	771
115-119	43	85	124	57	77	69	76	57	43	631
120-124	15	60	105	37	46	35	43	61	20	422
125-129	11	46	91	32	41	27	31	38	18	335
130-134	4	22	45	15	19	17	28	19	16	185
135-139	1	15	60	27	16	14	20	14	8	175
140-144	1	11	34	9	9	7	14	11	11	107
145-149		8	24	3	8	4	12	10	4	73
150-154	1	5	21	2	4	2	7	4	7	53
155-159		4	7	2	2	1	5	3	3	27
160-164			8		1	1	2	2	2	16
165-169			2				2		1	5
170-174		1				1			1	3
175-179	1	3	1							5
180-184			1	1		1	1	1	1	6
185-189										
190-194							2			2
195-199			1							1
200-204										
205-209					1					1
Total	1,120	1,347	1,392	1,465	1,466	1,028	1,816	869	763	11,266

[1]U32
[2]O32

Table 5. Between-reader percent agreement for Pacific halibut market samples that were aged from 1996-2016 (CV = coefficient of variation, APE = average percent error).

Year	Total aged	No. aged twice	Percent agreement (± 1 year)	CV	APE
1996	13,452	1,839	92.3	2.8	2.0
1997	15,500	2,203	93.6	2.4	1.7
1998	14,395	2,110	91.9	2.6	1.8
1999	12,796	1,117	92.0	2.5	1.8
2000	13,982	1,002	88.8	3.0	2.1
2001	13,181	2,025	86.3	3.9	2.8
2002	17,770	2,135	87.9	3.2	2.3
2003	13,738	984	82.6	3.9	2.8
2004	11,866	809	82.6	3.6	2.5
2005	13,945	1,315	85.9	3.7	2.6
2006	12,330	1,241	88.3	3.5	2.5
2007	13,910	1,488	85.8	3.9	2.8
2008	13,460	1,337	90.3	3.1	2.2
2009	13,718	1,348	91.5	2.9	2.0
2010	16,106	1,617	91.7	2.9	2.1
2011	11,215	1,131	88.4	3.4	2.4
2012	12,981	1,364	90.3	2.8	2.0
2013	11,039	1,259	89.4	2.7	1.9
2014	12,606	1,357	90.9	2.8	2.0
2015	12,312	1,366	91.0	2.4	1.7
2016	11,618	1,641	93.9	2.0	1.4

2.3.2 Age distribution of Pacific halibut in the 2017 IPHC fishery-independent setline survey

Joan E. Forsberg

Abstract

Pacific halibut otoliths are collected annually from the International Pacific Halibut Commission (IPHC) fishery-independent setline survey to provide age data for use in the stock assessment. The annual setline survey provides catch and biological data (including ages) that are independent of the commercial fishery and can be used to monitor changes in the stock over time.

The age distribution of Pacific halibut sampled during the 2017 IPHC fishery-independent setline survey is summarized in this paper. Fish ranging from four to 46 years old were captured, with 12-year-olds comprising the largest age group in the overall catch. Average age was higher and average fork length was lower for males than females in all regulatory areas.

Otolith collections

Samples used for age data

Pacific halibut otoliths are collected annually to provide age data for use in the stock assessment. Otoliths are obtained from three main sources: the International Pacific Halibut Commission (IPHC) fishery-independent setline survey (setline survey), the commercial Pacific halibut fishery, and the National Marine Fisheries Service (NMFS) trawl surveys. Otoliths collected from the commercial catch provide age data that are representative of the directed fishery removals, while otoliths from the NMFS trawl survey provide age data for small Pacific halibut that are not captured on longline gear. Age distributions for the 2017 commercial fishery are presented in Forsberg (2017), the 2016 and 2017 age distributions from the Bering Sea trawl survey are presented in Sadorus et al. 2017a, and the 2015 Gulf of Alaska trawl survey are presented in Sadorus et al. 2017b. The annual setline survey, which uses standardized methods, gear, and bait, provides catch and biological data (including ages) that are independent of the commercial fishery and can be used to monitor changes in the stock over time. The setline survey otolith collection target is 2,000 (± 500) for Areas 2A, 2B, 2C, 3A, 3B, 4A, and 4B, and Areas 4C/4D combined. Targets are achieved by setting otolith sampling rates for each regulatory area based on projected catch rates. Setline survey sampling procedures, including area-specific otolith sampling rates, are described in Goen and Geernaert (2017).

Additional otoliths

Paired otoliths for the IPHC clean otolith archive collection (COAC) have been collected during the setline survey since 2010. Otoliths in this collection are not aged, but are stored dry for use in future studies. In 2017, COAC otoliths were collected from regulatory areas where sampling rates were not already 100%. A total of 504 otolith pairs were collected on the 2017 setline survey (Tobin et al. 2017).

Extra otoliths are also collected along with tissue samples from Pacific halibut that are sampled for environmental contaminants and for parasite studies. These otoliths are aged, but the ages are not included in the setline survey age distribution.

Age distribution

The age distribution of Pacific halibut sampled from the 2017 IPHC setline survey is summarized in Tables 1-3. The 2005 year class (12-year-olds) accounted for the largest proportion (in numbers) of sampled Pacific halibut for all areas and sexes combined (Table 1). The next most abundant year classes were 2004 and 2006 (13- and 11-year-olds, respectively).

Twelve-year-olds were the most abundant age class for female Pacific halibut sampled from all areas combined, as well as for females in all Regulatory Areas except for Area 4A (Table 2). The second and third most abundant age classes for sampled females across all Regulatory Areas were 13- and 11-year-olds, respectively.

The 2005 year class (12-year-olds) was the largest for male Pacific halibut from all areas combined, as well as from Regulatory Areas 2, 3B, 4A, and 4B (Table 3). The second and third most abundant age classes for sampled males across all Regulatory Areas were 13- and 11-year-olds, respectively.

Mean age and fork length (FL) by Regulatory Area of sampled setline survey Pacific halibut for the years 2008-2017 are presented in Table 4. Average length was calculated only from fish that were aged. Average age was higher and average fork length was lower for males than females in all areas for all years with the exception of Regulatory Area 4C in 2008, where the average age was slightly lower for males than females.

The youngest and oldest Pacific halibut in the 2017 setline survey samples were determined to be four and 46 years old (Table 5). There were four fish determined to be four years old: a female from Regulatory Area 3A measuring 53 cm FL; two females from Regulatory Area 3B measuring 53 and 55 cm FL); and one male from Regulatory Area 3B measuring 71 cm FL. The 46-year-old was a male captured in Regulatory Area 4B with a fork length of 119 cm. The maximum fork length recorded for setline survey-caught Pacific halibut in 2017 was 190 cm: a female from Regulatory Area 3A aged at 22 years. The smallest Pacific halibut sampled in the 2017 setline survey measured 33 cm FL: a male from Regulatory Area 4A aged at five years.

Quality control

Ten percent of annual setline survey otoliths are aged a second time by a different reader as a measure of quality control (QC). QC age readings for the 2017 survey otoliths were not complete at the time of writing. Between-reader percent agreement for setline survey ages from 2002 through 2016 is presented in Table 6.

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Table 1. Age distribution (number of individuals sampled) of all Pacific halibut (male, female, and unknown sex combined) collected in the 2017 fishery-independent setline survey. "Sample rate" indicates the percentage of those halibut captured in each Regulatory Area whose otoliths were removed for subsequent aging.

	Regulatory Area									
	2A	**2B**	**2C**	**3A**	**3B**	**4A**	**4B**	**4C**	**4D**	
	Sample rate (%)									
	100	35	33	9	13	78	45	100	100	
Age (years)										**Total**
4				1	3					**4**
5	1	7	9	5	10	9	4	7	2	**54**
6	4	18	26	13	25	34	14	12	7	**153**
7	12	23	21	13	38	40	43	9	10	**209**
8	18	31	43	18	37	86	26	23	29	**311**
9	86	129	117	82	110	222	76	71	92	**985**
10	104	123	145	107	115	172	72	57	130	**1,025**
11	125	204	240	174	183	220	109	69	131	**1,455**
12	193	345	371	287	289	335	228	87	133	**2,268**
13	141	240	349	233	208	331	191	77	106	**1,877**
14	64	105	184	145	144	249	175	50	96	**1,212**
15	47	88	186	140	113	163	113	38	55	**943**
16	20	45	113	94	41	82	62	8	30	**495**
17	14	43	82	97	34	65	55	7	16	**413**
18	10	32	81	95	29	56	41	4	11	**359**
19	11	11	49	47	21	28	38		9	**214**
20	4	13	35	29	6	25	31		11	**154**
21	4	4	13	20	2	12	19		6	**80**
22	1	3	12	17	2	10	11		6	**62**
23	3	3	10	7	1	9	18		6	**57**
24	1		4	2	2	4	13		6	**32**
25	1	2	5	5	2	4	9	1	2	**31**
≥26	1	2	9	3	6	31	60	2	59	**173**
Total	**865**	**1,471**	**2,104**	**1,634**	**1,421**	**2,187**	**1,408**	**522**	**953**	**12,565**

Table 2. Age distribution (number of individuals sampled) of female Pacific halibut collected in the 2017 fishery-independent setline survey. Note that halibut are not sampled at the same rate in all Regulatory Areas (see rates in Table 1), and that there are not separate sampling rates by sex within an area.

	Regulatory Area									
Age	**2A**	**2B**	**2C**	**3A**	**3B**	**4A**	**4B**	**4C**	**4D**	**Total**
4				1	2					**3**
5	1	6	7	4	8	5	3	7	2	**43**
6	3	9	16	7	22	28	7	10	4	**106**
7	11	15	14	10	26	28	30	6	9	**149**
8	15	19	29	11	18	54	15	19	17	**197**
9	65	83	80	51	60	101	37	66	66	**609**
10	84	91	97	72	47	95	37	46	97	**666**
11	101	125	179	122	77	93	57	64	97	**915**
12	158	230	285	202	126	164	116	79	106	**1,466**
13	118	159	279	152	100	172	103	65	84	**1,232**
14	52	65	131	89	59	139	71	47	73	**726**
15	38	44	142	77	36	83	44	31	40	**535**
16	11	22	87	43	9	42	14	7	23	**258**
17	12	19	57	39	9	26	20	4	10	**196**
18	6	9	53	31	11	28	14	3	6	**161**
19	10	3	29	12	4	11	3		5	**77**
20	1	2	23	7		14	6		7	**60**
21	3	1	8	5		3	4		1	**25**
22	1	2	8	2		5	3		4	**25**
23	3		6	2		4	2		3	**20**
24	1		2			2	3		4	**12**
25		1	5			1	2	1	1	**11**
≥26		2	4	2		9	9		23	**49**
Total	**694**	**907**	**1,541**	**941**	**614**	**1,107**	**600**	**455**	**682**	**7,541**

Table 3. Age distribution (number of individuals sampled) of male Pacific halibut collected in the 2017 fishery-independent setline survey. Note that halibut are not sampled at the same rate in all Regulatory Areas (see rates in Table 1), and that there are not separate sampling rates by sex within an area.

	Regulatory Area									
Age	**2A**	**2B**	**2C**	**3A**	**3B**	**4A**	**4B**	**4C**	**4D**	**Total**
4					1					**1**
5		1	1	1	2	4	1			**10**
6	1	9	9	6	3	5	7	2	3	**45**
7	1	8	5	2	12	12	12	3	1	**56**
8	3	12	14	6	18	31	11	4	12	**111**
9	21	45	35	30	49	119	38	5	26	**368**
10	19	32	45	34	65	77	33	11	33	**349**
11	22	78	58	46	106	125	50	5	33	**523**
12	34	113	85	82	159	169	109	8	26	**785**
13	21	77	69	80	103	156	84	11	21	**623**
14	11	40	53	52	82	108	104	3	23	**476**
15	9	43	44	63	76	79	67	7	15	**403**
16	9	23	26	50	32	39	47	1	7	**234**
17	2	23	24	58	25	38	33	3	6	**212**
18	4	23	28	63	18	27	27	1	5	**196**
19	1	8	20	35	17	16	34		4	**135**
20	3	11	12	22	6	11	24		4	**93**
21	1	3	5	15	1	9	15		5	**54**
22		1	4	15	2	5	7		2	**36**
23		3	4	5	1	5	16		3	**37**
24			2	1	2	2	10		2	**19**
25	1	1		4	1	3	7		1	**18**
≥26	1		5	1	5	21	51	2	36	**122**
Total	**164**	**554**	**548**	**671**	**786**	**1,061**	**787**	**66**	**268**	**4,905**

Table 4. Mean age (in years) and mean fork length (in centimeters) of sampled Pacific halibut caught on standard survey skates by sex and Regulatory Area (CLS = Bering Sea closed area), 2008-2017 (F = female, M = male).

Reg.		2008		2009		2010		2011		2012[1]		2013		2014		2015		2016		2017	
Area		F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M
2A	Age	11.3	11.4	10.3	11.0	11.0	11.1	11.4	12.0	11.8	12.0	11.2	11.6	10.5	11.4	10.6	11.1	10.8	11.8	12.0	12.4
	Length	90.3	78.8	89.5	79.4	93.1	79.1	95.6	81.5	95.1	80.1	94.7	80.4	95.8	81.3	93.0	80.5	92.1	78.5	100.7	81.1
2B	Age	10.6	11.1	11.2	11.8	10.9	11.4	11.1	11.6	11.4	12.3	11.4	12.3	11.2	12.6	11.3	12.4	11.5	12.3	12.0	12.8
	Length	91.0	77.2	93.5	77.4	93.8	78.2	94.6	78.5	95.2	79.8	94.4	79.1	92.1	78.8	91.8	78.7	93.4	78.1	95.6	80.0
2C	Age	11.4	11.5	10.9	11.7	11.0	11.5	11.9	12.0	11.2	11.6	11.9	12.4	11.7	12.3	11.9	12.3	12.7	13.2	13.1	13.4
	Length	93.4	78.8	90.6	78.2	91.0	77.0	96.9	79.8	95.8	80.1	96.4	79.4	97.0	80.0	97.7	80.4	96.7	81.0	100.7	82.9
3A	Age	12.9	16.0	11.7	14.6	12.1	15.0	12.2	14.9	12.2	14.6	12.7	14.3	11.8	13.8	11.8	13.7	12.8	14.6	12.8	14.7
	Length	93.7	81.8	89.5	79.6	89.4	78.7	87.6	78.3	90.1	78.6	89.4	76.4	87.7	75.5	88.5	75.3	90.4	76.0	92.0	77.2
3B	Age	11.1	14.4	10.6	13.5	10.7	13.0	10.8	12.9	10.7	12.5	11.3	13.3	10.9	12.7	11.3	12.8	11.5	12.4	11.6	12.8
	Length	83.0	78.1	82.3	77.6	81.8	75.9	81.5	74.2	81.7	74.9	80.3	73.3	80.5	73.4	82.3	72.2	83.9	71.2	87.8	73.2
4A	Age	10.7	13.5	10.5	12.6	10.6	12.7	10.8	13.2	11.1	13.2	11.3	13.4	12.3	14.7	11.5	13.9	12.3	13.0	12.5	13.0
	Length	82.4	78.6	84.1	77.6	82.6	76.6	83.4	76.5	82.8	76.6	85.8	78.3	88.2	79.7	84.7	77.0	89.1	74.1	88.0	74.1
4B	Age	12.6	15.8	13.1	15.9	12.2	14.9	12.2	15.2	11.8	13.9	11.0	13.6	11.2	13.7	11.0	13.6	11.4	13.6	12.8	15.3
	Length	103.4	92.1	103.8	92.7	100.3	90.3	98.4	89.7	96.6	86.5	89.4	84.1	92.0	84.1	94.6	86.2	91.1	82.1	96.7	85.3
4C	Age	10.5	10.4	9.6	10.8	10.2	10.8	10.4	11.2	11.3	13.2	10.6	11.2	11.3	11.4	10.7	11.4	11.7	12.1	11.5	12.3
	Length	88.0	72.7	84.1	75.1	84.3	73.8	82.0	72.8	86.3	78.8	80.7	74.2	84.7	72.9	83.1	72.2	87.0	74.9	93.9	74.3
4D	Age	13.4	16.1	13.8	16.6	14.4	17.4	13.2	14.9	12.0	13.7	13.8	15.2	12.3	13.1	12.5	13.3	13.3	14.2	12.8	15.1
	Length	93.8	85.3	94.4	86.7	96.6	87.3	88.4	80.9	86.6	78.5	91.9	81.5	88.2	77.6	88.2	77.6	88.1	77.7	93.7	80.6
4E	Age	----	----	----	----	----	----	----	----	----	----	----	----	----	----	10.1	12.5	----	----	----	----
	Length	----	----	----	----	----	----	----	----	----	----	----	----	----	----	89.0	79.9	----	----	----	----
CLS	Age	----	----	----	----	----	----	----	----	----	----	----	----	----	----	10.4	11.2	----	----	----	----
	Length	----	----	----	----	----	----	----	----	----	----	----	----	----	----	86.9	73.4	----	----	----	----

[1]Does not include otoltihs from fish sampled on experimental bait skates that were fished concurrently with standard survey skates during 2012 bait study (Webster et al. 2013).

Table 5. Maximum and minimum age (in years) and fork length (in centimeters) of Pacific halibut for which sex was determined, collected in the 2017 fishery-independent setline survey, by Regulatory Area and sex.

Reg. Area	Sex	Max. age	Min. age	Max. length	Min. length
2A	Female	24	5	145	60
2A	Male	33	6	113	57
2B	Female	30	5	174	55
2B	Male	25	5	127	56
2C	Female	31	5	186	57
2C	Male	32	5	139	54
3A	Female	28	4	190	48
3A	Male	27	5	147	51
3B	Female	19	4	161	50
3B	Male	31	4	127	48
4A	Female	34	5	155	50
4A	Male	37	5	121	33
4B	Female	36	5	174	53
4B	Male	46	5	134	57
4C	Female	25	5	180	56
4C	Male	36	6	106	53
4D	Female	32	5	175	57
4D	Male	42	6	134	34

Table 6. Between-reader percent agreement for fishery-independent setline survey ages 2002-2016. (CV = coefficient of variation, APE = average percent error, % -bias = % of ages where the second age estimated for a fish (age 2) was younger than the intially-estimated age (age 1), % +bias = % of ages where age 2 > age 1.)

Year	Total aged	Number aged twice	% agreement (± 1 year)	CV (%)	APE	% -bias	% +bias
2002	13,635	2,229	81.2	4.3	3.0	24.8	33.6
2003	12,613	1,633	83.3	4.3	3.0	22.0	29.3
2004	14,474	1,257	83.3	4.8	3.4	18.5	38.8
2005	14,552	1,361	85.1	3.9	2.8	20.4	30.2
2006	14,977	1,556	90.4	3.2	2.2	23.7	18.8
2007	16,022	1,566	87.2	4.5	3.2	28.1	28.6
2008	15,545	1,579	89.5	3.4	2.4	25.8	21.3
2009	15,706	1,567	91.1	3.4	2.4	26.2	19.0
2010	14,080	1,407	92.8	2.8	2.0	23.7	19.5
2011	14,451	1,448	89.8	3.7	2.6	30.3	19.3
2012	[1]17,459	[1]1,751	91.7	3.5	2.5	26.0	21.1
2013	12,717	1,438	91.9	2.6	1.8	16.9	17.7
2014	16,193	1,848	90.6	2.9	2.0	14.6	19.2
2015	16,023	2,044	86.8	3.5	2.5	10.1	26.7
2016	15,724	2,741	95.1	1.8	1.3	14.1	11.2

[1]Includes extra otoliths collected on standard skates and experimental bait skates from 2012 bait study (Webster et al. 2013).

2.4.1 2017 Discard mortality rates in the directed longline fleet

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Abstract

In 2017, the IPHC conducted a field experiment investigating the relationship between Pacific halibut release practices, physiological condition, injury levels, and post-release survival in an effort to improve discard mortality rate estimates in the directed Pacific halibut longline fishery. Longline gear was deployed southeast of Chignik, AK to collect Pacific halibut smaller than 84 cm (33 in), subject them to different hook-release techniques, measure physiological conditions, and possibly tag them to determine factors that affect discard mortality. Physiological parameters collected included information on condition status at capture (round weight, fat reserves) and post-handling stress levels (blood stress hormones). Electronic monitoring equipment was also deployed during the project to collect data on the accuracy of its ability to capture release methods. Over two trips and 38 sets, 79 Pacific halibut were fitted with accelerometer pop-up archival transmitting tags to assess near-term (96 days) survival, and 1,048 fish were wire tagged to investigate longer-term survival. Vitality (injury and condition) profiles by hook-release method will be developed as a proxy for discard mortality rates on EM trips.

Introduction

Due to regulatory requirements, all Pacific halibut that are caught as bycatch or that are of sublegal size in the targeted fishery cannot be retained and must be returned to the sea with minimal injury. However, through the process of capture and release, Pacific halibut incur a range of injuries and are subjected to a variety of factors that will affect their survival potential after release. Individual variability in terms of mortality after release to the sea will be expected depending on the level of injuries and stresses incurred during the discarding process as well as on the basal physiological condition of the fish. Therefore, an accurate understanding of the types and relative levels of injuries and stresses that fish are exposed to during the discarding process in relation to the biological characteristics of the fish can be instrumental in helping better estimate the probability of survival during the discarding process.

Discard mortality rates (DMRs) are calculated from data collected by observers from the release vitality or injury characteristics of Pacific halibut post-capture and are used to estimate the percentage of incidentally-caught fish that are expected to die after release. Currently, post-capture DMR estimates are based on qualitative assessments of the physical condition of the fish (e.g., minor/moderate/severe/dead for longline gear) and have a certain degree of uncertainty associated with them, which in turn is a source of uncertainty in the estimation of total mortality within current International Pacific halibut Commission (IPHC) stock assessment models. In practice, assigned DMRs and their uncertainty translate into *a priori* adjustments to expected mortality in each upcoming year, and to the catch limits that are thereafter assigned to each harvest sector. Given current low halibut yields relative to long-term mean productivity, uncertain estimates can result in undue hardship on some harvest sector(s) relative to others. Therefore, there is an urgent need to improve our estimates of DMR as well as to provide strategies to improve survival of incidentally-caught Pacific halibut after release.

It has been well recognized that fish condition assessments that incorporate additional levels of information on the physiological characteristics of captured fish have improved the power to predict survival in discarded fish (Davis, 2010; ICES, 2014). It is important to indicate, on one hand, that the physiological condition of the captured fish may influence their susceptibility to the stress associated with capture and handling events and, hence, their potential for survival after release. On the other hand, different capture and handling procedures can elicit different physiological responses in the fish to cope with the ensuing stress, which may also influence their survival after release. These two aspects are important because they drive most of the variability associated with discard mortality. Therefore, it is important to measure physiological indicators of stress and condition in a quantitative manner in relation to capture and handling events in order to understand their influence on mortality after release. Full condition assessments incorporating physiological parameters can then be used as a predictive tool to estimate DMRs if properly calibrated with the results of direct survival or behavioral studies (e.g., tagging and telemetry studies).

Traditional observer programs require examining the animal (which includes looking at both sides of the fish, testing muscle tone and opercular responses) to determine vitality; something that cannot be achieved with cameras. Development of electronic monitoring (EM) systems as an alternative to human observers highlights a need to develop the capability to convert imagery into actionable data. It has been demonstrated (Smith et al. 2017) that EM provides information on Pacific halibut hook-release techniques (e.g., careful shake, gangion cut, hook stripper) for close to 95% of events, however the suite of vitalities incurred by each hook-release technique is unknown. This project will provide a quantitative summary of injuries by release method.

There are two main goals of this research. First, to develop an understanding of the relationship between hook-release practices and fish physical and physiological condition. The second goal is to understand the post-capture probability of mortality based on hook-release technique, as assessed by tagging. This research will help to better estimate post-release mortality of incidentally-caught Pacific halibut in directed and non-directed (bycatch) longline fisheries, and provide data to develop a proxy for EM to associate DMRs to hook-release methods.

Experimental design and sampling procedures

The 2017 discard mortality rate study was conducted on the F/V Kema Sue in an area southeast of Chignik, AK, bounded between the following points (56°05'N, 158°10'W), (56°05'N, 157°25'W), (55°26'N, 156°23'W), (54°55'N, 157°15'W), (54°55'N, 158°10'W), and (55°40'N, 158°50'W) as depicted in Figure 1 (with the exception of several sets that were made outside the area to avoid severe weather conditions). Sets consisted of eight skates of conventional longline gear, each 1,800 feet (549 m) long with 100 hooks (#3 (16/0 Mustad) at 18' (5.5 m) intervals, on 24 to 48 inch (61 cm to 122 cm) gangions. The vessel's hauling station was located amidships with a chute, roughly 1 foot (0.3 m) above sea-level and an in-chute roller placed in-board of the rail roughly 1 foot (0.3 cm) above the slide to enable the release of fish onto area slide where they could be gently slid to an area to be assessed, tagged, and released. Gear was baited with 0.25 lb to 0.33 lb (0.11 kg to 0.15 kg) of chum salmon (*Oncorhynchus keta*). Two to three sets were made daily beginning at or after 6:30 AM, and the gear was soaked for at least three hours before hauling. Soaking the gear at night was avoided, when possible, to minimize sand flea infestation of the study fish. An EM system was installed by Archipelago Marine Research Ltd. (Victoria, British Columbia, Canada) in the same configuration as is used under the Exempted Fishing Permit program of the US National Oceanic and Atmospheric Administration (NOAA), underway in Alaska.

The first day of the experiment (2 sets) involved finalizing sampling protocols and four treatments were applied: the three releases mandated in IPHC regulations (i.e. careful shake, hook straightening, and gangion cutting), as well as a fourth treatment (hook stripping) for those fish that made it past the release point. Each treatment was randomly assigned to a whole skate of gear. It was quickly determined that hook straightening was not a feasible treatment as sublegal Pacific halibut do not have enough mass to straighten a #3 (16/0) circle hook; furthermore, this method is not practiced to release sublegal Pacific halibut in the fishery.

The full experiment began on the second day and involved the random assignment of hook-release methods (5 skates of careful shaking, 2 skates of hook stripping, and 1 skate of gangion cutting). All captured Pacific halibut were measured, weighed, assessed for current hooking injury, and evaluated for vitality (or release condition). Pacific halibut less than or equal to 84 cm (33 inches)[1] fork length (FL) were subjected to fat measurements using a FatMeter (Distell, Fauldhouse, Scotland), blood draw, genetic sampling (fin clip), and body temperature prior to being tagged and released. Water temperature was recorded using Minilog-II-T temperature data loggers (Vemco, Nova Scotia, Canada) attached to each set of gear. Fish temperature was collected with a hand held Ceenwes GM 550 infrared thermometer (Ceenwes, Shenzhen Guangdong, China). Survivorship pop-up archival transmitting tags (sPAT) tags (Wildlife Computers, Redmond, Washington, USA) containing accelerometer sensors were deployed randomly on Pacific halibut ≤ 84 cm FL in excellent release condition. Wire tags (Floy Tag, Seattle, Washington, USA) were deployed on Pacific halibut ≤ 84 cm of any condition. To manage the work load, a maximum number of 65 wire tags were deployed per set and 10 sPATs per day. For the same reason, blood collection was conducted on only half of the wire-tagged fish, whereas time on deck was recorded for all sPAT fish but only for 25% of the wire-tagged fish (random start and every 4th fish thereafter).

Results

The *F/V Kema Sue* successfully completed 38 experimental sets between 18 October; 2017 and 2 November, 2017. A total of 79 Pacific halibut were tagged with sPAT tags, and 1,048 with wire tags. At the time of writing this, samples are still being processed, and data from this project have not yet been entered or analyzed.

Acknowledgements

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[1] N.B. As the focus of the study was on the survival of Pacific halibut released from the gear in the directed longline fishery (fish less than 32 inches (81.3 cm) fork length), and as it is likely that some Pacific halibut are released that are slightly above this size limit, this study looked at survival of fish less than or equal to 84 cm (33 inches) fork length).

conditions and long days, and to IPHC sea samplers Danielle Vracin, Kaitlin Johnson, and Nathan Willse for their attention to detail and positive attitudes.

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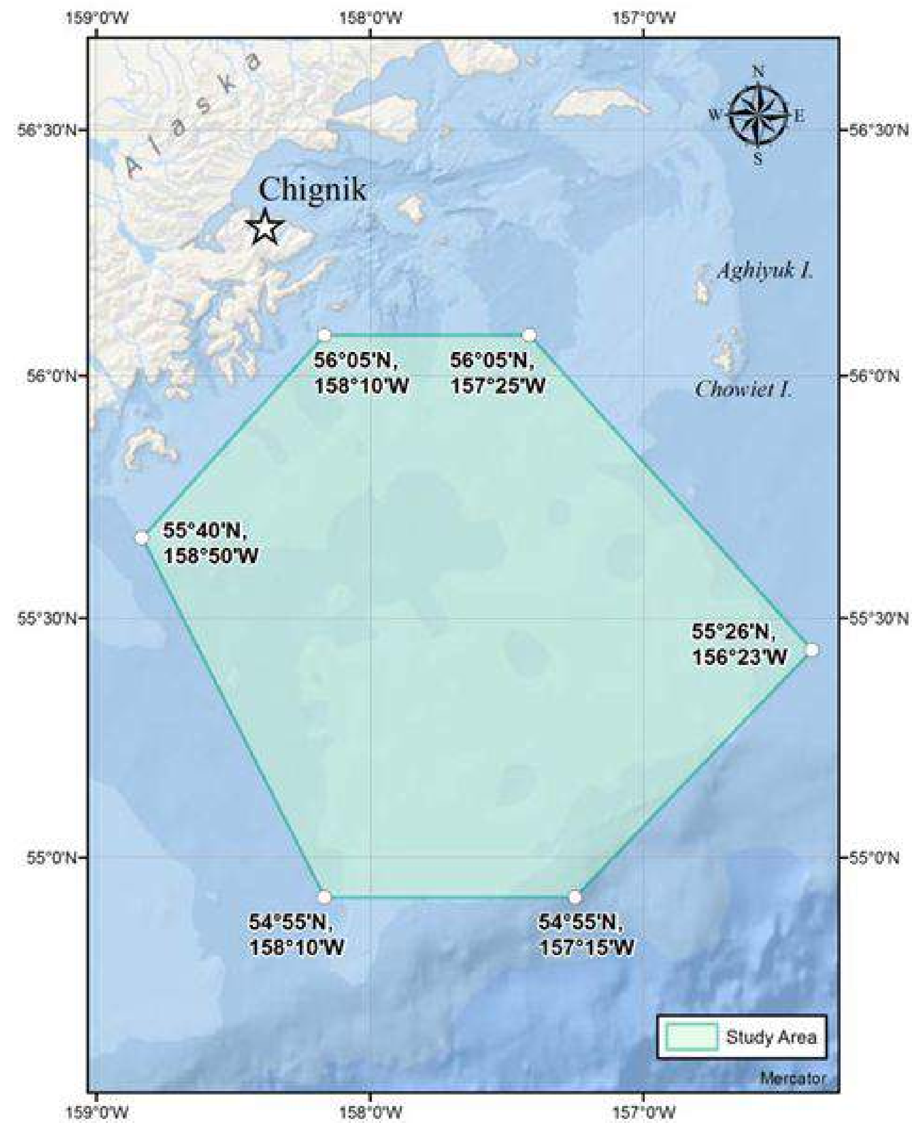

Figure 1. Discard mortality study area (southeast of Chignik, AK).

2.5.1 Pacific halibut tagging studies

Joan E. Forsberg

Abstract

Since the International Pacific Halibut Commission (IPHC) began tagging studies in 1925, over 465,000 tagged Pacific halibut (*Hippoglossus stenolepis*) have been released and more than 51,000 of these releases have been recovered. Pacific halibut are tagged to study migration, age, growth, and mortality. The IPHC conducted five tagging experiments in 2017 in which 4,545 fish were tagged and released. Thirty-seven tagged Pacific halibut, representing recoveries from several different IPHC experiments and sport tag releases, were recaptured in 2017. Otoliths were collected from 15 of these recaptured fish. An additional three tags recovered in previous years were reported in 2017.

Introduction

Since the International Pacific Halibut Commission (IPHC) began tagging in 1925, over 465,000 tagged Pacific halibut have been released. To date, more than 51,000 of these releases have been recovered. Pacific halibut are tagged to study migration, age, growth, and mortality. Of the recovered tagged Pacific halibut, over 39,000 were measured for length when recovered, and over 31,000 had otoliths collected for age determination.

Tag releases

IPHC tag experiments

The IPHC tagged and released 3,396 U32 Pacific halibut (<82 cm fork length) with plastic-coated wire opercular tags in 2017 in the third year of a long-term effort to tag young halibut. A total of 1,927 U32 Pacific halibut were tagged on 11 vessels participating in the IPHC fishery-independent setline survey (setline survey) in 2017 (Forsberg 2017) and a total of 1,469 U32 fish were tagged on three vessels conducting the National Marine Fisheries Service (NMFS) trawl surveys in the Bering Sea (n=756), Sadorus et al. (2017a) and the Gulf of Alaska (n=713, Sadorus et al. 2017b).

An additional 1,048 Pacific halibut ≤ 84 cm were wire-tagged as part of a discard mortality study in Regulatory Area 3B (Dykstra et al. 2017). Tagged fish in this study were subjected to different hook release and handling methods. Future recovery rates by hook release method can be used to improve discard mortality rates in the commercial longline fisheries.

The IPHC also tagged and released 101 Pacific halibut with pop-up satellite transmitting archival (PAT) tags in two different studies. Twenty-two PAT tags were released on the Bowers Ridge expansion stations that were part of the setline survey in Regulatory Area 4B in 2017 (Loher 2017). Reporting from these tags will provide information on seasonal and interannual dispersal of Pacific halibut in this region. Seventy-nine accelerometer PAT tags were released during the discard mortality study in Regulatory Area 3B. These tags will provide information on short-term post-release survival of longline-caught Pacific halibut subjected to different methods of hook release.

Sport tag releases

The IPHC continued to provide tags on a cost-recovery basis for two Alaskan sport fishing derbies in 2017. The Homer Jackpot Halibut Derby tagged and released 77 fish and the annual Seward Halibut Tournament tagged and released 41 fish. Both the Homer and Seward sport derbies use plastic-coated wire opercular tags. These tags are printed with the year, Derby/Tournament name, and tag number.

Other releases

For the second year, IPHC issued a permit to Gray FishTag Research (GFTR)1, in conjunction with a local fishing charter group, to tag Pacific halibut out of Seward, AK. GFTR was authorized to tag up to 80 Pacific halibut; however, no tagging was conducted in 2017. GFTR is interested in looking at local movement of the fish they tag.

Tag recoveries

Tag recoveries from a total of 27 Pacific halibut from various IPHC tagging experiments were reported in 2017, as well as 13 tags from sport tagging programs. Otoliths were collected from 15 of the IPHC-tagged Pacific halibut recovered. Recoveries by experiment or tag type are discussed below. Total release and recovery numbers for the most recent major IPHC tagging experiments are presented in Table 1. Current-year recoveries of tagged Pacific halibut from sport tagging programs are presented in Table 2. Sport-tagged halibut are usually measured when recovered but otoliths are not collected.

Recoveries from experiments using wire tags only

In 2017, three tags were recovered from the 2010 Aleutian wire tagging experiment, a study designed to identify potential future tagging sites for archival tag releases in Regulatory Area 4B (Loher 2011). Eight Pacific halibut tagged during the 2015 pilot study on the NMFS trawl survey were recovered (Forsberg et al. 2016); two fish had been recaptured in 2016 and six were recovered in 2017. The remaining wire tags recovered in 2017 were part of the U32 tagging effort. Two fish tagged on the 2016 NMFS trawl survey were recovered (one in 2016 and one in 2017). Six tags were recovered from Pacific halibut tagged on the 2017 setline survey (Forsberg 2017) and one tagged halibut released on the 2017 NMFS trawl survey in the Gulf of Alaska was recovered.

Recoveries from archival and dummy archival tag experiments

Tags from seven fish from the 2013 dummy archival tag experiment in Regulatory Area 3A (Loher and Geernaert 2014) were returned in 2017. Six of these fish had been tagged with both a dummy archival dart tag and a plastic-coated wire cheek tag, and one had been tagged with only an external dummy archival tag attached to the operculum; the purpose of this study was to evaluate different attachment methods for archival tags.

Sport tag recoveries

Three tags from the 2017 Homer Derby were recovered. Additionally, six tags from previous Homer Derby releases were recovered in 2017: four from the 2015 derby and two from the 2016 derby. All of the Homer Derby tags recovered in 2017 were recovered by sport fishers out of Homer during the Derby.

Four tags from the 2017 Seward Halibut Tournament were recovered by sport fishers during the tournament.

Recoveries from Gray FishTag releases had not been reported at the time of writing.

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Table 1. Total recovery rates for the most recent major Pacific halibut tagging experiments.

Experiment	Reg. Area of release	Release year(s)	Number released	Number recovered to date	Number reported in 2017	Recov. rate
Longline mortality	3A, 3B	1993-94	13,096	1,123	0	9%
Trawl mortality	3A	1995	4,852	178	0	4%
Wire/PIT double-tagging (3A)	3A	2001	281	30	0	11%
Wire/PIT double-tagging (2B)	2B	2003	2,661	731	0	27%
PIT tagging (coastwide)	2A through 4D	2003	43,999	2,266	0	5%
PIT tagging (2B and 3A)	2B, 3A	2004	23,437	1,179	0	5%
PAT tagging Gulf spawning	2B, 2C, 3A, 3B	2002	12	0*	0	0%
PAT tagging Bering Sea spawning	4C, 4D	2002	12	0*	0	0%
PAT tagging Bering Sea spawning	4B	2004	25	1*	0	4%
PAT tagging Gulf migration timing	2B, 2C, 3A, 3B	2005	49	15*	0	31%
PAT tagging Bering Sea spawning	4A, 4D	2006	24	2*	0	8%
PAT tagging Area 2 dispersal	2A, 2B	2006	78	12*	0	15%
PAT tagging Bering Sea dispersal	4A, 4B, 4C, 4D	2008	115	7*	0	4%
PAT tagging Bering Sea dispersal	4A, 4C, 4D	2009	17	1*	0	6%
Archival tagging (2B)	2B	2008	166	22	0	13%
Wire/dummy archival double-tagging	3A	2009	200	48	0	24%
Aleutian wire tagging	4B	2010	773	50	3	7%
Geomagnetic-sensing archival	2C, 3A	2011	30	2	0	7%
External dummy archival attachment	3A	2013	901	100	7	11%
PAT tagging Salish Sea dispersal	2A	2014	12	3*	0	25%
Gulf of Alaska NMFS trawl tagging	2C, 3, 4A	2015	1,491	12	7	<1%
Bering Sea NMFS trawl tagging	4A, 4CDE, CLS	2015	485	5	1	1%
Bering Sea NMFS trawl tagging	4A, 4CDE, CLS	2016	425	1	1	<1%
Aleutian Islands NMFS trawl tagging	4B	2016	170	1	1	<1%
Setline survey U32 wire tagging	4D	2016	169	0	0	0
PAT tagging Bering Sea spawning	4D	2016	20	0*	0	0
PAT tagging Bering Sea dispersal	4D	2016	15	0*	0	0
Setline survey U32 wire tagging	2BC, 3, 4A, 4B	2017	1,927	6	6	<1%
Bering Sea NMFS trawl tagging	4A, 4CDE, CLS	2017	756	0	0	0
Gulf of Alaska NMFS trawl tagging	2C, 3, 4A	2017	713	1	1	<1%
PAT tagging Bowers Ridge dispersal	4B	2017	22	0*	0	0
PAT tagging short-term survival	3B	2017	79	0*	0	0
Longline discard mortality wire	3B	2017	1,048	0	0	0

* refers to physical recovery of tagged fish, not pop-up data broadcast to satellite

Table 2. Recoveries of sport-tagged Pacific halibut in 2017.

Release source	Number recovered in 2017
Homer Jackpot Halibut Derby	9
Seward Halibut Tournament	4

2.5.2. Deployment and reporting of pop-up archival transmitting (PAT) tags to study seasonal and interannual dispersal of Pacific halibut on Bowers Ridge (Area 4B)

Timothy Loher

Abstract

The International Pacific Halibut Commission (IPHC) has conducted a series of pop-up archival transmitting (PAT) tag studies in the Bering Sea and Aleutian Islands (BSAI) region in order to identify winter spawning locations, determine the timing of seasonal movements, and investigate mixing within the BSAI and between the Bering Sea and Gulf of Alaska. However, neither PAT nor PIT (passive integrated transponder) tagging has been conducted on Bowers Ridge (IPHC Regulatory Area 4B), because this region has not been previously surveyed by the IPHC. In 2017, we took advantage of setline survey expansion in order to generate data for this unstudied region that will complement prior work. From 5-10 July 2017, 22 Pacific halibut ranging from 115-170 cm fork length (FL) were tagged with Wildlife Computers miniPAT pop-up archival transmitting tags. Sixteen tags were programmed to detach from their host fish to report their location and download environmental data to passing Argos (Advanced research and global observation system) satellites during the 2017-2018 spawning season, on 15 January 2018; 6 tags were programmed to detach and report after 365 days at liberty, in July of 2018. In addition to determining the length of the tagged Pacific halibut, blood samples were obtained for future analysis of plasma hormone levels that might be predictive of individual migratory behavior, and ultrasound was employed to determine sex and the likelihood that tagged females (n = 13) were mature.

Introduction

The International Pacific Halibut Commission (IPHC) has a considerable history of conducting pop-up archival transmitting (PAT) tag studies in the Bering Sea and Aleutian Islands (BSAI) region in order to investigate both seasonal and inter-annual dispersal. In total 188 tags have been deployed in the BSAI region in previous studies, covering the historically-surveyed range of Pacific halibut (*Hippoglossus stenolepis*) throughout IPHC Regulatory Area 4. These studies have been designed to identify winter spawning locations, gain greater understanding of the timing of movements within this stock component, and investigate mixing among regulatory areas in a fishery-independent manner. Taken together, they have resulted in an understanding of population function that is generally consistent with the spatial structure of the IPHC's Area-as-Fleets stock assessment model (Stewart and Martell 2016).

Studies of seasonal migration and winter distribution were initiated in 2002 in the shallow nearshore waters of Regulatory Area 4C (Seitz et al. 2007), expanded to Regulatory Area 4B in 2004 (Seitz et al. 2008), and to the northern and southern extents of the IPHC's Bering Sea continental shelf-edge survey grid in 2006 (Seitz et al. 2016). The result was an integrated 5-site design spanning from Attu Island in the west to Unimak Pass in the east, and northward to Pervenets Canyon. With respect to stock structure, the results indicated considerable mixing on the eastern continental shelf in conjunction with relative isolation within Regulatory Area 4B (Seitz et al.

2011). Additionally, the results suggested that the stock's spawning range is considerably broader than had been traditionally assumed. Prior to the initiation of the IPHC's PAT-tagging program, the best available evidence indicated that Pacific halibut in the eastern Pacific Ocean concentrate their winter spawning activity at submarine canyons from southern British Columbia to Pribilof Canyon in the southeastern Bering Sea, with no indication of spawning along the Aleutian Ridge (St. Pierre 1984). PAT tag data suggest a spawning distribution that extends latitudinally from at least Cape Johnson, Washington (Loher and Blood 2009) northwards to Pervenets Canyon, and westward to Attu Island (Seitz et al. 2016). Still, the full range of potential spawning habitats has not been studied.

From 2008-2010, a large PAT-tagging experiment was conducted in the Bering Sea to examine inter-annual dispersal of Pacific halibut (Loher and Clark 2010). This was designed as a fishery-independent complement to an earlier large-scale Passive Integrated Transponder (PIT)-tagging study (Webster et al. 2013) that had relied upon the directed commercial fishery to recapture tags. Results of the inter-annual dispersal experiment were consistent with both seasonal PAT tagging and large-scale PIT tagging in demonstrating relative isolation of Regulatory Area 4B from the remainder of the stock and a relative discontinuity in north-south dispersal across the Aleutian Ridge. With respect to the latter, Pacific halibut that were tagged in Regulatory Area 4A were found to be more likely to move into Regulatory Area 3 if they had been tagged south of Unimak Pass than if tagged in Regulatory Area 4A north of Unimak; i.e., movement of commercially-recruited sizes was considerably more prevalent within the western Gulf of Alaska (GOA) than was movement of Pacific halibut from the Bering Sea into the GOA. Additionally, results of the study suggested reduced east-west dispersal (Loher and Clark 2010) of adult Pacific halibut across deep Aleutian passes, consistent with recent population genetic analyses that suggest the existence of significant stock structure to the west of Amchitka Pass (Drinan et al. 2016). However, as with examinations of spawning distribution, geographic gaps occur in both the PIT- and PAT-tag data due to survey coverage that has not extended to the limits of the managed range; in particular, near the Russian border and along Bowers Ridge north of the Aleutian Islands. Here, we take advantage of ongoing setline survey expansion in order to begin filling these gaps in understanding. In the current study, PAT tags were deployed at Regulatory Area 4B expansion stations on Bowers Ridge.

Tag specifications and biological sampling

The miniPAT (manufactured by Wildlife Computers, Redmond, WA) is a cast epoxy satellite-transmitting archival tag (Fig. 1) that is shaped somewhat like a microphone, with a body diameter of 1.8 cm (0.75 in), float diameter of 3.7 cm (1.5 in), a total body length of 11.5 cm (4.5 in). The body of the tag contains temperature (nominal recording range of -40° to 60° C; accuracy of 0.1° C at 0.05° resolution), pressure (depth; 0-1700 m, accurate to 1% of recorded values at 0.5-m resolution) and light (ranging from 5 x 10^{-12} W cm^{-2} to 5 x 10^{-2} W cm^{-2}) sensors as well as programming circuitry and a satellite transmitter. The tag weighs 60 g in air.

The tags were attached to Pacific halibut via a dart and leader assembly composed of a 10-cm (4.5-in) leader constructed of 300-lb (136-kg) test nylon monofilament line covered in black adhesive-lined shrink-tubing secured to a titanium dart. The darts were embedded into the dorsal musculature so as to rest against the uneyed-side of the fish's pterygiophores, with their leaders extending roughly 4 cm (1.5 in) medial to the dorsal fin where the body begins to taper towards the tail. After pre-programmed deployment period, the tags will be released from their leaders and float to the surface, where data transmissions will begin. Data will be transmitted to the US National Oceanic and Atmospheric Administration's (NOAA) polar-orbiting satellites, administered by the Advanced Research and Global Observation System (ARGOS). Wildlife Computers miniPAT tags are equipped with surface-detect capabilities, and so tags that detach from their host fish prematurely will broadcast upon surfacing. Upon broadcast, each tag's endpoint position will be determined from the Doppler shift of its transmitted radio frequency in successive uplinks received during one satellite pass (Keating 1995) and during these uplinks, daily summary data for temperature and depth, along with daylight curves that are derived from onboard data processing and can be used to produce at-liberty geoposition estimates, will be remotely downloaded. If a tagged fish is captured and its tag retrieved before the tag pop-up date, or if a tag is found awash following detachment from a fish, the full archival data records for each recorded parameter can be accessed.

Tags deployed in this study were programmed to release from their host Pacific halibut within one of two treatment groups: a) reporting on 15 January 2018 (i.e., summer-to-winter); b) reporting after 365 days at liberty (i.e., summer-to-summer). The January reporting date was chosen to correspond to the peak spawning period for Pacific halibut in the GOA (Loher and Seitz 2008) and is inferred to be roughly equivalent in the Bering Sea (Seitz et al. 2011).

All Pacific halibut were captured using standardized commercial longline gear during the IPHC's 2017 fishery-independent setline survey (Henry et al. 2017). Briefly, gear was composed of six skates of groundline tied end-to-end, with each skate measuring 549 m (1800 ft) and fitted with 100 16/0 circle-hooks secured via 0.6-1.2 m (2-4 ft) gangions spaced 5.5 m (18 ft) apart. Each hook was baited with #2 of semi-bright chum salmon (*Oncorhynchus keta*). Gear was never set before 0500 hours and was allowed to soak for a minimum of five hours before being hauled.

Fish selection protocols for each treatment group followed methods that were used in the prior research that these data are intended to complement. Summer-to-winter tags were deployed on Pacific halibut ≥105 cm FL because individuals of both sexes of this size have a high probability of being mature and therefore undergoing seasonal spawning migrations (*sensu* Seitz et al. 2011). Summer-to-summer tags were applied to any Pacific halibut of any commercially-legal size (≥ 32 in (O32) or 81.3 cm FL) without *a priori* regard to sex in order to reflect the demographics of regional exploitable biomass (*sensu* Loher and Clark 2010).

Upon capture, Pacific halibut were measured to the nearest centimeter FL and examined for physical condition. Individuals were tagged only if they were in excellent condition: not substantially injured during capture, showed no evidence of predation by sand fleas (gammarid amphipods), and displayed considerable strength and opercular reflex. Sex and ovarian length were determined prior to tagging via veterinary ultrasound following the methods described in Loher and Stephens (2011). A small tissue sample was taken from the tip of the caudal fin (tail) of each individual and immediately preserved in 100% ethanol. Blood samples were extracted from the caudal vein (DFO 2004), accessed through the caudal peduncle, using pre-heparinized hypodermic needles. Following collection, blood samples were centrifuged at 1600 rpm for 15 minutes in order to separate the plasma, and the resulting plasma samples were frozen for storage and transport.

Tag deployments

A total of 22 Pacific halibut were tagged in this study in IPHC Regulatory Area 4B on Bowers Ridge (Fig. 2). Tagging occurred on dates ranging from 05-10 July 2017 (Table 1). Sixteen Pacific halibut (four male, 11 female, and one of unknown sex) ranging from 117-170 cm FL were tagged with PAT tags scheduled to detach and report on 15 January 2018. Six Pacific halibut (four male, two female) ranging from 117-144 cm FL were tagged with PAT tags programmed to detach after 365 days, resulting in scheduled reporting dates of 5 and 10 July 2017.

Biological sampling

Maximum posterior ovarian extent (MPOE; Loher and Stephens 2011) was determined for all of the known-female Pacific halibut (Table 1). MPOE is an index of the length of the ovary, in which the listed value represents the ventral fin-ray number immediately above which the ovary terminates posteriorly. MPOEs of the tagged fish ranged from 27-35. Given that prior research (Loher and Stephens 2011) has estimated that 50% maturity in the Pacific halibut population in the GOA occurs at MPOE = 18, and that >90% maturity occurs at MPOEs ≥22, all of the individuals tagged in the current study are likely to have been mature. Blood plasma samples were obtained for all tagged individuals.

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Table 1. Deployment details for Lotek Wireless PSATflex satellite-transmitting archival tags deployed on Pacific halibut in the eastern Bering Sea during the IPHC's 2016 setline survey (see also Fig. 2). For longitude, negative values indicate west longitude and positive values east. For sex, "F" = female, "M" = Male, "MPOE" = Maximum Posterior Ovarian Extent; "n.a." = not applicable (males). MPOE is an index of the posterior length of the ovary; the listed value represents the ventral fin-ray number immediately above which the ovary terminated. In prior research (Loher and Stephens 2011), 50% maturity was estimated to occur at MPOE = 18 and >90% maturity at MPOE ≥ 22.

Tag #	Deploy date	Programmed tag-reporting date	Latitude (N)	Longitude	Sex	Length (cm FL)	MPOE
S-17001	07/05/17	07/05/18	54.833°	178.634°	F	118	32
S-17002	07/05/17	07/05/18	54.833°	178.634°	F	144	33
S-17003	07/10/17	07/10/18	54.000°	-179.967°	M	116	n.a.
S-17004	07/10/17	07/10/18	54.000°	-179.967°	M	115	n.a.
S-17005	07/10/17	07/10/18	54.000°	-179.967°	M	115	n.a.
S-17006	07/10/17	07/10/18	54.000°	-179.967°	M	111	n.a.
S-17011	07/05/17	01/15/18	54.833°	178.634°	F	128	27
S-17012	07/05/17	01/15/18	54.833°	178.634°	F	148	33
S-17013	07/05/17	01/15/18	54.833°	178.634°	M	118	n.a.
S-17014	07/05/17	01/15/18	54.833°	178.634°	M	123	n.a.
S-17015	07/05/17	01/15/18	54.833°	178.634°	F	147	36
S-17016	07/09/17	01/15/18	54.334°	179.466°	M	137	n.a.
S-17017	07/10/17	01/15/18	54.000°	179.750°	F	150	33
S-17018	07/10/17	01/15/18	54.000°	179.750°	F	170	31
S-17019	07/10/17	01/15/18	54.000°	-179.967°	M	125	n.a.
S-17020	07/10/17	01/15/18	54.000°	-179.967°	F	152	35
S-17021	07/10/17	01/15/18	54.000°	-179.967°	F	108	27
S-17022	07/10/17	01/15/18	54.000°	-179.967°	F	142	38
S-17023	07/10/17	01/15/18	54.000°	-179.967°	F	117	29
S-17024	07/10/17	01/15/18	54.000°	-179.967°	F	117	32
S-17025	07/10/17	01/15/18	54.000°	-179.967°	F	133	28
S-17026	07/10/17	01/15/18	52.666°	-179.420°	unk	117	n.a.

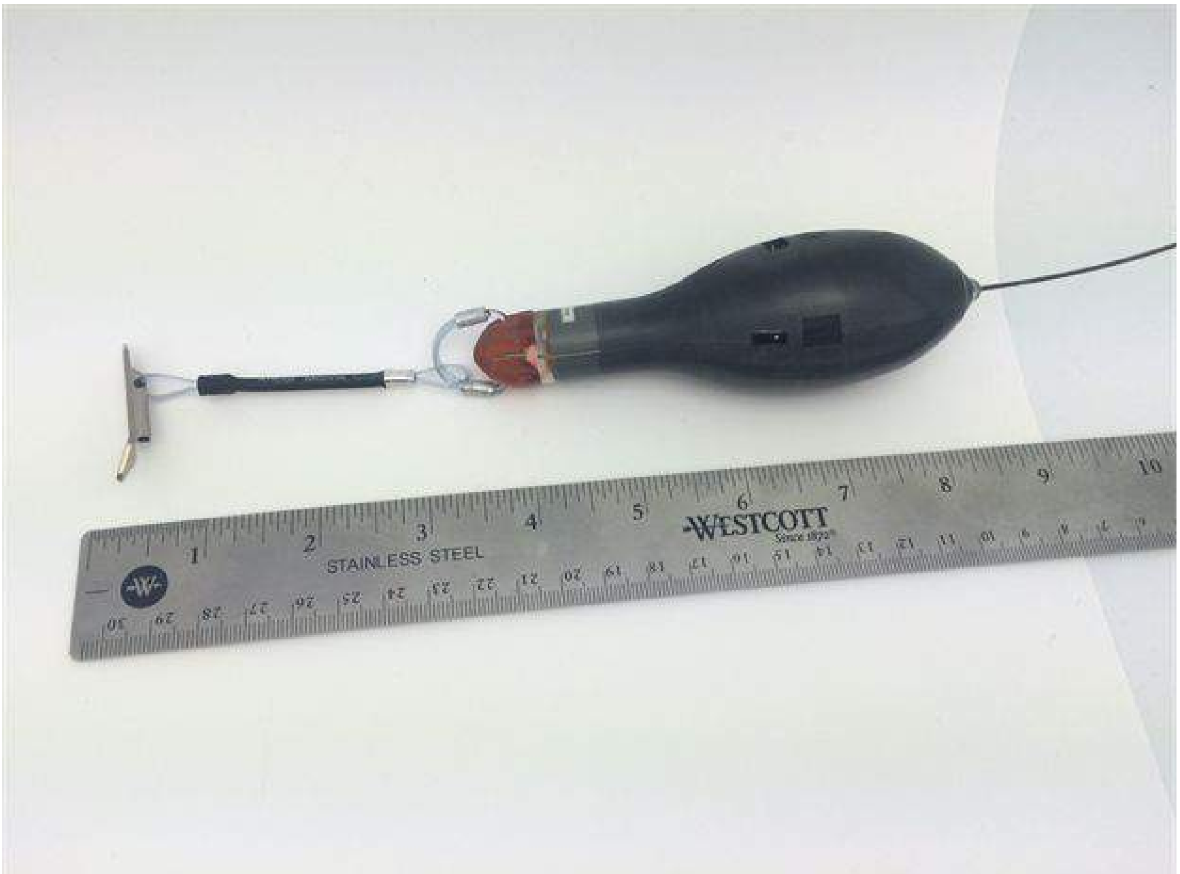

Figure 1. A Wildlife Computers miniPAT satellite-transmitting archival tag.

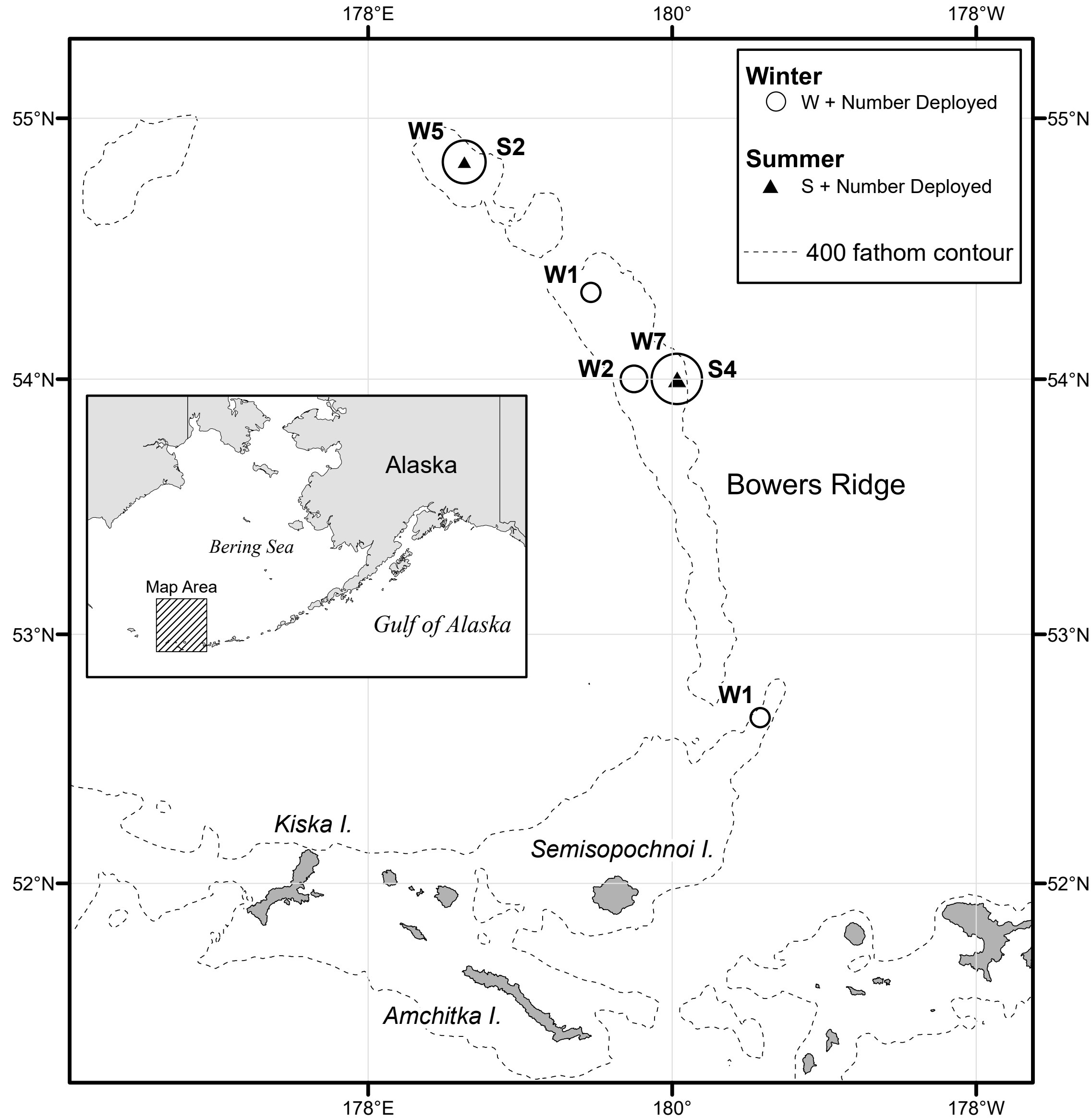

Figure 2. Deployment locations for Wildlife Computers (Redmond, WA) miniPAT satellite-transmitting archival tags deployed on Pacific halibut on Bowers Ridge during the IPHC's 2017 fishery-independent setline survey. Circles indicate summer-to-winter tags deployed to examine seasonal migration and spawning locations; triangles are summer-to-summer tags deployed to investigate interannual dispersal.

2.5.3 Evaluating Pacific halibut larval connectivity between the Gulf of Alaska and Bering Sea: Project update

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This study is currently ongoing with final results for the first portion expected in 2018. Following is a brief summary of the project objectives and preliminary findings with a description of plans for future work.

Introduction

Pacific halibut (*Hippoglossus stenolepis*) is a long-lived flatfish that spends the majority of its life living on or near the ocean bottom. However, the larval stage, which encompasses the first six months of life, is spent in the pelagic zone and the success of these larvae is highly dependent on favorable environmental conditions. While a larval Pacific halibut can somewhat control its position vertically in the water column within a few weeks after hatch (McFarlane et al. 1991), horizontal distribution of larvae is determined by the currents accessed as well as the strength and direction of those currents.

In the past, it was thought that each ocean basin contained a unique stock of Pacific halibut (Thompson and Van Cleve 1936), but later tagging studies showed that there is connectivity between the Gulf of Alaska (GOA) and Bering Sea by way of actively migrating fish through Aleutian Island passes (Webster et al. 2013, Skud 1977). The migration of adult and juvenile Pacific halibut has been studied extensively, but much less is known about the larval stages and the extent of dispersal both within and between basins.

While currents could feasibly carry larvae through any of the Aleutian Island passes (refer to map in Sadorus et al. 2015, page 387), this study focuses on basin connectivity via Unimak Pass, which is the main connection between the GOA and the Bering Sea continental shelves. The Alaska Coastal Current (ACC) flows through this pass from the GOA to the Bering Sea and once it enters the Bering Sea, its direction is determined by a combination of current strength and season, i.e. the flow can continue westward and follow the 50 or 100 m isobath, or turn sharply to the northeast into Bristol Bay (Stabeno et al. 1999).

Objectives for the initial phase of this study are to: 1) update and redefine larval distribution in the GOA and Bering Sea, 2) investigate the likelihood and magnitude of larval connectivity between the GOA and the Bering Sea, and 3) identify possible environmental factors that influence larval year class strength, organism size, degree of connectivity between basins, and recruitment to demersal stages, and 4) define parameters for the modeling phase of the project.

Data sources

This study utilizes 43 years of National Oceanic and Atmospheric Administration (NOAA) icthyoplankton survey data from 1972-2015. These data include both standardized catch, which was used as a proxy for abundance, and individual lengths of a subset of the data. Because there are no surveys that routinely capture Pacific halibut from settlement to about age-2, survival of the larvae to the adult form is gauged using data collected on 2-year-olds caught during the annual National Marine Fisheries Service groundfish trawl surveys in the Bering Sea.

Environmental data included sea surface temperatures for both January and May, summer bottom temperature in the Bering Sea, annual anomaly data for both the Pacific Decadal Oscillation (PDO; Mantua et al. 1997) and the North Pacific Index (Trenberth and Hurrell 1994), and sea ice cover extent. All environmental data were downloaded from freely accessible NOAA databases available on their website.

Preliminary results and conclusions

A map of larval occurrence over the 43 yr-sampling period provides strong anecdotal evidence that larval transport through the pass may be significant (Fig. 1). Mapping exercises of occurrence data by month along with catch totals by month, indicated that Pacific halibut larvae are widely detected in the water column from February to June and largely absent from the water column by about mid-summer forward. Given that spawning is known to occur in the winter months, it is likely that larvae are also present in the water column in December and January, but very little to no sampling has occurred during those months. These results agree with earlier accounts (Thompson and Van Cleve 1936), and mean that larval transport through Unimak Pass is most likely to occur from the winter to the early summer. Vertical distribution data are largely lacking, but in the few data points that were available, Pacific halibut larvae were at depths > 300 m at the smallest sizes and found within 100 m of the surface when the yolk sac was estimated to be fully absorbed (Liu et al. 1993) and feeding commenced. Unimak Pass is relatively shallow, ranging from about 70-160 m depth (Stabeno et al. 2002) and larvae moving through the pass are occupying the more shallow depths and so have likely already surpassed a major hurdle to survival and are actively feeding.

A series of linear regression analyses were performed to try and identify possible predictors of larval abundance. While none of the predictors chosen, significantly described GOA larval abundance, a significant result was found using GOA larval abundance and the North Pacific Index to describe Bering Sea larval abundance (Adj R^2= 0.20, p-value=0.031). Also significant was GOA larval abundance to predict age-2 abundance in the Bering Sea (Adj R^2=0.11, p-value=0.039) but, notably, Bering Sea larval abundance was not a predictor of age-2 Pacific halibut abundance in the Bering Sea.

To compare larval abundance and recruitment between warm and cold years, two temperature stanzas were chosen for comparison using sea surface temperature in the Bering Sea. Warm years were defined as the period 2001-2005 and cold years as the period 2007-2013. There were distribution differences between stanzas of both larvae in the Bering Sea and resulting 2 year olds. In warm years, larvae were concentrated in the east over Bering and Pribilof Canyons and in cold years, larvae were more dispersed along the continental shelf edge extending to the west. Two year olds (those that hatched during the stanzas) showed the opposite pattern and were more widely dispersed in Bristol Bay extending westward in warm years and concentrated to the east in cold years. A t-test indicated that average Bering Sea larval catch was higher during cold years compared to warm years, but the difference was not significant. In the GOA, the opposite was true, i.e. that average larval catch appeared higher in warm years compared to cold years but the difference again was not significant. However, an F-test showed that the difference in variance between the two stanzas was significant, i.e. variability was greater in warm years than in cold years (p-value=0.002). Both abundance and variance differences of 2-year-old fish were significant (p-value=0.034 and p-value=0.013, respectively) in the Bering Sea with warm years resulting in higher abundance and variability than cold years.

A preliminary examination of size at age of 2-year olds over time showed a significant positive relationship between size and temperature experienced by the animal at age 1 (R^2=0.595, p-value=0.0002). Neither larval size nor temperature at year 0 was a significant predictor.

Given the results of the first phase, there is correlative evidence to suggest that GOA larvae are significant contributors to the eastern Bering Sea stock. There is also reason to hypothesize that the strength of the ACC may play a role in both the magnitude of larvae that are transported through Unimak Pass, as well as their final destination upon entrance to the Bering Sea. Temperature positively affects length of newly settled Pacific halibut and warm years produced significantly more Pacific halibut than cold years suggesting that fish may be moving more quickly through their most vulnerable stages in warm years compared to cold years, resulting in increased survivability.

Future work

The first phase of this project is nearly complete and the next phase will be to examine movement of larvae using a NOAA-produced oceanographic transport model. The process of producing parameters for the model is underway and this work is scheduled to take place in 2018.

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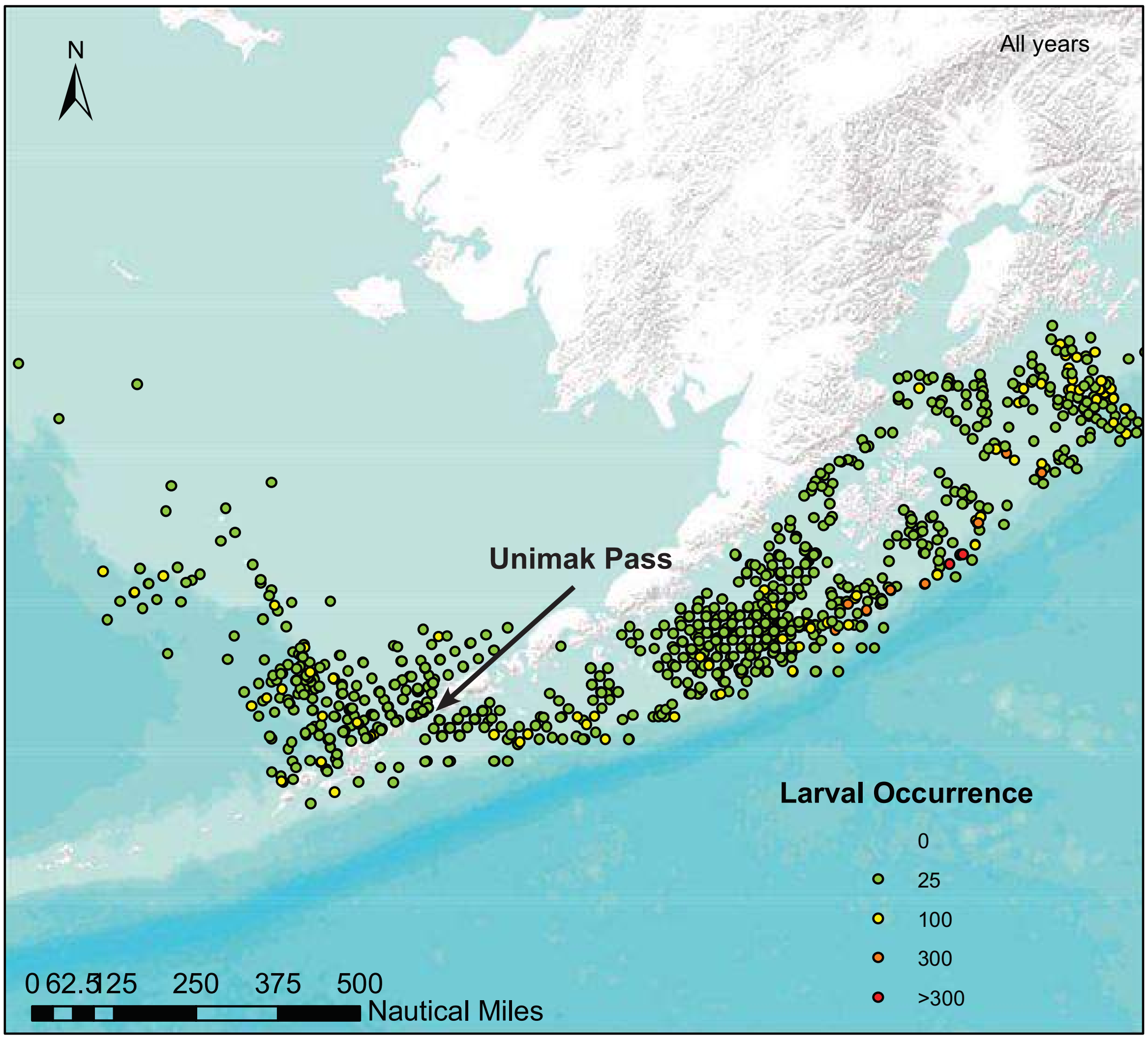

Figure 1. Occurrence of larval Pacific halibut captured during NOAA icthyoplankton surveys from 1972-2015 in the western Gulf of Alaska and eastern Bering Sea. Note that only those stations where Pacific halibut catch was > 0 are shown.

2.5.4 Wire-tagging on the fishery-independent setline survey

Joan E. Forsberg

Abstract

Following a successful wire-tagging pilot study in a single survey region in 2016, the International Pacific Halibut Commission expanded the tagging effort to additional regions of the annual fishery-independent setline survey in 2017. A total of 1,927 small Pacific halibut (< 82 cm fork length) were tagged and released and tissue samples were collected from 1,918 of these tagged fish.

Introduction

In 2015, the International Pacific Halibut Commission (IPHC) began a long-term effort to wire-tag young Pacific halibut with a pilot study on the National Marine Fisheries Service (NMFS) groundfish trawl surveys (Forsberg et al. 2016). The main goal of the trawl tagging effort was to provide data on juvenile Pacific halibut movement and growth. Migration information on adult Pacific halibut has been well documented in recent tagging studies, but less is known about juvenile Pacific halibut movement. The 2015 trawl survey tagging pilot was successful and the decision was made to continue the project into the foreseeable future on the NMFS trawl surveys and to test the feasibility of expanding the tagging effort to small Pacific halibut captured on the IPHC fishery-independent setline survey (setline survey).

Not all Pacific halibut are sampled for otoliths on the IPHC setline survey; otolith sampling rates are assigned by regulatory area to achieve a target of 2,000 otoliths per area. Pacific halibut that are of the minimum commercial size or greater (fork length ≥ 81.3 cm (> 32 inches) or *O32*) and are not sampled for otolith collection are measured and kept for sale. Pacific halibut that are below the minimum commercial size (fork length < 81.3 cm (< 32 inches) or *U32*) and not sampled for otolith collection are measured and released alive. Wire-tagging non-sampled U32 Pacific halibut on the existing setline survey platform is an inexpensive way to increase the number of small Pacific halibut tagged as well as the likelihood of recoveries in the future. Additionally, a small tissue sample (fin clip) from each tagged fish will enable the IPHC to know the sex of the animals tagged, even if they are later recovered in the commercial fishery where the sex may be unknown.

The 2016 setline survey tagging pilot was limited to Regulatory Area 4D where catches of small Pacific halibut were expected to be relatively low and where tagging could be incorporated into the workflow without compromising other survey objectives. The pilot study was successful and U32 tagging was expanded in 2017 to all survey areas for which the otolith sampling rate was less than 100%. Tagging was conducted in Regulatory Areas 2B, 2C, 3A, 3B, 4A, and 4B in 2017.

The number of Pacific halibut encountered in the different survey regions varies greatly. In order to incorporate U32 tagging into other sampling duties, a target number of 500 tags per regulatory area was established and a tag sampling rate was set for each regulatory area to achieve this target (Table 1).

Methods

Determining Pacific halibut to be tagged

Tagging and tissue sampling instructions were incorporated into the 2017 setline survey manual (IPHC 2017). Samplers on vessels in Regulatory Areas with otolith sampling rates less than 100% instructed vessel crew to land all U32 Pacific halibut carefully (i.e., without gaffing the fish in the body or gills). All U32 Pacific halibut were measured dark-side-up to minimize potential damage to the eyes in the event the fish was selected for tagging. Samplers used electronic tablets for data collection in 2017. Random sampling algorithms were programmed into the tablet to select Pacific halibut for otolith removal or tagging. Because only U32 Pacific halibut were to be tagged, the sampling rate for potential tagged fish was adjusted (i.e., increased) to factor in the predicted proportion of U32 to O32 fish expected for each Regulatory Area. The expected proportion of U32 to O32 was based on proportions observed in 2016. Of the U32 Pacific halibut that were selected for potential tagging, only individuals that were in viable condition based on U.S. federal fishery observer criteria (AFSC 2017) (*Excellent, Moderate,* or *Poor*) were tagged. A fin tissue sample was also collected for each tagged Pacific halibut before release. The tissue samples provided genetic material for determining sex (Drinan et al. 2017).

Tags

Pacific halibut were tagged on the eyed-side operculum (cheek) using conventional plastic-coated wire tags. The IPHC has used plastic-coated wire tags in many tagging experiments. Tags used in this project were manufactured by Floy Tag[1] using 0.5 mm diameter stainless steel wire covered with colored polyolefin tubing for an overall diameter of 1.8 mm. Each tag was 16.5 cm long and was labeled with a unique number as well as the IPHC's contact information (Fig. 1). Samplers were provided with tag applicators made of hollow stainless metal tubing attached to a solid shank, which curve and taper to a point (Fig. 1). Samplers could make adjustments to the curve of the shank using pliers.

Data collected from tagged fish prior to release

In addition to data usually collected on the setline survey: fork length (FL) and prior hooking injury (PHI), samplers also assessed and recorded the release condition and tag number and type for each tagged fish. Release condition was determined using the criteria used by NMFS observers on longline vessels for assessing Pacific halibut viability. The criteria include four categories: *Excellent* (E), *Moderate* (M), *Poor* (P), and *Dead* (D) (Table 2). Those assessed *Dead* were not tagged or sampled for fin tissue, but samplers recorded length, sex, and maturity. Only Pacific halibut that were scored as *Excellent, Moderate,* or *Poor* were tagged and released. Each unique tag number was recorded in its entirety. Wire tags are assigned a tag type code based on tag thickness and color. Tags used in 2017 were type "Y" (fluorescent yellow) and "C" (pink).

Tagging procedure

Samplers were instructed to use the tags in numerical order if possible. Tags were pre-bundled in groups of 25 tags with consecutive numbers. Each sampler was equipped with a plastic block with 50 holes that allowed them to sort and hold tags while on deck. Tags were sorted and loaded

[1] Floy Tag (www.floytag.com/) 4616 Union Bay Pl NE, Seattle, WA 98105, (206) 524-2700

into the plastic block, in numerical order, prior to the gear being hauled. Tags were applied by first inserting the tag into the hollow shaft of the applicator. The sharpened end of the applicator was then inserted between the pre-opercular and the opercular bone of the cheek at an angle which permitted the applicator to pass between the two bones. The curvature of the solid shank of the applicator caused it to pass around the pre-opercular bone and come out through the edge of the cheek. The tag was then pulled through the opening created by the applicator, and the two ends of the tag were folded together and twisted a minimum of five times so a closed loose loop (allowing for growth) was created around the pre-opercular bone. Any excess tag beyond the twist was cut off. The tagging procedure is illustrated in Figure 2.

Fin tissue sample

After a fish was tagged, a small sample of fin tissue was collected and transferred to filter paper that was pre-printed with a 50-cell grid. Samplers were provided with biopsy punches and wire cutters or "clippers" for collecting the fin tissue (Fig. 3a, b). The biopsy punch consisted of a hollow tube and plunger/ejector assembly with a 7-mm circular cutting edge at the tip. The biopsy punch was used to collect a small piece of fin tissue from the outer portion of the fin by simultaneously pressing down and rotating the punch. Composite biopsy cutting mats were used under the fin while cutting the sample to protect the cutting tip from damage. Samplers using the wire cutters clipped off a small piece of tissue from the corner of the tail or pectoral fin. For either method, samplers were instructed to deposit each tissue sample in a separate printed grid cell on the filter paper and to record the tag number in the same cell. The wet fin tissue adheres to the paper and remains in place as it dries (Fig. 4). The tissue sampling equipment was cleaned with 70% isopropanol between fish to avoid cross contamination between samples. Once a sheet was filled and tissue samples were dry, the sheets were stored individually inside plastic sheet protectors with silica gel desiccant packs to ensure samples stayed dry.

Results

A total of 1,927 Pacific halibut were tagged and released among six Regulatory Areas (Table 3). Most of the tagged Pacific halibut (76%) were assessed as *Excellent* (Table 3). Release condition was not recorded for 28 tagged fish, but would have been *Excellent, Moderate,* or *Poor* since fish assessed as *Dead* were not tagged. Nineteen Pacific halibut selected for tagging were assessed as *Dead* and were not tagged. Fork length of the tagged fish ranged from 45 to 82 cm (Table 4) with 87% of the tagged fish measuring between 65 and 81 cm FL. One fish measuring 82 cm FL was inadvertently tagged in Regulatory Area 2B, and one fish was tagged and released in Regulatory Area 3A without an accompanying length measurement. All but six tagged fish were examined for PHIs. Most of the tagged fish (n=1,847, or 96%) had no PHI, 56 fish (3%) had minor injuries, and 18 tagged fish (<1%) had moderate PHIs. Tissue samples were collected for all but 9 wire-tagged Pacific halibut in 2017 (>99%).

Project evaluations

The biologists in the field were encouraged to provide feedback with respect to the impact of the additional time involved in tagging and collecting tissue samples on the rest of the survey workload for samplers and vessel crew. This feedback will be used to better streamline the process on future surveys, and to adjust the tagging rates if necessary.

Samplers were able to easily incorporate the tagging of U32 Pacific halibut into the workflow in most cases; samplers in regions with extra projects were challenged on sets with high catches. Catch rates of Pacific halibut of all sizes were lower than anticipated, and the target of 500 tagged U32 fish was not met in any regulatory area. Several samplers suggested an addition to the tablet software that will give advance notice of a fish to be potentially selected for tagging (similar to the current "upcoming otolith" feature). The maximum number of U32 Pacific halibut tagged in a set in 2017 was 19.

Samplers on all vessels found the wire cutters easier to use than the biopsy punches and most fin tissue samples were collected using wire cutters. The wire cutters supplied in 2017 were not made of stainless steel and they tended to rust. Sea samplers will be provided with stainless steel wire cutters in 2018.

Future of the project

The IPHC plans to continue the U32 wire-tagging effort on the fishery-independent setline survey for the foreseeable future. Tagging as many Pacific halibut as possible over the next several years will increase the chance of meaningful recoveries. Samplers will also continue to collect tissue from all tagged fish for genetic sexing.

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Table 1. Regulatory Area-specific tagging rates used in 2017.

Regulatory Area	Tagging Rate
2A	no tagging
2B	0.281
2C	0.328
3A	0.040
3B	0.053
4A	1.000
4B	0.416
4CD	no tagging

Table 2. Viability criteria used to assess release condition (criteria are listed in order of importance).

Excellent: Injuries, if any, are slight and inconsequential to health of the fish. (*observer code Minor*)

1. Injuries around the mouth from the hook and hook removal are slight.
    - *A hook entrance/exit hole around the jaw or in the cheek.*
    - *The lip (skin covering the external portion of the jaw) may be torn and hanging.*
    - *The hook and some length of residual gangion may be hanging from the mouth if the gangion was cut.*
2. Very little bleeding, if any.
    - *Bleeding is seen only in the area surrounding the jaw.*
    - *Bleeding may have stopped, or may be continuing very slowly a few drops at a time.*
3. No penetration of the body or head by sand fleas.
    - *Membranes surrounding eyes and anus are intact, without any holes from sand fleas.*
    - *A few sand fleas may be seen on body and can be wiped off with your hand. Typically, no penetration has occurred when only a few (e.g., <10) sand fleas are found on the body.*

Moderate: Injuries are present, but are not severe. (*observer code Moderate*)

1. Injuries may have been inflicted to the jaw, cheek, eye, or body.
    - *Lower jaw may be broken into 2 pieces at the snout, but each is still attached at the base of the jaw.*
    - *Jaw is torn on one side or the other, possibly extending through the cheek.*
    - *Hook may have punctured the eye or eye socket.*
    - *Wounds on head and abdomen limited to surface scratches on skin*
    - *No wounds of any kind to abdominal organs. Abdominal cavity wall not punctured.*
    - *Wounds in body consist of puncture holes in skin, with possibly a flesh tear.*
2. Bleeding is occurring but not from gills.
    - *Blood may be seen around mouth and jaw.*
    - *Blood is not flowing profusely, but is oozing continuously.*

(Table 2. continued next page)

Table 2. continued

3. No penetration of the body or head by sand fleas.
   - *Membranes surrounding eyes and anus are intact, without any holes from sand fleas.*
   - *A few sand fleas may be seen on body and can be wiped off with your hand. Typically, no penetration has occurred when only a few (e.g.,<10) sand fleas are found on the body.*

Poor: Severe life-threatening injuries can be seen. (*observer code Severe*)

1. Injuries to the head and/or jaw have occurred. Any of the following will be present, individually or in combination:
   - *Skin on head (forward of preopercle) is ripped and torn deeply, exposing tissue and internal organs.*
   - *Side of the head, possibly including the jaw, has been torn loose and missing from the fish.*
   - *Lower jaw has been torn away and is missing.*
   - *No wounds of any kind to abdominal organs. Abdominal cavity wall not punctured.*
2. No penetration of the body or head by sand fleas.
   - *Membranes surrounding eyes and anus are intact, without any holes from sand fleas.*
   - *A few sand fleas may be seen on body and can be wiped off with your hand. Typically, no penetration has occurred when only a few (e.g.,<10) sand fleas are found on the body.*

Dead: Fish is lifeless, sand flea predation, severe bleeding. (*observer code Dead*)

1. Fish is already dead when brought to the surface on the gear.
   - *Fish is in rigor and lifeless, even if no apparent injuries.*
   - *Gills appear completely devoid of blood (light pink or white in color).*
2. Marine mammals have taken bites out of the fish.
   - *Usually taken out of the back of the fish or from the abdominal cavity.*
3. Sand fleas have penetrated the body via the eyes, fins, or anus.
   - *Membrane surrounding eye may be partially or completely missing.*
   - *Dorsal and/or anal fin membranes may be eaten away, leaving fin rays exposed. Skin on the body is separated from tissue where sand fleas have eaten.*
4. Bleeding is severe, especially from the gills.
   - *Blood is flowing freely and continuously in large quantity.*
   - *Bleeding is occurring from a torn or severed gill arch.*
5. Internal organs are damaged, possibly by a gaff.
   - *Abdominal cavity wall is punctured or torn.*
   - *Viscera are visible and exposed, and may be protruding*

Table 3. Number of Pacific halibut tagged in the 2017 setline survey by Regulatory Area and release condition category. Fish in the unknown category were those for which release condition was not recorded.

Reg. Area	Moderate	Excellent	Poor	Unknown	Total
2B	55	232	1	3	291
2C	96	292	13	6	407
3A	51	275	9	6	341
3B	86	221	21	4	332
4A	66	235	6	5	312
4B	29	195	16	4	244
Total	**383**	**1,450**	**66**	**28**	**1,927**

Table 4. Number of Pacific halibut tagged in the 2017 setline survey by 10-cm fork length category and Regulatory Area.

	Regulatory Area						
Fork length category (cm)	**2B**	**2C**	**3A**	**3B**	**4A**	**4B**	**Total**
<46				1			**1**
46-55	1		3	3	9		**16**
56-65	21	29	27	51	77	13	**218**
66-75	125	191	149	193	143	110	**911**
76-82	144	187	161	84	83	121	**780**
Total	**291**	**407**	**340***	**332**	**312**	**244**	**1,926**

*Excludes one fish tagged in 3A for which length was not recorded

Figure 1. Wire tag inserted in hollow end of tag applicator.

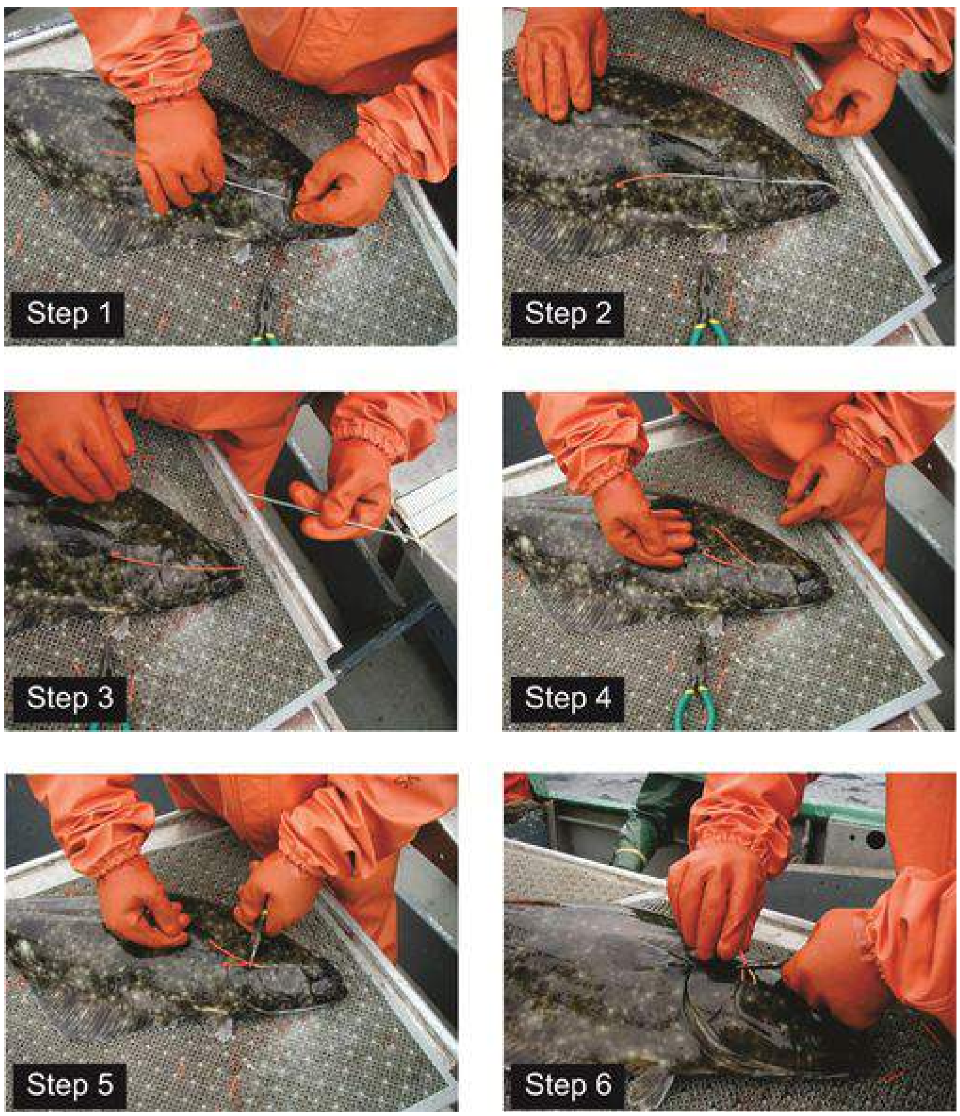

Figure 2. Illustration of the opercular wire tagging procedure used on halibut

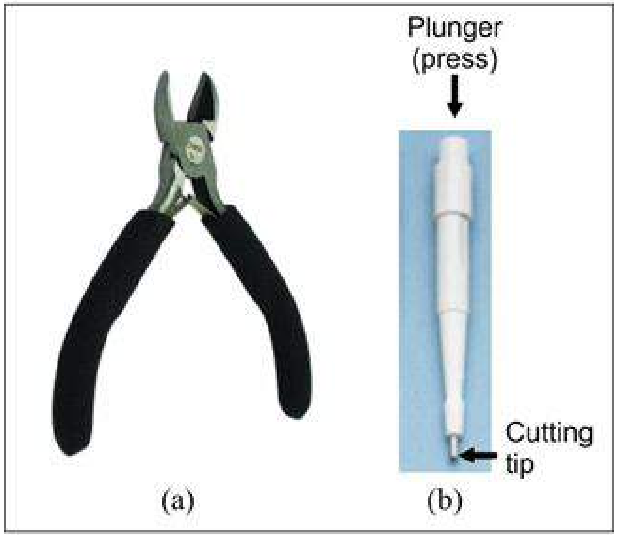

Figure 3. (a) wire cutters and (b) biopsy punch used for taking fin tissue samples.

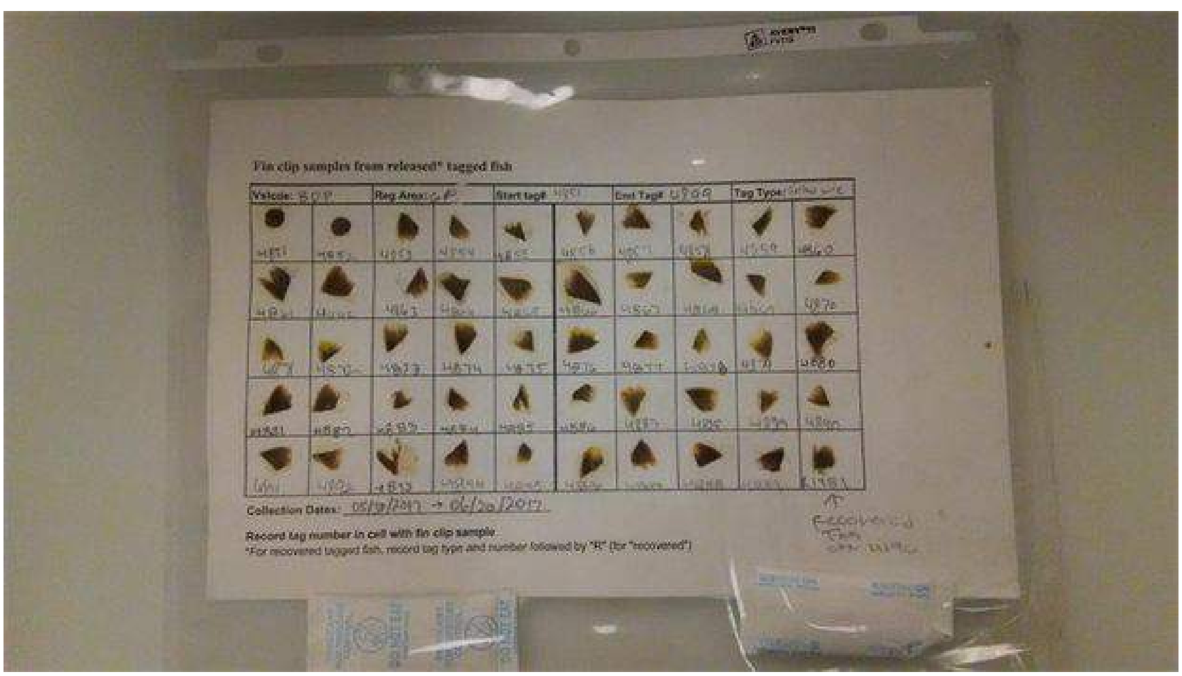

Figure 4. Fin tissue samples on filter paper inside plastic sleeve. The samples in the upper left two cells were taken with a biopsy punch, the rest were taken with the wire cutters.

2.5.5 Otolith archive collection for elemental and isotopic studies

Robert S. Tobin, Joan E. Forsberg, Dana M. Rudy

Abstract

Recent trends in otolith research include analysis of trace element constituents of the otolith. Samples used in these types of analyses need to be free of contaminants, such as glycerin. The International Pacific Halibut Commission's otolith collection has primarily been composed of otoliths collected for age determination, which have been stored in a glycerin/thymol solution to increase readability. A separate collection of paired otoliths for use in future elemental and isotopic studies was started in 2010 (the "clean" otolith archive). A total of 755 otolith pairs were added to the clean otolith archive collection in 2017.

Background

With the advent of new technologies, fisheries researchers have the ability to study the elemental constituents incorporated in the microstructure of the otolith. Otoliths are composed primarily of calcium carbonate (in the form of aragonite) in a protein matrix. Otoliths grow through the life of the fish through gradual accretion. Crystals of aragonite as well as trace amounts of other elements are added to the outer surfaces of the otolith in discrete increments that are stable over time. The most commonly measured elements are those that fall under the alkali, alkaline earth, and transition metals categories of the periodic table, which include, but are not limited to, beryllium (Be), magnesium (Mg), calcium (Ca), strontium (Sr), barium (Ba), and manganese (Mn). It is possible to detect and measure extremely small concentrations of these elements in otoliths, however any contaminants in the sample, such as glycerin (1, 2, 3-propanetriol), can make these measurements difficult to interpret.

The International Pacific Halibut Commission (IPHC) otolith collection has, by and large, been comprised of samples collected for age determination as a data input into the annual stock assessment. These structures have been stored in a solution of glycerin and thymol (2-isopropyl-5-methylphenol) that allows for increased readability. As useful as it has been, this collection has limitations for other research purposes. Otolith-based research has seen a shift from age and growth studies to isotopic and elemental analyses of otoliths (Campana 2005). Oxygen isotope analysis can be used to reconstruct thermal history, and stable isotope analysis (carbon and nitrogen) can provide information on a fish's dietary history. Trace elements in the otoliths can be used in conjunction with other sampling to identify nursery origin by analyzing the trace element composition of the core. Analyzing trace element composition over time within an otolith (by sampling material from sequential annuli along a transect of a sectioned otolith) can provide information useful to understanding migration (Campana and Thorrold 2001, Gao and Noakes 2012). A glycerin/thymol solution maintains readability in stored otoliths, enabling age determination; however, it renders these structures unusable for research involving some isotopic and all elemental analyses. While methodological problems with measurement of otolith trace elements remain (Geffen et al. 2013), it is likely that studies involving otolith elemental and isotopic analyses will become more useful as the technologies that underlie these studies become more reliable. To make structures available for future chemical analyses, a clean otolith archive collection (COAC) program was initiated in 2010.

Collection

The COAC is composed of structures from IPHC otolith collection programs and other research opportunities, including: the fishery-independent setline survey (setline survey), commercial port sampling program, National Marine Fisheries Service (NMFS) trawl survey, and special charters that sacrifice Pacific halibut for research. These otoliths are collected along with any associated data, such as capture location and fork length, following the established collection procedures of the applicable program. Otoliths from the COAC are not used for age determination. They are wiped clean of blood and tissue, dried, and stored whole in climate-controlled conditions for future analysis.

There are separate annual COAC sampling goals for Pacific halibut caught on the setline and the NMFS trawl survey platforms. For Pacific halibut caught with longline gear (setline survey and commercial sampling program), the annual COAC sampling goal is to collect a random sample of 100 otolith pairs from each of IPHC Regulatory Areas 2A through 4B, and 100 pairs from Regulatory Areas 4C, 4D, and 4E combined. Ideally, all of these otoliths would come from the setline survey, because sex and exact capture location are available. However, in areas of lower catch, the setline survey otolith sampling rate may already be 100% to achieve the otolith target necessary for age determination. For these areas, COAC otoliths are collected from commercial deliveries. For the NMFS trawl survey, annual COAC sampling goals have ranged between 210 and 250 otolith pairs, depending on the survey regions for a given year. Parts of the NMFS trawl survey occur in IPHC statistical areas not covered by the setline survey; in addition, the trawl survey encounters small Pacific halibut that are not caught on setline gear. A total of 755 otolith pairs were collected for the COAC in 2017.

Setline survey

Sampling for the COAC began on the setline survey in 2010. To achieve a per-area target of 100 otolith pairs, setline survey otolith sampling rates were increased by approximately 5% for each regulatory area, excluding those areas that required a 100% sampling rate to meet the otolith target for age determination. In 2017, otoliths were collected for the COAC from Regulatory Areas 2B through 4B. Selection of fish to be sampled was determined from area-specific random number tables for both the COAC and age determination otolith collections. COAC otoliths were placed in black Tray Bien™ storage trays to prevent confusion with the standard blue Tray Biens™ utilized for the setline survey. COAC totals for the setline survey were 504 otolith pairs. Pairs collected by vessel are listed in Table 1 by vessel code as defined in the 2017 IPHC survey manual (IPHC 2017a).

Commercial sampling program

The COAC from the commercial fishery began in 2011. These otoliths are only collected from deliveries of Pacific halibut caught in regulatory areas where COAC sampling cannot be fully conducted on the setline survey. The number of otoliths targeted from commercial deliveries varies from year to year and depends on the availability of otoliths from the setline survey in a given Regulatory Area. In 2017, COAC samples from the commercial fishery were requested from

Regulatory Areas 2A and 4CD, and 100 and 151 otolith pairs were collected respectively from these areas (Table 1). These otoliths were collected by samplers in Newport, OR, Bellingham, WA, and La Conner, WA (Regulatory Area 2A); and St. Paul, AK (Regulatory Area 4C). Sampling protocol and rates were established by port and Regulatory Area prior to the start of sampling in those ports (IPHC 2017b). In Bellingham, La Conner and Newport, most of the COAC samples were taken from the same deliveries sampled for age and length data to be used in the stock assessment, but a few came from deliveries not sampled for age determination. In St. Paul, the samplers collected COAC otoliths on days when commercial samples for the assessment were not being collected.

NMFS trawl survey

The NMFS conducts an annual trawl survey in the Eastern Bering Sea and biennial surveys on alternate years in the Gulf of Alaska and Aleutian Islands. Due to the nature of the trawl survey, a large portion of the catch consists of small Pacific halibut that are not represented in the setline survey or commercial port sampling collections. COAC sampling took place on the NMFS trawl surveys between 2011 and 2014. Trawl survey COAC sampling has been suspended since 2015 when a Pacific halibut wire tagging project was implemented (Forsberg et al. 2016). Although the IPHC expects to continue tagging over the next several years, samplers may resume COAC sampling on future trawl surveys.

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Table 1. Number of COAC otoliths collected by regulatory area, vessel code, and collection type in 2017. Collection type: FISS (fishery-independent setline survey) and CSP (commercial sampling program).

Vessel Code	Collection Type	2A	2B	2C	3A	3B	4A	4B	4C	4D	Total
		Regulatory Area									
PEN	FISS		31								
VNI	FISS		39								
PEN	FISS			76							
STW	FISS			24							
BDP	FISS				26						
CLD	FISS				14						
STN	FISS				25						
STW	FISS				18						
ALL	FISS					30					
CLD	FISS					13					
FTW	FISS					15					
PRE	FISS					14					
FTW	FISS						114				
KSU	FISS							5			
NCR	FISS							60			
	CSP	100								151	
Total		100	70	100	83	72	114	65		151	**755**

2.6.1 At-sea marking and the development of genetic techniques for determination of sex in routine catch sampling of commercially-harvested Pacific halibut

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Abstract

Pacific halibut (*Hippoglossus stenolepis*) is an important commercial species with an annual harvest valued at U.S. $100–170 million in the eastern portion of its range. Over the past four decades, size at harvest has declined dramatically (by ~20 pounds) and, coupled with sexually-dimorphic growth and size limits on commercial catches, suggests that commercial harvests are becoming increasingly biased towards females. Understanding the annual contribution of both sexes to the commercial harvest is important for predicting population dynamics and setting catch limits, but there has been no reliable way to determine sex in the commercial harvest, given that Pacific halibut are eviscerated at sea. Here, we describe efforts to develop an at-sea marking program in which the sex of individual Pacific halibut would be identified during the course of dressing the catch; and the development of genetic assays for accurate sex identification of individuals using field-collected tissue samples. The program began in 2014 with the development of methods to mark Pacific halibut at sea; a pilot test of those methods was conducted in 2015 at the port of Homer, Alaska; in 2016, voluntary at-sea marking was conducted by the commercial fleet throughout IPHC Regulatory Area 2B; and voluntary marking was scaled to coastwide in 2017. Data from at-sea sex marking suggest that commercial vessels may encounter a higher proportion of female Pacific halibut across commonly-encountered ages than does the IPHC's fishery-independent setline survey. Genetic assay development employed restriction-site associated DNA sequencing and identified 40,308 sequences, with 56 sequences (containing 70 single nucleotide polymorphisms) linked to sex, and three loci limited to females. All loci linked to sex in the Pacific halibut were observed on a single chromosome, as is also true for the Atlantic halibut (*Hippoglossus hippoglossus*), which suggests that we have identified the sex-determining chromosome. Assays were developed from a subset of sex-linked loci.

Introduction

Trends in mean weight-at-age, in concert with variance in underlying sex ratios and changing age-distribution over time, can have substantial effects on the demographics of fishery landings and influence population structure as individual cohorts progress through their fisheries. For Pacific halibut (*Hippoglossus stenolepis*) in US and Canadian waters, the average individual weight of harvested fish is estimated to have varied more than two-fold over the last 80 years; increasing from approximately 20 pounds to over 40 pounds between the 1940s and the mid-1970s, then steadily declining to ~20 pounds by 2011 (Stewart and Monnahan 2016). In many regions, the largest decline was observed from 1995-2005 and was most strongly observed for age-10 Pacific halibut and older: age-classes primarily comprising the directed fishery (Stewart and Monnahan 2016). In conjunction with sexually-dimorphic growth, in which female Pacific halibut are typically larger at-age than males (Stewart and Monnahan 2016), longline selectivity tends to subject Pacific halibut to increased vulnerability to harvest with increasing size (Stewart and Martell 2014). A minimum commercial size limit has remained constant since 1973 (Stewart and Monnahan 2016), resulting in an expectation that the sex composition of commercial catches has become increasingly female-biased over the last two to three decades. Given an assessment framework that predicts that both selectivity and natural mortality may vary according to sex (Stewart and Martell 2016), it is important to correctly estimate population sex ratios in order to conduct long-term policy analyses. For example, recent sensitivity analyses have indicated that uncertainty regarding sex ratios within commercial harvests can strongly influence estimates of female spawning stock biomass (SSB_f), with 10% variance in estimated sex ratio translating into roughly 50 million pounds of estimated SSB_f (I. Stewart, IPHC, unpublished). Such uncertainty may be exacerbated if age-specific sex compositions vary in space and time (*sensu* Clark 2004) as recent analyses suggest (Loher et al. 2016).

Unfortunately, there is presently no reliable way to determine the sex of commercially-harvested Pacific halibut at landing because they are eviscerated at sea. Efforts have been undertaken to determine the feasibility of invoking a regular at-sea sex-marking program for the directed Pacific halibut fleet, in which retained catch would be marked by commercial fishers as either male or female during the dressing process (McCarthy 2015, Loher et al. 2017). Such a program would be conceptually similar to Atlantic lobster fisheries in which fishers “V-notch” gravid females prior to releasing them (Acheson and Gardner 2011) and add considerably to the IPHC’s assessment and policy analyses. However, as such marks would not represent direct observations of sex, portside sampling would need to be accompanied by an empirical method to validate sex ratios as well as to monitor sex ratios within components of harvest for which at-sea marking might not be practical. Therefore, genetic assays have been developed from a subset of single-nucleotide polymorphisms (SNPs) found to be associate with sex. SNPs are highly reproducible and modern screening methods allow high throughput screening of SNPs at low costs. Recent advances in sequencing technologies have made the identification of SNPs in non-model species, such as Pacific halibut, feasible (Baird et al. 2008). The current report summarizes the sampling that has been conducted during the at-sea sex-marking program and the completion of the SNP-based sex assays.

At-sea sex marking

Methods

The IPHC’s at-sea sex marking program was launched in 2014 and has been composed of four stages of activity over a four-year period, as follows:

1) Development of methods to mark Pacific halibut at sea, conducted on the IPHC’s setline survey platform (2014).
2) Pilot-testing of the chosen marking methods in a limited commercial setting (2015).
3) Initiation of voluntary at-sea marking by the commercial fleet within IPHC Regulatory Area 2B (2016).

4) Scale up of voluntary at-sea marking by the commercial fleet to include all IPHC regulatory areas (2017).

Brief summaries of each of these stages are found in the subsections that follow.

Development of at-sea marking methods

At-sea marking methods were developed and tested in 2014 by IPHC student intern Orion McCarthy, in a dual-phase study that began in the Alaskan ports of Homer and Dutch Harbor and was completed during the IPHC setline survey aboard the F/V *Kema Sue*. The objective of McCarthy's work was to develop a method for sex-marking halibut that would be easy for fishermen to accomplish while dressing their catch, would not damage their catch from a commercial perspective, and would allow our port samplers to distinguish between female and male marks easily and accurately. Nine marks were initially tested portside, including cuts to various fins, the tail, and the gill plate (operculum). With feedback from the port samplers, fishers offloading the halibut, and local buyers, each potential mark was ranked according to its ease and practicality. From the original nine marks, the top three were then tested to determine which would be easiest for the port samplers to identify while also taking length data and collecting otoliths. The two "winning" marks were then used by the crew of the *F/V Kema Sue* to mark all retained catch from six days of survey fishing, during which the crew provided feedback on the ease of marking, and improvement in their marking accuracy through experience was evaluated by the intern through the trip. After retained fish were dressed and marked by the crew, and then sampled for biological information (including sex) by the IPHC sea samplers, they were inspected by the intern for the presence/absence of the knife cuts and tagged with a unique fish identity number (ID). These unique fish ID numbers were matched with the sample data for each individual fish and used to keep a record of each fish's true sex, the sex marking, and where the fish was caught including station and skate number. During the offload, the IPHC port sampler in Dutch Harbor examined all the Pacific halibut in the catch and recorded the sex based on the mark as well as the individual fish ID. The sex ratio of the catch was estimated from the marks counted by the port sampler and compared with the sex ratio of the catch as marked by the crew as well as to the known true sex ratio for the trip.

The two marks that were chosen were as follows: for females, two cuts made in the dorsal (upper) fin; for males, a single cut through the white-side gill plate (Fig. 1). The vessel crew marked ~85% of the catch correctly. Roughly two thirds of incorrectly-marked fish had either not been given a mark or were given a mark that couldn't be identified later; fewer than 5% of the fish were marked as the wrong sex. Ultimately, the proportion of female halibut in the offload as estimated from crew's sex-marks was ~3% greater than its known composition (i.e., 85% female versus a true proportion of ~82%). These results indicated that an at-sea sex-marking program would have considerable promise for providing sex-ratio data at the resolution required for assessment purposes, given that both accuracy and precision could be measured and monitored over time. This was especially true considering that the crew became more comfortable with the process and increasingly accurate as the trip progressed; suggesting that sex-marking should become easier and potentially more accurate than estimated as the project is scaled upwards and the fleet gains experience with it. For additional details regarding this project component, please see McCarthy (2015).

Pilot test of at-sea marking on commercial trips

During April and May of 2015, the IPHC's Homer port sampler, Jessica Marx, enlisted the cooperation of two vessels in the local fleet to conduct a voluntary field test of the marking method described above. Sex markings to accompany age and length data were obtained from 228 Pacific halibut representing five offloads. For each of these offloads, the crew marked all of their catch, but somewhat fewer total samples were obtained because IPHC port-sampling protocols may stipulate that not all fish from a given offload are to be sampled for age and length.

Feedback from the skippers and crew of the vessels regarding the ease of the process was positive, and a summary analysis of the sex ratio in their catches further highlighted the importance of collecting these data. Although the sample was relatively small and the sex markings were not verified, the data suggested that the vessels encountered a much higher proportion of female Pacific halibut across commonly-encountered ages than our setline survey data would have predicted based on similar sample sizes (Fig. 2). This was most pronounced for Pacific halibut age 9-13, over all landed sizes. Whereas random samples of equivalent sample size and over the same age classes taken from the IPHC's Area 3A setline survey catches had been about 60-70% female, the commercial samples were more than 90% female.

Voluntary at-sea marking by the Area 2B fleet

In advance of the 2016 commercial fishing period, IPHC staff met with representatives of the Pacific Halibut Management Association of British Columbia (PHMA) to discuss logistical considerations associated with a regulatory-area-wide voluntary sex marking program and to receive their input regarding the most efficient way to generate interest from the fleet. A laminated informational flyer (Fig. 1) was produced to assist crew members in distinguishing between male and female Pacific halibut, and to describe the sex-marking procedure. The flyer was provided to PHMA who included it in their pre-season mailing to all Area 2B commercial license holders; i.e., 435 vessels. Subsequently, the IPHC's port samplers in Prince Rupert, Port Hardy, and Vancouver served to communicate and clarify the project's intent, answer any questions that fleet members might have, distribute reward hats to the crews of participating vessels to acknowledge their help with the project, and solicit their feedback as the season progressed.

Over the course of the season, 28 sex-marked landings were sampled representing approximately 13% of the area's entire sampled catch (Table 1). These samples represented just under 4% of 2B's 7.3 million pound (3,311 metric ton) catch limit. Feedback from participants indicated that marking was not disruptive of normal fishing activity, nor did it have any adverse effects on marketability of these fish.

Coastwide voluntary at-sea marking

In advance of the 2016 commercial fishing period, IPHC staff met with and provided informational materials to the Pacific Halibut Management Association of British Columbia (PHMA), Fishing Vessel Owners Association (FVOA), Alaska Longline Fishermen's Association (ALFA), and Central Bering Sea Fishermen's Association (CBSFA) for distribution to their members. The IPHC's port samplers served in all coastwide ports to further communicate and clarify the project's intent, answer any questions that fleet members might have, distribute reward hats, and solicit feedback.

Over the course of the season, a total of 84 sampled offloads were sex-marked, yielding 929 individual samples (fish) for which otoliths and an accompanying fin clip were obtained (Table 1).

Percentage of the sampled catch that was composed of sex-marked fish varied from area-to-area, from a low of 3.7% of the Area 4D's sampled offloads to a high of 20.3% in Area 3B.

Continuation of at-sea marking

Tissue samples collected during the 2017 fishing season have been archived but validation of individual sexes and sex ratios within the samples offloads has not yet been conducted. Genetic sex of the sampled individuals will be determined in 2018 (see next section). Following those assays, the sex-mark data will be compared to the validation results to determine the accuracy associated with the at-sea marking program to-date, and make a determination regarding the degree to which the program as-conceived will satisfy assessment needs, or will require modifications. We will not pursue at-sea marking during the 2018 fishing season, but will refine the program for 2019 as informed by the aforementioned analyses.

Genetic sex assays

Complete documentation of the development of assays for genetic sex in Pacific halibut and additional discussion of sex-determination in the species can be found in Drinan et al. (in press). Here, brief summaries of sample collection, laboratory techniques, and assay development will be provided.

Sample collection

Samples were collected between 2003 and 2007 aboard IPHC-chartered longline vessels at five locations representing the IPHC-managed range of the species: from British Columbia (Haida Gwai) in the south to Attu Island in the western Aleutians and Pribilof Canyon in the southeastern Bering Sea; and at two additional sites (Adak Island and Petrel Bank) in the central Aleutians (Fig. 3). Full details of sample collection can be found in Drinan et al. 2016. Briefly, for each Pacific halibut sampled, sex was determined via macroscopic gonad examination, the fish was measured to the nearest centimeter fork length, and its sagittal otoliths and a fin tissue sample were collected. Tissue samples were preserved and stored in 100% ethanol. Ninety-five individuals, 55 morphological females and 40 morphological males, were used to develop the sex assays.

Laboratory techniques

Single nucleotide polymorphisms were identified using restriction-site associated DNA sequencing (RADseq) techniques (Baird et al. 2008). RADseq is a reduced representation library technique that sequences individuals at thousands of loci spread throughout the genome, and is ideal for identifying genomic regions linked to phenotypic differences in species with few genomic resources. In this study, DNA from each fin tissue sample was extracted using DNeasy Blood & Tissue Kit (Qiagen, Hilden, Germany) prepared for RADseq using standard laboratory techniques (Baird et al. 2008). The *Sbf-I* restriction enzyme was used to create the RAD library with sequencing performed on the Illumina HiSeq 4000.

Using the resulting sequence data, a baseline set of putative loci and consensus sequences were identified using the STACKS v1.35 pipeline (Catchen et al. 2011, 2013) and the sequence aligners BOWTIE2 v2.1.0 (Langmead and Salzberg 2012) and BLAST v2.2.30 (Altschul et al. 1990). Loci identified in individuals were then compared to the catalog (*sstacks*) and genotypes were produced (*populations*: -m 5, -r 0.25, and -p 3 [of 5]). A locus was retained if at least 25%

of individuals had a sequencing depth of five or more reads in at least three sampling locations. From each retained locus, a consensus sequence was identified to create a temporary database of putative loci. Next, loci in the temporary database were quality filtered to remove loci with repeat regions in the genome or those containing repetitive elements using the same alignment based on the methodologies of Brieuc et al. (2014). Loci that aligned exclusively to themselves using both aligners were retained as a final baseline of putative loci present in Pacific halibut.

Genotypes were estimated for each individual at each locus in the final baseline of putative loci by first removing PCR duplicates from the raw reads using *clone filter* within STACKS, and non-duplicated reads were then aligned to the putative set of loci using BOWTIE2. A catalog was then created using the most deeply-sequenced female and male from each stock (*cstacks*: -g), and all individuals were compared to the catalog to identify loci present in each individual (*sstacks* and *populations*: -m 8 and -r 0.5). A SNP was retained for further analyses if at least 50% of individuals within each sample had a read depth of eight or more sequences, and a minor allele frequency > 0.1. Loci linked to sex were identified using genetic differentiation between sexes, measured by F_{ST} using Genepop v4.2.1 (Raymond and Rousset 1995, Rousset 2008). Lastly, high-throughput TaqMan® assays (Thermo Fisher Scientific, Waltham, Massachusetts, USA) were developed. Loci used for the development of assays were selected based on SNP position (the middle of the sequence was preferred), number of SNPs in the locus (fewer was preferred), and differentiation among males and females (greater differentiation was preferred).

Assay development

Sequencing resulted in 163,212,521 sequence reads, with an average of 1,542,009 reads per sample (standard deviation = 733763.1 reads; minimum = 157,282; maximum = 2,059,192). From these reads, a baseline set of 40,308 putative loci was identified. Two loci (*Hs23885* and *Hs10183*) were developed into TaqMan® assays, and their efficacy was tested on 199 individuals that were morphologically sexed previously. Each genetic assay was in agreement with the morphological identification of 194 (97.5%) samples, and both genetic assays as well as the morphological identification were in agreement for 192 (96.5%) samples. In five individuals (3.5%), the genetic assays were in agreement with each other, but differed from the morphological assessment. Four of the five individuals for which the genetic and morphological tests disagreed were genetically assigned as females, but morphologically determined to be males. The converse was true in the fifth individual. Lastly, two individuals (1%) were genetically assigned as a female at one locus and a male at the other. Morphologically, one of these individuals was identified as a male and the other a female.

The efficacy of these genetic assays was comparable to assays in other fish (Palaiokostas et al. 2013, Larson et al. 2016, Utsunomia et al. 2017) and are an improvement, both in terms of analysis time, repeatability, and costs (~$0.60-0.70 US per reaction), over prior genetic tests in Pacific halibut (Galindo et al. 2011). However, differences between the morphological and genetic sex assignments were observed. Beyond inaccurate data collection, alleles may not be fixed between the sexes due either to low levels of recombination or to the recent evolution of sex chromosomes in Pacific halibut. Low levels of recombination may occur in chromosomal regions that are distal to the sex-determining gene in the early stages of sex chromosome evolution (Ellegren and Carmichael 2001). Additionally, environmental conditions may affect sex determination and could contribute to the disagreement between morphological and genetic sex assignment. Sex determination is a highly complex process and has been observed to be affected by environmental conditions, particularly water temperature, in other flatfishes (Luckenbach et al. 2009, Montalvo et al. 2012, Mankiewicz et al. 2013). Additional research would be required to investigate the causes of the discrepancies observed here.

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Table 1. Number of sex-marked commercial Pacific halibut offloads that were sampled, number of biological samples taken (i.e., sagittal otoliths and accompanying tissue samples) for those trips, the weight of offloaded fish represented by the sex-marked offloads, and the proportion of sampled weights that were sex-marked, as sampled by IPHC port samplers during the 2016 and 2017 commercial fishing seasons.

	2016				2017			
Regulatory Area	**Sex-marked offloads**	**Sex-marked samples**	**Sex-marked weight (1000 lbs; metric tons)**	**% sex-marked by weight**	**Sex-marked offloads**	**Sex-marked samples**	**Sex-marked weight (1000 lbs; metric tons)**	**% sex-marked by weight**
2A	-	-	-	-	36	70	18; 8.2	6.2
2B	130	1,905	274.5; 124.5	13.1	5	84	91; 41.3	5.3
2C	-	-	-	-	16	116	110; 49.9	9.0
3A	-	-	-	-	10	113	219; 99.3	7.6
3B	-	-	-	-	9	292	285; 129.3	20.3
4A	-	-	-	-	2	77	34; 15.4	7.4
4B	-	-	-	-	2	95	32; 14.5	10.7
4C	-	-	-	-	3	63	18; 8.2	9.1
4D	-	-	-	-	1	19	16; 7.3	3.7

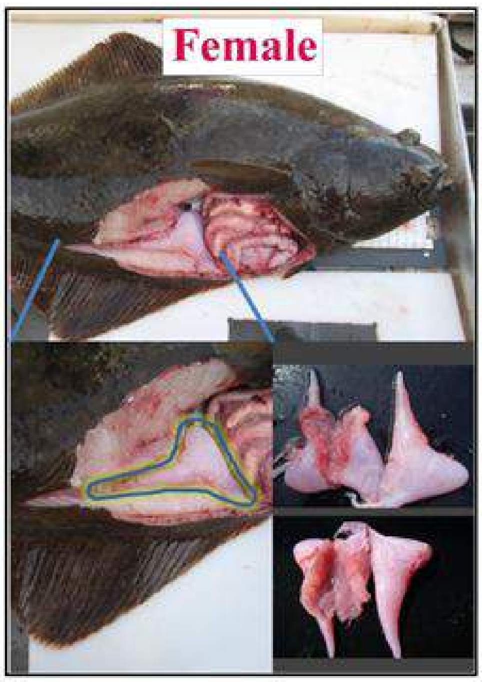
Sex-marking of halibut aboard commercial fishing trips

The IPHC requests your help during the 2016 fishing season, as we work to develop standard protocols for determining the sex of halibut that are landed by the commercial fishery. Accurate sex-ratio information is necessary for stock assessment - most notably, for accurately estimating and monitoring spawning stock biomass. You can help by marking the sex of the fish that you catch, while dressing them, using the identification-cuts that are described below.

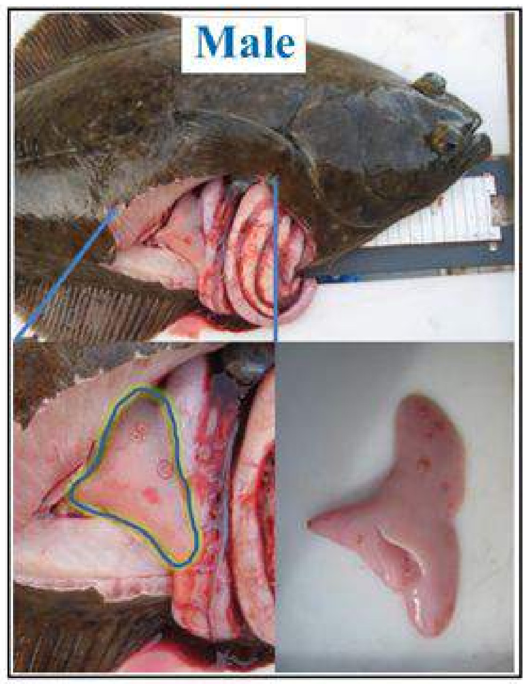
First: Determine whether you have a female or a male halibut.

Female halibut have ovaries that are elongated (funnel-shaped) triangles (**see below, left**). These take up the rear portion of the gut cavity, farthest from the head, and extend back into to body. The ovaries are smooth and sac-like, with a blutly rounded front edge. Inside, the ovaries may contian develoiping eggs; the outer surface may have well-developed blood vessels. For fish of any given size, ovaries tend to be much larger than testes.

Male halibut have testes that are pale pink and relatively triangular (**see below, right**), with a sharly-tapered front edge, and lacking visible blood vessels on the outer surface. The testes are made up of overlapping lobes (a bit like a liver) that produce fine notches and crevices in the surface. They are also in the rear of the gut cavity, farthest from the head.



Female halibut: ovary location and shape. Ovaries have an elongated funnel-shape, and are a smooth sac with a rounded front edge.

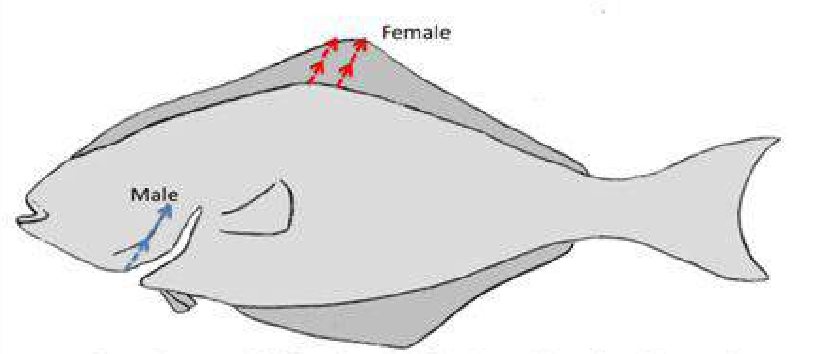


Male halibut: testis location and shape. Testes are more triangular than ovaries, are composed of overlapping lobes, and have a sharper front edge.

over →

Figure 1a. Page 1 of the laminated flyer distributed to the Area 2B fleet for the 2016 commercial fishing season, describing the difference between female and male Pacific halibut.

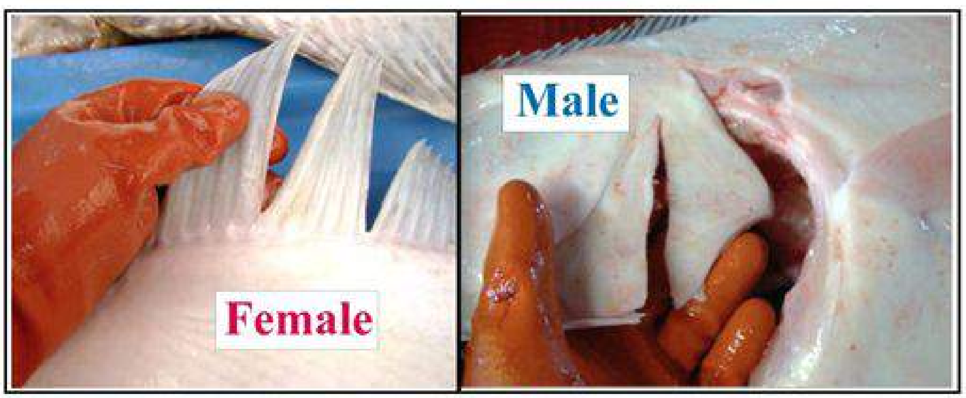
Then: Mark the fish as either female or male, using your gutting knife.



Locations on a halibut for marking it as either female or male

Female: Make two parellel cuts through the top (dorsal) fin (**see below, left**), being sure to make your cuts using an upward stroke, away from the animal, to avoid damaging the flesh. Two cuts must be made, so that the sex-marks cannot be confused with pre-existing injuries to the fin. Note that only the top (dorsal) fin can be marked; any marks found in the lower fin will be ignored when the fish is sampled in port.

Male: Make a single cut through the gill-plate (operculum) on the fish's white side (**see below, right**). Make the cut using an upward stroke, making the cut parallel to the rear edge of the operculum. The cut should extend about 3/4 of the way up the plate, so that the "flap" that you create will remain attached to the plate.



Female: Make two parallel cuts in the top (dorsal) fin.

Male: Make one cut through the white-side gill plate (operculum).

Please mark 100% of your catch!

Your effort is greatly appreciated!

Figure 1b. Page 2 of the laminated flyer distributed to the Area 2B fleet for the 2016 commercial fishing season, demonstrating how to mark halibut as either male or female while dressing them.

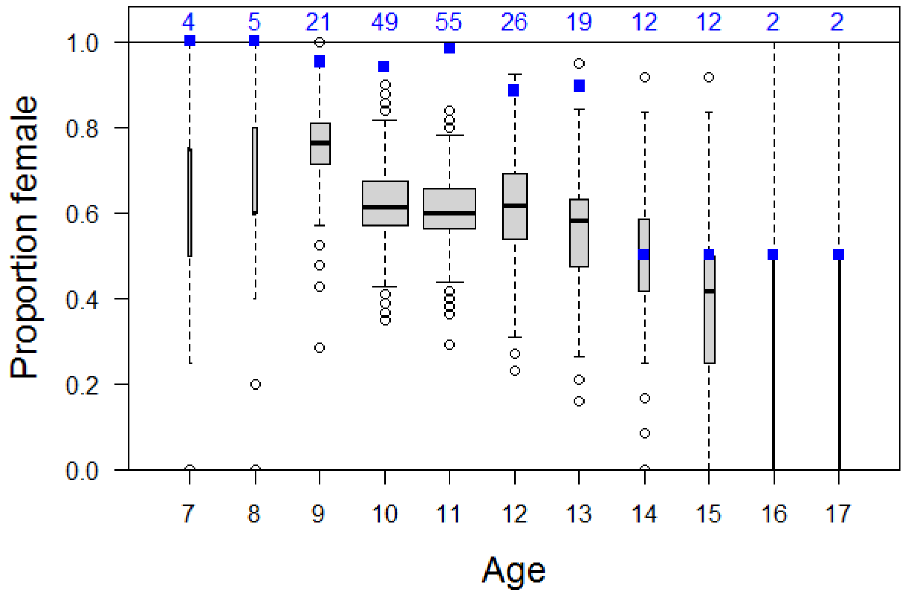


Figure 2. Based on voluntary at-sea marking of commercially-harvested Pacific halibut (n=207) landed in Homer, Alaska in 2015, proportions of female halibut at-age within those landings (small blue squares) relative to what would have been epected from similar sample sizes based on results of the IPHC fishery-independent setline survey (box and whisker plots) during 2015 in Regulatory Area 3A. In the box and whisker plots, the horizontal lines indicate the median values; the gray boxes contain the central 50% of expected values around those medians; the dashed line the 95% interval; and the dots beyond the expected variation indicate unlikely-yet-possible "outlier" values. Sample sizes by age are denoted in the top margin. Note that for halibut <14 years of age, the sampled commercial trips were composed of considerably more females than would have been expected.

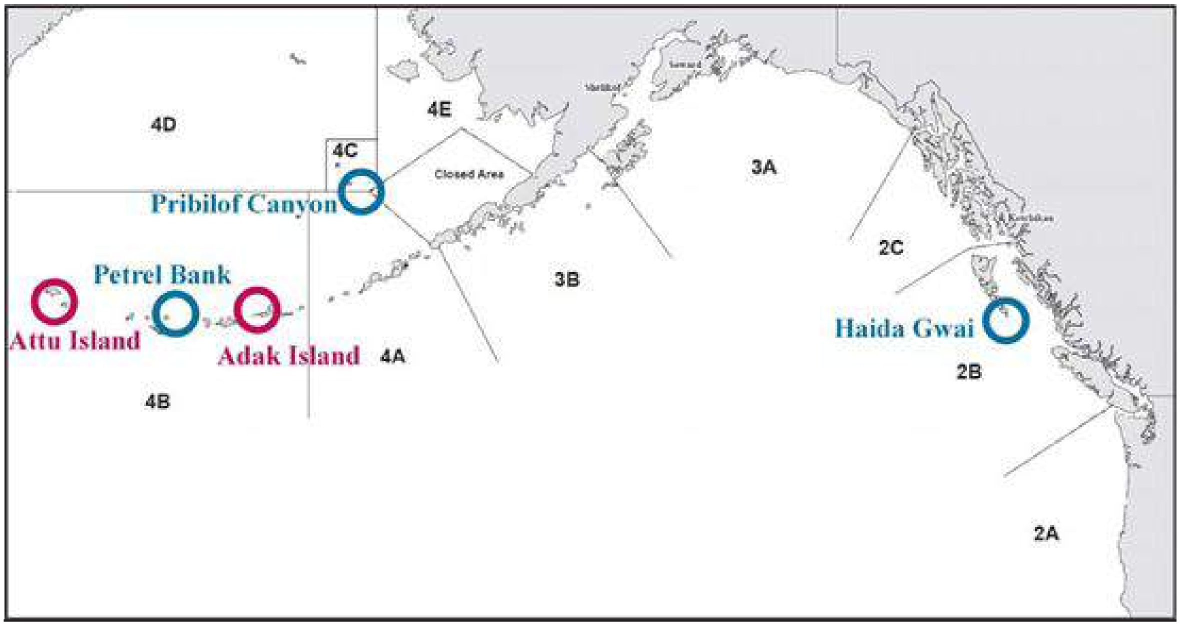


Figure 3. Locations at which Pacific halibut samples were obtained for the development of genetically-based assays of sex. Locations depicted in red were sampled during the summer (i.e. on halibut feeding grounds) and those in blue during the winter (on spawning grounds).

2.6.2 Sequencing of the Pacific halibut genome

Josep V. Planas and Timothy Loher

Abstract

One of the most important biological resources for a fish species with high socio-economic importance and a fascinating life history such as the Pacific halibut is the sequenced genome. Through the genome we can understand the genetic basis of biological processes such as growth or reproduction as well as describe genetic and evolutionary changes in Pacific halibut that occur in response to environmental and fisheries-related influences. At the International Pacific Halibut Commission efforts have begun to generate a first draft of the genome of the Pacific halibut.

Introduction

The genome of an organism is the collection of genes that are organized into chromosomes and that contain the genetic material necessary for its development, growth, and maintenance. The genome sequence therefore contains information on all of the genes present in the genome, namely their DNA sequence and location in the genome. The purpose of this project is to generate a first draft of the genome of the Pacific halibut. Through the sequencing of the Pacific halibut genome we will be able to identify genomic regions and genes that are responsible for temporal and spatial adaptive and phenotypic characteristics of the species. This will provide a better understanding of genetic and evolutionary changes in Pacific halibut that occur in response to environmental and fisheries-related influences. Therefore, the genome sequence will be essential for understanding possible changes in the genetic constitution of the Pacific halibut population. Importantly, the genome sequence will also allow us to understand the genetic basis of growth, reproductive performance, or migratory behavior in the Pacific halibut. In the short term, the Pacific halibut genome sequence will allow us to effectively map and capitalize information derived from the identified single nucleotide polymorphisms (SNPs) associated with sex that are being derived through RAD sequencing as well as the transcripts generated from our current RNA sequencing efforts.

Materials and Methods

Sample

A DNA sample from a Pacific halibut female whose sex was verified morphologically (QCI_F060) was extracted from fin tissue using a Qiagen (Hilden, Germany) DNA extraction kit. The resulting DNA was treated with RNAse in order to remove contaminating RNA. The DNA concentration obtained, as determined by spectrophotometry, was 15 ng/µl and the quality and integrity of DNA was confirmed by BioAnalyzer (Agilent Technologies, Santa Clara, USA). Approximately 1.4 µg of DNA in a volume of 95 µl were sent to the MGX Platform (Universite Montpellier, France) for sequencing.

Sequencing

Pacific halibut DNA was used to build a True Seq DNA nano library. The genomic library was sequenced on half a lane of an Illumina (San Diego, USA) HiSeq 2500 genome sequencer in 2 x 250 pair end mode. The obtained genomic sequences were subjected to quality control. In the absence of a reference genome, a *de novo* assembly (i.e. reconstruction of the genome sequence from overlapping DNA sequences) strategy was applied by using the DISCOVAR software (https://software.broadinstitute.org/software/discovar/blog/). Library construction, genome sequencing and sequence assembly was performed at the MGX Platform.

Results

De novo assembly of the Pacific halibut genomic sequences yielded a predicted genome size of approximately 700 megabases (Mb), as indicated by the total size of the generated contigs (i.e. continuous assembled sequences devoid of gaps) and of the generated scaffolds (i.e. sets of ordered and oriented contigs that may contain gaps) (Table 1). The N50 metric of the assembly was 45 kilobases (Kb), indicating that half of the genome is contained in scaffolds larger than 45 Kb in size. The longer scaffold was 700 Kb and the mean and median scaffold size were 1.5 Kb and 242 base pairs, respectively, indicating that a large proportion of scaffolds were of small size. Similar results were obtained regarding the contigs.

Discussion

Through a first round of preliminary and fragmented genome sequencing, we estimated that the genome size of the Pacific halibut is approximately 700 Mb, a genome size that is comparable to the genomes of other flatfish species such as the half-smooth tongue sole (*Cynoglossus semilaevis*; 477 Mb) and the turbot (*Scophtalmus maximus*; 568 Mb) (Chen et al. 2014; Figueras et al. 2016). Although the N50 metric indicated that the assembly strategy was successful considering the limited sequencing effort performed, the resulting incomplete *de novo* assembly of the Pacific halibut genome is evidenced by comparing the obtained scaffold N50 size of 45 Kb in contrast with that of the half-smooth tongue sole (867 Kb) and the turbot (4.3 Mb). Future efforts will be devoted to expanding and improving the sequencing coverage with other types of sequencing platforms that can produce much longer sequences and that, therefore, can produce much better assemblies, such as Oxford Nanopore (Oxford, UK). These strategies will be highly dependent on our ability to collect, store, and extract high molecular weight genomic DNA.

Although the completion of the Pacific halibut genome will still require additional sequencing and improved assembly of longer sequencing reads, the obtained genome, although fragmented, can be extremely useful for a variety of applications. First, it can be used to map the small sequences obtained from RADseq (Loher et al. 2018) onto the genome and identify genome contigs harboring potential sex marker sequences. Second, the partial genome can be used to design primers to develop PCR-based molecular tools for particular genetic characteristics in Pacific halibut, such as sex identification, geographic origin, etc. Third, the partial Pacific halibut genome can be used to perform comparative genomics studies with good quality genomes of other flatfish species with fully-sequenced genomes (e.g., half-smooth tongue sole and turbot). Finally, the partial Pacific halibut genome can be used to map the transcripts obtained by RNA sequencing of growth (liver and muscle) and reproductive tissues (ovary, testis) (Planas and Dykstra 2017) and identify genome contigs, and therefore the gene composition of growth- and reproductive-regulatory regions in the Pacific halibut genome.

Acknowledgements

We would like to thank Dr. Yann Guiguen (INRA-Rennes, France) for his help and guidance with this project and Dr. Dan Drinan (University of Washington) and Dr. Lorenz Hauser (University of Washington) for providing the Pacific halibut DNA sample for genome sequencing and for their involvement in this project.

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Table 1. Metrics of the first genome sequencing in the Pacific halibut (size in base pairs or nucleotides, nt).

Number of scaffolds	467660	
Total size of scaffolds	709887856	
Longest scaffold	699452	
Shortest scaffold	61	
Number of scaffolds > 1K nt	41649	8.9%
Number of scaffolds > 10K nt	9913	2.1%
Number of scaffolds > 100K nt	1231	0.3%
Number of scaffolds > 1M nt	0	0.0%
Number of scaffolds > 10M nt	0	0.0%
Mean scaffold size	1518	
Median scaffold size	242	
N50 scaffold length	45579	
L50 scaffold count	3526	
scaffold %A	28.96	
scaffold %C	21.05	
scaffold %G	21.03	
scaffold %T	28.89	
scaffold %N	0.07	
scaffold %non-ACGTN	0.00	
Number of scaffold non-ACGTN nt	0	
Percentage of assembly in scaffolded contigs	38.5%	
Percentage of assembly in unscaffolded contigs	61.5%	
Average number of contigs per scaffold	1.0	
Average length of break (>25 Ns) between contigs in scaffold	100	
Number of contigs	472607	
Number of contigs in scaffolds	8079	
Number of contigs not in scaffolds	464528	
Total size of contigs	709393156	
Longest contig	426312	
Shortest contig	61	
Number of contigs > 1K nt	46595	9.9%
Number of contigs > 10K nt	13314	2.8%
Number of contigs > 100K nt	662	0.1%
Number of contigs > 1M nt	0	0.0%
Number of contigs > 10M nt	0	0.0%
Mean contig size	1501	
Median contig size	244	
N50 contig length	29898	
L50 contig count	5744	
contig %A	28.98	
contig %C	21.06	
contig %G	21.04	
contig %T	28.91	
contig %N	0.00	
contig %non-ACGTN	0.00	
Number of contig non-ACGTN nt	0	

2.7.1 IPHC oceanographic monitoring program 2017

Lauri L. Sadorus and Jay Walker

Abstract

This was the ninth consecutive year of the International Pacific Halibut Commission (IPHC) coastwide oceanographic data collection program. Oceanographic data are collected using water column profilers during the IPHC fishery-independent setline survey that spans the area from southern Oregon in the U.S.A. to British Columbia and into the Gulf of Alaska, Bering Sea, and Aleutian Islands. The IPHC has operated profilers since 2000 on a limited basis, and coastwide since 2009. Oceanographic data were successfully collected at a total of 1,281 stations out of a possible 1,420 in 2017. The coldest near-bottom water (-0.82^{o}C) was detected around St. Matthew Island in the Bering Sea. The warmest near-bottom water (13.85^{o}C) was found at a shallow station off of southern Oregon. For the first time in several years, profiler data indicated a severe hypoxic zone off of the Washington coast with dissolved oxygen levels measured as low as 0.069 ml/L.

Introduction

Since the expansion of its fishery-independent setline survey (survey) in 1997 to monitor the Pacific halibut (*Hippoglossus stenolepis*) population, the International Pacific Halibut Commission (IPHC) has annually conducted fishing operations at more than 1,200 stations ranging geographically from the U.S. West Coast to the Bering Sea. Following a pilot program in the 2000s in which oceanographic data were collected coincident with survey fishing, the effort was expanded to all survey stations in 2009 and has since taken place annually (Sadorus et al. 2016). Oceanographic data are collected using water column profiling units manufactured by Sea-bird Electronics[1] that collect a suite of oceanographic data including pressure (depth), conductivity (salinity), temperature, dissolved oxygen, pH, and fluorescence (chlorophyll concentration).

All survey stations are located on the continental shelf and are arranged on an equidistant 10 nmi (18.52 km) grid (except for the Bering Sea flats area and a few stations in southeast Alaska) (Fig. 1). In addition to the standard grid used in the survey, stations in areas not normally surveyed are occasionally added on a temporary basis in response to specific biological and/or management questions or concerns. The profilers are typically deployed at these additional stations, provided that the expected depth is ≤ 500 m. Stations > 500 m are not profiled due to depth limitations of the rigging. A multi-year survey expansion was in its fourth year in 2017, and included additional stations in the Bering Sea, Salish Sea, and U.S. West Coast.

Expansion of the profiler program in 2009 was made possible through grants from the Oregon Department of Fish and Wildlife Restoration and Enhancement Program, and the National Oceanic and Atmospheric Administration (NOAA). The NOAA grant expired in September 2012 and ongoing maintenance costs are currently borne by the IPHC.

[1] Sea-bird Electronics Inc. 13431 NE 20th Street, Bellevue, WA 98005.

Methods

Instruments

The models currently used are SBE19*plus*V2 CTD units with auxiliary sensors to record dissolved oxygen (SBE 43), pH (SBE 18), and chlorophyll *a* concentration (WETlabs ECO-FLRTD). Sensor specifications are described in Sadorus et al. (2016). The sensors are protected by a stainless steel cage, 96 cm tall and specially designed for each unit. The primary units (pressure, conductivity, temperature) have titanium housings and are rated for deployment to depths of 7,000 m. The auxiliary sensors have maximum depth ratings ranging from 1,000-7,000 m which is sufficient for all standard IPHC survey stations. Part of the survey expansions that started in 2014 included stations with an estimated average depth as deep as 730 m. As a precautionary measure, the profilers are deployed at standard survey stations and expansion stations with a posted depth of up to 500 m only.

To adapt the profiler for deployment from a Pacific halibut fishing vessel, a system was designed using weights and floats that permits the profiler to descend rapidly enough through the water column to collect valid data and also ensures that the unit will not crash into or become permanently attached to the ocean bottom (Hare 2001). A sustained descent rate of 1-2 m/s is the target, and the weight of the assembly in the water is sufficient that, if the unit is allowed to free fall, the target descent rate is achieved.

A 15-meter anchor line is attached to the bottom of the profiler cage and a 40-pound longline anchor or cannonball is attached to the end of the line. A section of gangion line separates the profiler from the anchor line and acts as a weak link in case the anchor cannot be freed from the bottom. To the top of the cage, floats are attached that effectively offset the weight of the anchor in water. The floats are attached to standard buoy line which is almost neutrally buoyant (Sadorus et al. 2016).

Deployment

A profiler unit was deployed at each eligible survey station just prior to hauling the fishing gear. To deploy the unit, the anchor was lowered into the water followed by the profiler, then the buoy line and buoys, and the line was threaded through the gurdy. After a minimum 90-second acclimation period at the surface, the line was released, and the full setup allowed to free fall to the bottom. Each profiler took measurements from the surface to depth at a rate of four per second and a pump ensured consistent water flow past the sensors. Once the anchor hit the bottom, the remainder of the unit ceased descent shortly afterward due to the strong positive buoyancy of the floats. On board the vessel, it was usually evident when the anchor hit bottom because of a noticeable slackening of the line. At that time, the profiler was immediately hauled back aboard via the vessel's gurdy. Once on deck, a series of protocols were executed to clean the sensors and store the unit until the next deployment, as outlined in the Seacat operation manual (IPHC 2017.).

Data capture

Each profiler was shipped into the field with a dedicated laptop computer. Approximately once per day, the profiler was connected to the computer, data were uploaded, and the profiler unit was then reset for the next day's casts. The data were sent remotely or via data storage cards back to the Seattle office after each trip. To facilitate quicker retrieval and processing of the data, beginning in 2013 a cloud storage service has been used to transmit the data more efficiently to the

IPHC office. Specifically, when the vessels arrived in port after each trip, the samplers (whenever possible) connected the laptops to the internet whereby data were automatically uploaded to a secured storage location in the cloud and were immediately accessible to office staff.

Results in 2017

Two replacement profilers were purchased in 2015 and 2016 to replace units lost at sea earlier in the program, bringing the total available to 15 units. One profiler was lost in 2017 off the northern Washington coast on August 26. A replacement profiler was sent to the vessel and ultimately only a few stations were not profiled. Several of the profilers had mechanical issues with the dissolved oxygen sensor and those issues will be addressed by Seabird prior to the 2018 survey.

Data collection

In 2017, a total of 12 fishing vessels were chartered to complete the survey and each vessel was outfitted with a profiling unit, a laptop computer, and accessory gear. Out of a possible 1,420 stations coastwide, 1,281 useable casts of environmental data were collected (Table 1), resulting in a 90% success rate. Note that possible stations included those within the sensor depth range of 0-500 m, but there were a total of 1,496 scheduled stations for 2017.

Occasionally, data collection was unsuccessful or not attempted, and there were several reasons for this. The vessel captain and lead biologist together decided whether it was prudent to launch the profiler, given the conditions at each station. Poor weather and strong tides periodically resulted in missed casts. On stations where tides were strong but the station was otherwise deemed viable, the samplers were allowed to incorporate up to 60 pounds (27 kg) total to the bottom of the assembly to achieve a more vertical descent. Periodically, moisture seeped under the endcaps which caused the profiler to shut down mid-cast. In these cases, samplers dried the endcap components and replaced them if necessary.

The original laptop computers, most purchased in 2008, have exceeded their expected lifespan, due largely to the careful handling of these units by the field staff. Systematic replacement began in 2015 and will continue as needed. In 2017, the survey transitioned from paper forms to electronic tablets for field data capture. Ideally, profiler data capture will be an added feature in the future and the laptops will be discontinued, but this transition is not yet scheduled.

Environmental conditions on the Pacific halibut grounds

The sample area encompasses a wide range of environmental conditions. Off the U.S. West Coast, particularly off the Oregon and Washington coast, there has often been areas of hypoxic water (< 1.4 ml/L), but since 2013, the hypoxic events in the area have been relatively mild. In 2017, however, the profilers recorded a large severe hypoxic event off of the Washington coast when surveying those stations in August (visible in Fig. 2b). Catches of Pacific halibut within the low oxygen area were either very low or zero. The lowest near-bottom dissolved oxygen concentration detected (0.069 ml/L) was off the coast of Washington just south of La Push.

Near-bottom temperatures coastwide ranged from below zero to nearly 14°C. The coldest near-bottom temperature (-0.82°C) was found once again off of St. Matthew Island in the Bering Sea. Waters in that area are typically close to zero or below in summer. The warmest near-bottom temperature (13.85°C) was measured at a shallow station off the U.S. west coast near Coos Bay, Oregon.

Figures 2-4 contain a series of plots produced using Ocean Data View software (Schlitzer 2010) illustrating bottom temperature and dissolved oxygen conditions during the survey in the summer of 2017. Figure 2 contains information for the U.S West Coast, Figure 3 for the Gulf of Alaska, and Figure 4 for the Bering Sea and Aleutian Islands. The data are illustrated as iso-surface plots, which are continuous surfaces that use the observed point values to interpolate values at locations between those observations. Survey stations (i.e., where measurements were actually taken) are denoted as black dots.

Data processing and availability

A primary goal of this project is to make the survey profiler data available to scientists worldwide. The IPHC is working with the Joint Institute for the Study of the Atmosphere and Ocean (JISAO) at the University of Washington and NOAA's Pacific Marine Environmental Laboratory to process the oceanographic data and make them publicly accessible. Completed profiles are available at: http://www.ecofoci.noaa.gov/projects/IPHC/efoci_IPHCData.shtml

For the first time since the inception of the coastwide profiler project, all of the bottom readings for temperature and dissolved oxygen from 2009 to the most recent year (in this case 2017) are available for use in analyses by IPHC staff. These data have undergone an internal edit and questionable values were removed in the interim pending further examination by NOAA personnel. The near real-time availability of these data allows for their use in distribution studies, the spatial model that has been developed for the stock assessment, and others.

Acknowledgments

The success of the profiler project depends on the efforts and cooperation of many contributors. We would like to acknowledge the IPHC fishery-independent survey program staff for competently incorporating the profiler project into the survey protocols, Jason Taylor for making sure the gear was ready for the field, IPHC sea samplers for their hard work and attention to detail in collecting the data, the survey vessel captains and crews for making sure the profilers were safely retrieved after every cast, Chris Johnston for his assistance organizing and pre-editing the data, and Peggy Sullivan at NOAA/JISAO for her tireless work on the data and website.

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Table 1. Number of profiler casts completed during the 2017 standardized stock assessment survey, by IPHC regulatory area, survey region, and vessel.

		Stations		
Survey region	**Reg. area**	**Profiled**	**Possible**	**Vessel**
N. California	**2A**	**23**	**38**	Pacific Surveyor
Oregon		40	54	Pacific Surveyor
Washington		68	83	Pacific Surveyor
Puget Sound		10	14	Pacific Surveyor
Vancouver	2B	36	41	Vanisle
Goose Island		43	43	Vanisle
St. James		39	42	Vanisle
Charlotte		40	44	Pender Isle
Ketchikan	2C	31	41	Star Wars II
Ommaney		40	40	Pender Isle
Sitka		33	42	Pender Isle
Fairweather	3A	48	49	Star Wars II
Yakutat		51	51	Star Wars II
Prince William Sound		43	45	Bold Pursuit
Seward		44	48	Bold Pursuit
Gore Point		45	45	Bold Pursuit
Portlock		44	46	St. Nicholas
Albatross		45	45	Clyde
Shelikof		42	45	St. Nicholas
Trinity	3B	45	47	Clyde
Chignik		41	45	Allstar
Shumagin		42	44	Allstar
Sanak		44	48	Free to Wander
Semidi		44	47	Predator
Unalaska	4	66	66	Free to Wander
4A Edge		52	57	Free to Wander
4D Edge		48	68	Kema Sue
Andreanof		42	44	Norcoaster
Amchitka		41	35	Norcoaster
North Bowers Ridge		8	8	Kema Sue
South Bowers Ridge		17	17	Norcoaster
Near Island		26	38	Kema Sue
Total regions: 32		**1,281**	**1,420**	**Total vessels: 12**

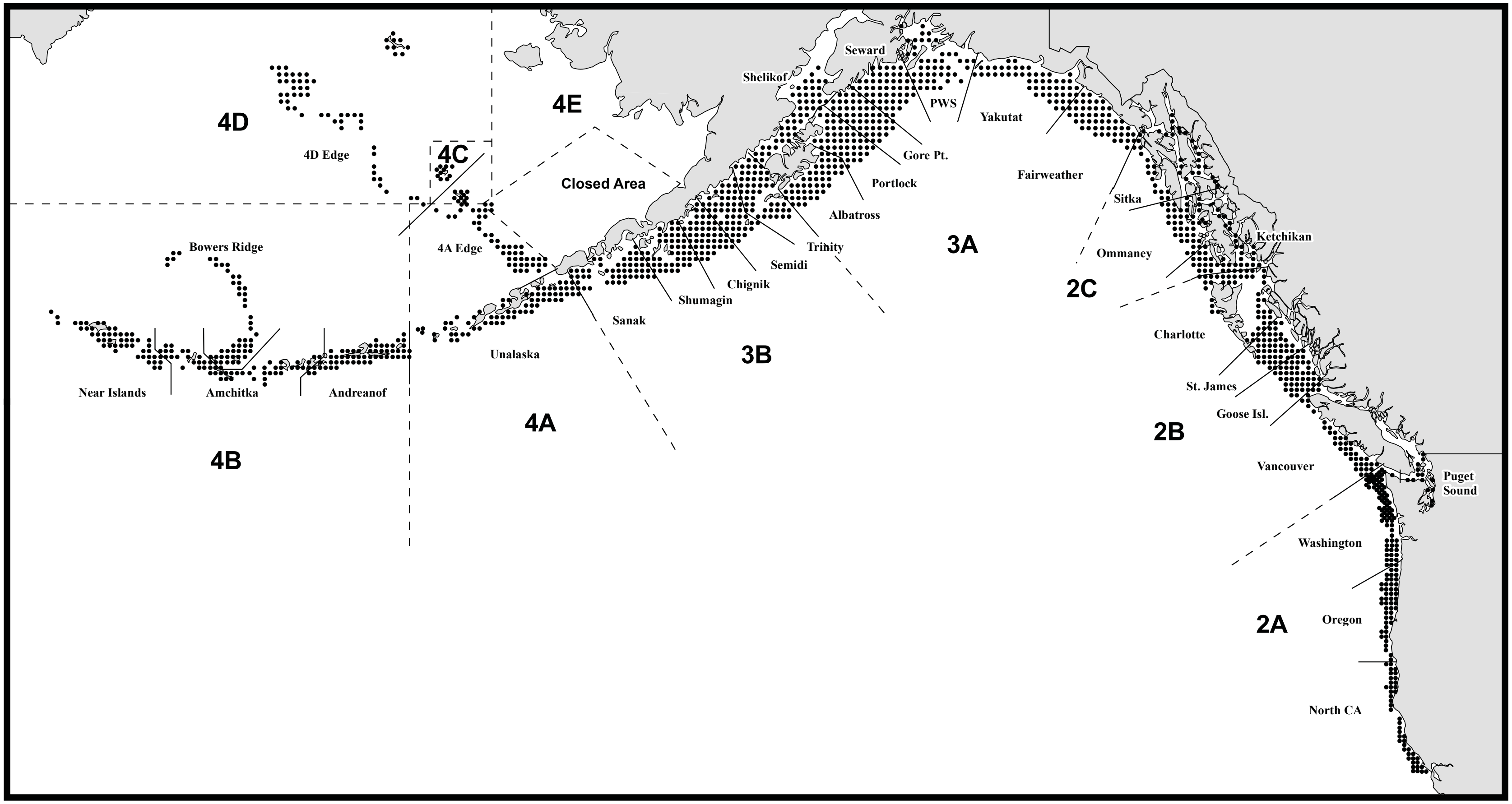

Figure 1. Stations surveyed and profiled during the 2017 IPHC fishery-independent survey. Figure reproduced from IPHC Staff (2017).

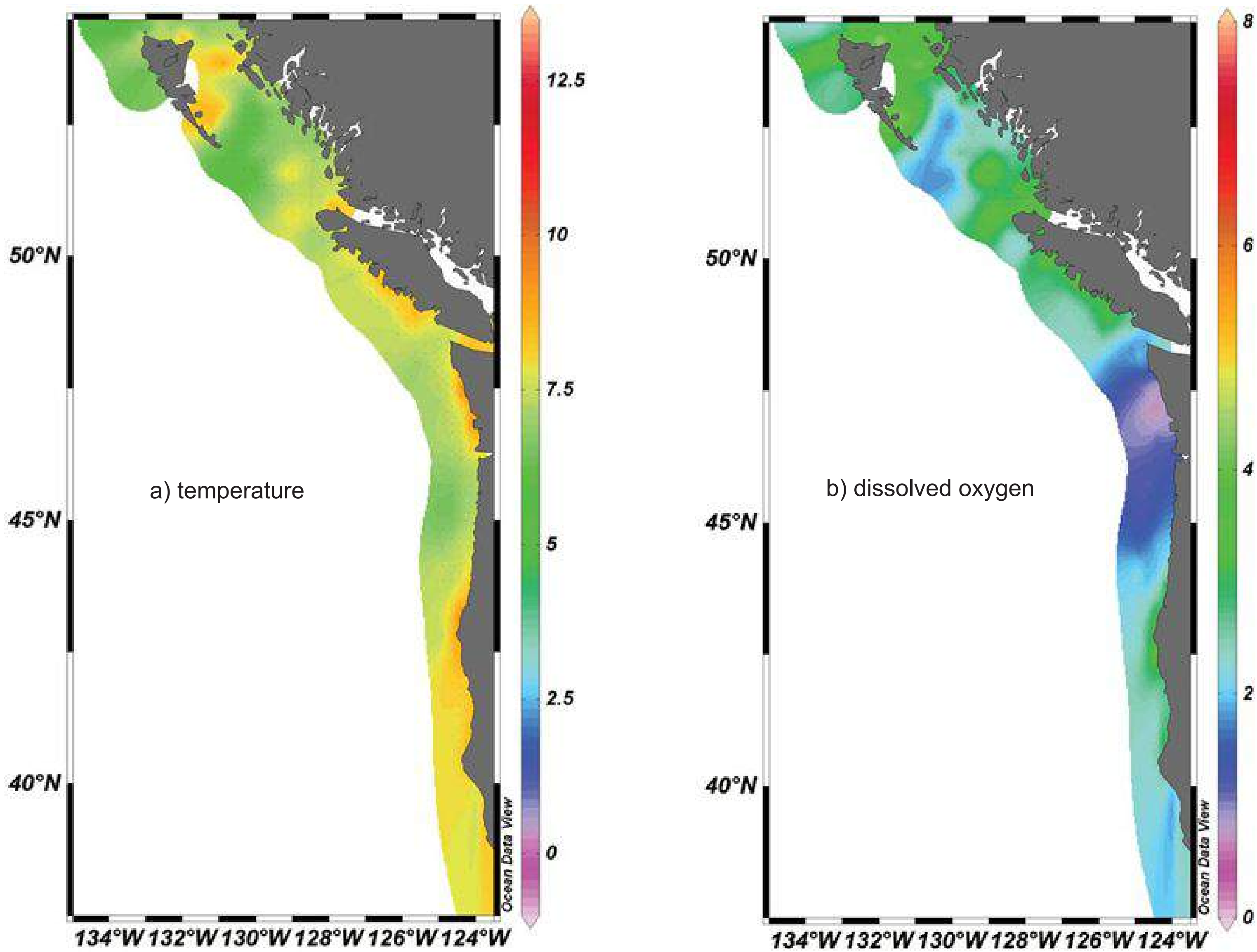

Figure 2. Iso-surface map of near-bottom a) temperature (°C) and b) dissolved oxygen (ml/L) off the U.S. West Coast during the IPHC fishery-independent setline survey.

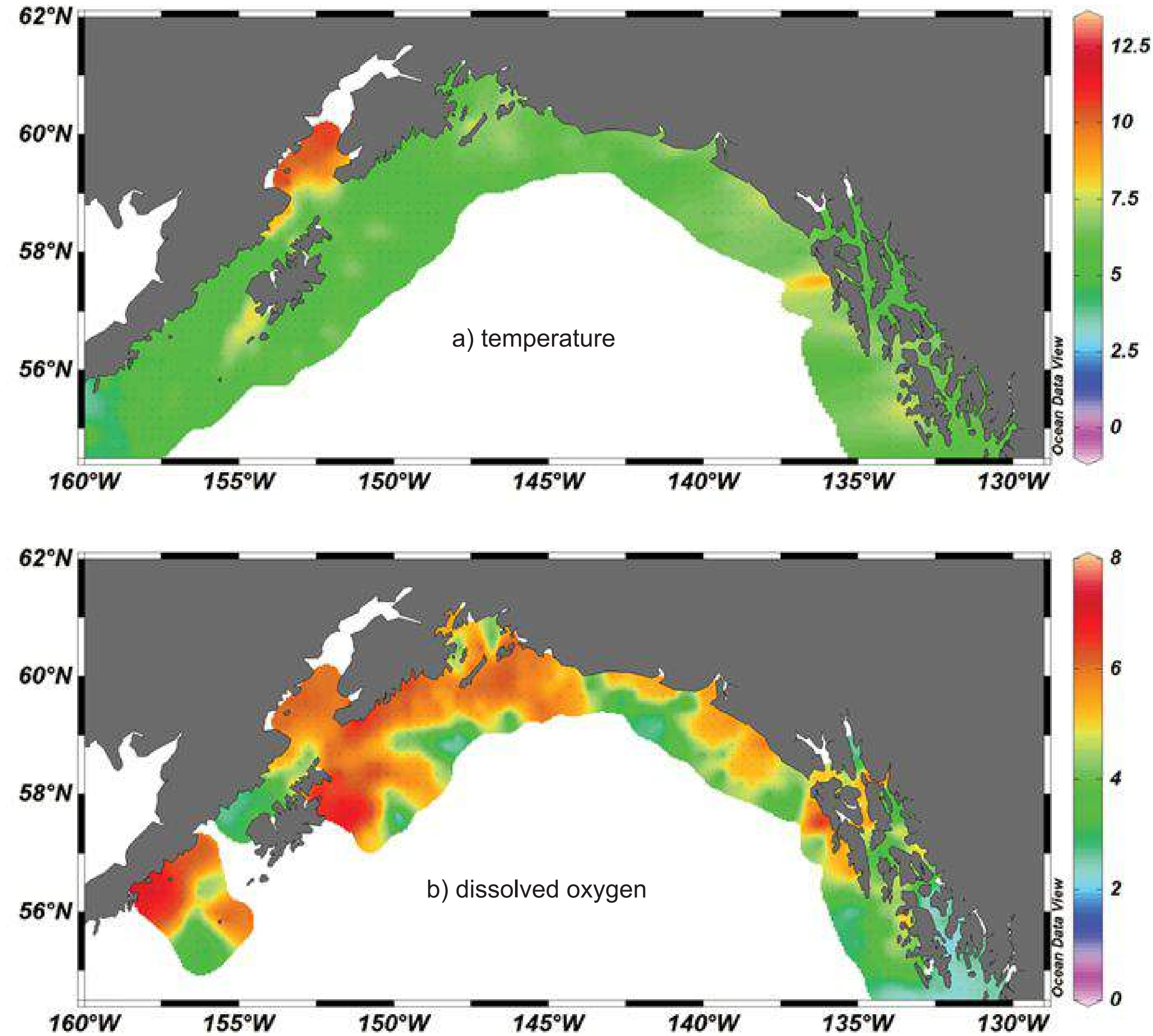

Figure 3. Iso-surface map of near-bottom a) temperature (°C) and b) dissolved oxygen (ml/L) in the Gulf of Alaska during the IPHC fishery-independent setline survey.

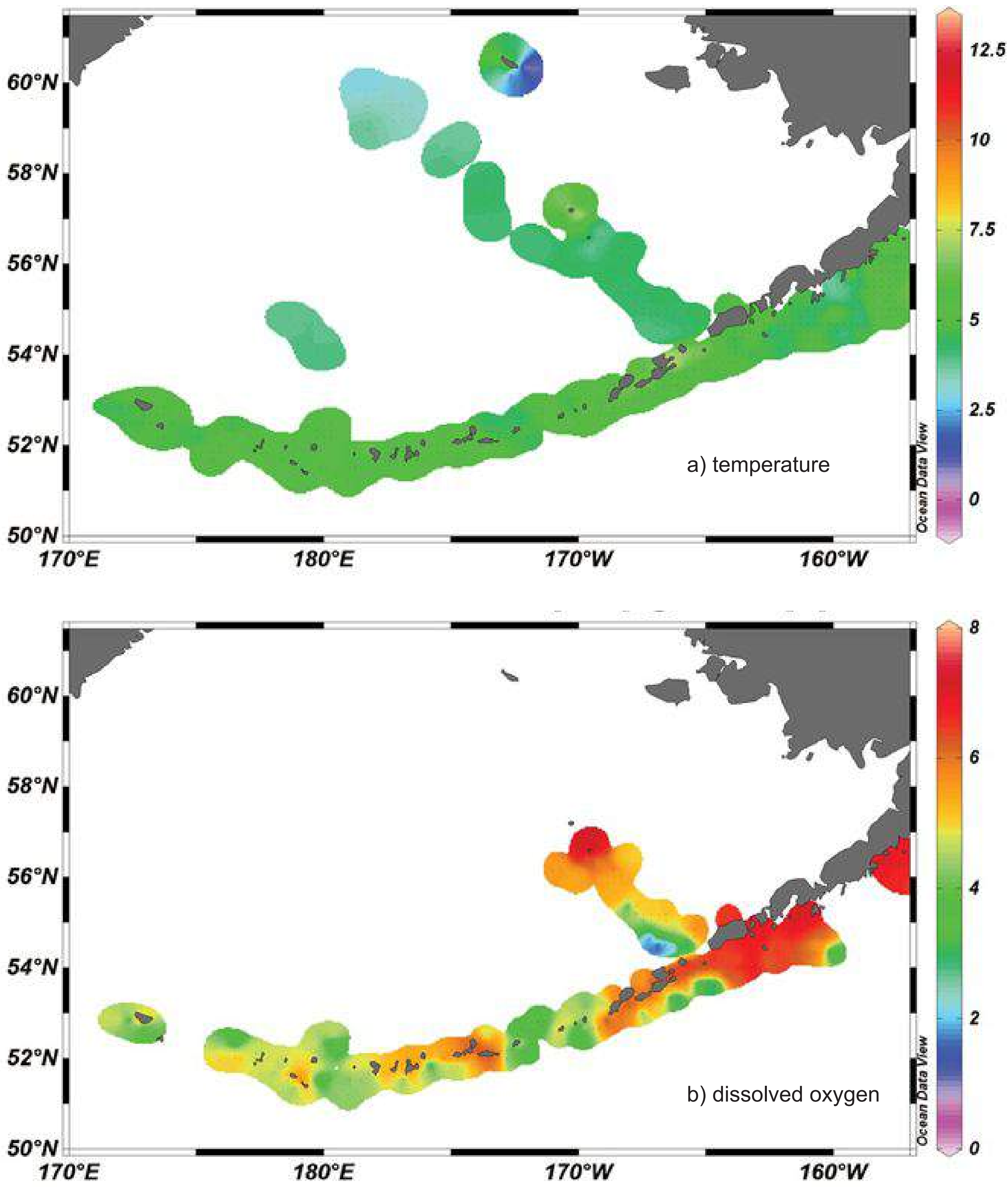

Figure 4. Iso-surface map of near-bottom a) temperature (ºC) and b) dissolved oxygen (ml/L) in the Bering Sea and Aleutian Islands during the IPHC fishery-independent setline survey.

2.7.2 Contaminant and parasite monitoring of Pacific halibut

Claude L. Dykstra

Environmental contaminant sampling

The IPHC has been working cooperatively with the Alaska Department of Environmental Conservation (ADEC), to investigate the presence of heavy metals (arsenic, selenium, lead, cadmium, nickel, mercury, and chromium) and persistent organic pollutants (POPs) in Pacific halibut (*Hippoglossus stenolepis*) caught in Alaskan waters since 2002. Results from these studies are used to identify ADEC's future research needs.

Through 2016, a total of 2,744 samples have been tested by ADEC. The mean level of total mercury for these samples has been 0.3 ppm, ranging from non-detectable to 2.0 ppm. For comparison, the U.S. Food and Drug Administration (FDA) limit of concern is based on methyl mercury (~85% of total mercury) levels of 1.0 ppm, and the U.S. Environmental Protection Agency (EPA) and Canadian Food Inspection Agency (CFIA) level of concern is 0.5 ppm. Results from analysis of POPs (i.e. pesticides, selected PCB congeners, polybrominated diphenyl ethers (PBDE's – found in plastics as fire retardants) dioxins, and furans etc.) found that in general these compounds are either undetectable in Pacific halibut or well below the levels found in other marine fish species. This finding is consistent with the fact that the majority of POP chemicals are fat-soluble, and Pacific halibut have lower fat content compared to other species.

In 2017 IPHC samplers collected Pacific halibut muscle and liver samples from survey stations that corresponded to high commercial catch within the target site, with a goal of collecting samples from 20 petite (P; <80cm), 20 small (S; 80-89 cm), 20 medium (M; 90-112 cm), 20 large (L; 113-148 cm), and 10 extra-large (XL; >148 cm) Pacific halibut in three survey regions.

In 2017 eighty five samples were collected in the Bowers Ridge/Amchitka region (20 P, 20 S, 20 M, 5 XL), 60 samples were collected in the Gore Pt. region (15 P, 19 S, 20 M, 6 L), and 83 samples were collected in the Unalaska charter region (20 P, 20 S, 20 M, 20 L, 3 XL).

Samples will be tested for a broad suite of environmental contaminants, including organochlorine pesticides, dioxins, furans, polybrominated diphenyl ethers, polychlorinated biphenyl congeners, methyl mercury, and heavy metals (arsenic, selenium, lead, cadmium, nickel, and chromium). Additional small muscle and liver tissue samples were collected to be examined for genetic expression of genes that are responsive to contaminant load. Continued collaborative work with ADEC is anticipated.

Ichthyophonus sampling

In 2017 the IPHC continued investigating *Ichthyophonus* incidence in Pacific halibut. *Ichthyophonus* is a protozoan parasite from the class Mesomycetozoea, a highly diverse group of organisms with characteristics of both animals and fungi, and has been identified in many marine fish. The project resampled the three geographically distinct areas (Oregon, Prince William Sound (PWS) and 4D Edge (Bering) charter regions) that have been sampled since 2011, to investigate temporal stability of *Ichthyophonus* prevalence. Prevalence in these samples was similar to previous years with PWS being much higher than the other areas (2011-2016 average: Oregon=26.73%, PWS=67.3%, and Bering=27.1%; 2017: Oregon=15.2%, PWS=75.4%, and Bering=12.8%). Genetic and histology results for these samples are still pending.

It is important to note that there is no historical data on *Ichthyophonus* infection in Pacific halibut and it is unknown if *Ichthyophonus* is a new or long-term symbiote of Pacific halibut. Additionally, it is not known what effect, if any, *Ichthyophonus* may be having on the health of individual Pacific halibut, and on population (mortality) or growth dynamics.

2.7.3 Trends in seabird counts from the IPHC fishery-independent setline surveys (2002-17)

Tracee O. Geernaert

Abstract

Counts of live seabirds, taken immediately following gear retrieval, have been conducted during International Pacific Halibut Commission (IPHC) fishery-independent setline surveys since 2002. The Convention waters, extending from off California northward to Alaska and the border of the Exclusive Economic Zone (EEZ) with Russia, are surveyed annually between late May and early September. A total of 20,921 seabird counts have been conducted over the last 16 years, with 1,368 occurring in 2017. More than 916,000 observations of seabirds have been recorded since 2002.

Northern fulmars (*Fulmarus glacialis*), glaucous-winged gulls (*Larus glaucescens*), black-footed albatross (*Phoebastria nigripes*), and fork-tailed storm petrels (*Oceanodroma furcata*) represent the most commonly observed species. The observed number of unidentified gulls has decreased, inversely correlated with an increased number of observations of glaucous-winged gulls and herring gulls (*L. argentatus*). This shift was likely the result of increased emphasis on gull identification during annual IPHC field biologist training. A total of 389 endangered short-tailed albatross (*P. albatrus)* sightings have been recorded overall, with an average of 24 observed annually since 2002.

Introduction

In 2002, the International Pacific Halibut Commission (IPHC), in collaboration with Washington Sea Grant, developed a sampling protocol for collecting seabird occurrence data on the IPHC fishery-independent setline survey (FISS). This was initially a collaborative project between the IPHC, Alaska Department of Fish and Game (ADFG), and the National Marine Fisheries Service (NMFS) sablefish (*Anoplopoma fimbria*) survey group. The purpose of the project was not only to establish a seabird database for Alaska that could be analyzed for population purposes, but also to make recommendations for regulatory changes to the seabird avoidance requirements for commercial fishing vessels. Several reports that evaluated seabird occurrence using these data were published between 2002 and 2013 (Melvin et al. 2004, 2006; Piatt et al. 2006; Guy et al. 2013). Although the collaboration ended in 2004, the IPHC incorporated the seabird data collection protocols into its annual FISS. Observations were conducted between the end of May and the beginning of September, on IPHC FISS stations (Fig. 1). Field biologists aboard each survey vessel counted the number of seabirds in the vicinity of the vessel's stern immediately following gear retrieval/hauling. Sampling seabird occurrence after the haul addresses the question of where and when certain seabird species occur during hauling events. It also aids in the assessment of individual species at risk by providing information on their population trends over time.

Methods

A detailed description of the IPHC FISS, including seabird observation protocols can be found in the IPHC Fishery-Independent Setline Survey Manual (IPHC 2017). Briefly, seabird counts have been conducted since 2002 at all IPHC stations, as well as experimental stations not used for assessment purposes (expansion survey stations were not included). After hauling operations were completed at each station, biologists recorded the abundance of seabirds by taking a snapshot estimate of seabirds within the count zone, which is a 50-meter radius hemisphere from the vessel's stern (Fig.2). The counts are similar in concept to performing a terrestrial bird feeder count. Counts are not conducted when poor visibility prohibits the accurate identification of the seabirds (i.e., in fog or darkness). Binoculars and field guides are provided on all vessels, and the IPHC conducts annual training in seabird identification with slide presentations and field guide reviews. Seabird counts were recorded on forms and entered into the setline survey database, along with the other data collected. Seabird count data examined in this report are from grid and experimental stations fished on the annual IPHC FISS only, and do not include other agency data, or records from winter surveys, special projects conducted by the IPHC, or seabirds caught on setline gear.

Results

A total of 20,921 counts have been conducted on the IPHC FISS over the last sixteen years (2002-2017). Seabird counts were taken at 99% of the IPHC stations during this time period; 166 sets were not observed because of poor visibility. The average number of seabird counts conducted each year was 1,308 (Table 1). More than 916,000 seabird sightings (composed of 36 unique species) were recorded. The average number of unique species observed annually is 21 and the percentage of the times the species appeared each year ranges from 6-100% (Table 1). Start dates for each year's survey ranged from 25 May to 7 June and the end dates from 27 August to 14 September, but the bulk of the surveys took place from June to August (Fig. 3) and most of the counts took place in the Gulf of Alaska (Fig. 4).

The most common species observed in the counts during all years is the northern fulmar (*Fulmarus glacialis*), making up 71% of the cumulative sightings. Glaucous-winged gulls (*Larus glaucescens*) and black-footed albatross (*Phoebastria nigripes*) made up ten and eight percent of the overall sightings, respectively (Fig. 5). Fork-tailed storm petrels (*Oceanodroma furcata*), and mixed shearwater species each represented two percent of all sightings where Laysan albatross (*P. immutabilis*) sightings made up one percent (Fig. 5). Counts per year have remained relatively consistent since 2002 with the average at 1,308 (Table 1). The relative abundance of four of the top five most frequently observed seabirds, northern fulmars, black-footed and Laysan albatross and fork-tailed storm petrels, are plotted over the 16-year period (Fig. 6). Northern fulmar numbers dropped slightly over the last two years to 37,462 and 37,673 respectively, from 2015's high of 46,383. Laysan albatross numbers have been increasing and the all-time high of 1,469 was observed in 2017. Fork-tailed petrel numbers remained nearly unchanged over the last 3 years. A total of 389 sightings of the endangered short-tailed albatross (*P. albatrus)* were recorded during the counts over the 16-year period and this year we saw a record 55 birds seen during the counts (Table 1) with the average of 24 seen annually.

The number of glaucous-winged gull sightings has increased by over 25 percent while the unidentified gull numbers decreased by a factor of 5 from last year (Fig. 7). The ratio of unidentified seabirds to total number of individual seabirds (Fig. 8) has decreased over the time series as well.

When the various unidentified species are examined (excluding unidentified gulls), we see that the unidentified shearwaters make up a large component of the unidentified seabirds (Fig. 9).

Discussion

The number of unidentified seabirds within the survey count zones has decreased since the start of the seabird data collection program in 2002, indicating that the IPHC biologists have improved their identification skills. The change in glaucous-winged gull numbers over time demonstrates this learning curve. Observation rates of glaucous-winged gulls were inversely correlated with observation rates of unidentified gulls such that, as glaucous-winged gull sightings increased, unidentified gull sightings decreased (Fig. 7). The unidentified seabirds numbers also decreased this year after a slight increase in 2016. The field biologists have become more skilled at identification over this time period with our survey field staff training focusing on improving identification to the species level especially among shearwaters and gulls.

Population sizes of many seabirds species vary from year to year, and trends up or down can be indicative of a change in diet, weather, and/or timing of chicks fledging from the nest. Though the FISS offers only a window in time of seabird occurrence, they are broad in geographic scope (conducted coastwide) and are repeated in the same spatial pattern annually. By continuing to accumulate data, it is hoped to eventually determine how observations relate to actual abundance levels; specifically, for seabirds of concern such as the albatrosses. The endangered short-tailed albatross have been seen in increasing numbers since 2002 with a record 55 recorded this year. These data are of particular importance because the short-tailed albatross is a rare species and one of considerable interest to management agencies. Their populations have rebounded and the increase we are seeing in our counts helps substantiate the recovery reported in the literature (Deguchi et al. 2014).

With continued, consistent gathering of these data for all species seen, trends in abundance may be determined that will help predict a species' decline or recovery.

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Table 1. Number of seabirds in 2017; average, total since 2002; and percent presence since 2002.

Species	2017	Average 2002-17	Total	Percent presence
Northern fulmar	37,673	40,640	650,247	100%
Black-footed albatross	3,941	4,339	69,424	100%
Laysan albatross	1,469	861	13,783	100%
Short-tailed albatross	55	24	389	100%
Glaucous-winged gull	9,593	5,711	91,380	100%
Herring gull	233	300	4,505	94%
Western gull	607	411	1,642	25%
Mew gull	-	23	115	19%
Glaucous gull	204	45	405	50%
Heermann’s gull	2	14	95	44%
Sabine’s gull	4	3	23	44%
Slaty-backed gull	-	2	7	6%
Ring-billed gull	1	4	19	25%
Bonaparte’s gull	-	2	6	14%
Unidentified gull	286	2,195	35,114	100%
Arctic tern	-	1	3	13%
Unidentified tern	-	4	30	31%
Ruddy turnstone	-	3	8	6%
Pomarine jaeger	-	4	50	81%
Parasitic jaeger	1	3	38	81%
Long-tailed jaeger	-	4	21	25%
Unidentified jaeger	1	5	42	57%
South polar skua	-	1	3	13%
Fork-tailed storm petrel	660	1,134	18,150	100%
Leach’s storm petrel	6	49	783	100%
Unidentified storm petrel	10	319	5,096	100%
Black-legged kittiwake	780	428	6,846	100%
Red-legged kittiwake	4	10	162	100%
Unidentifed kittiwake	-	61	971	99%
Short-tailed shearwater	-	154	2,304	88%
Sooty shearwater	463	245	3,923	100%
Pink-footed shearwater	41	53	534	63%
Flesh-footed shearwater	-	1	2	6%
Unidentified shearwater	1,028	576	9,222	100%
Common murre	15	8	63	50%
Thick-billed murre	1	10	31	13%
Unidentified murre	4	19	310	100%
Rhinoceros auklet	-	1	2	13%
Parakeet auklet	-	1	2	6%
Tufted puffin	6	7	107	94%
Horned puffin	3	2	11	38%
Unidentified puffin	1	11	174	100%
Unidentified alcid	1	13	80	31%
Bald eagle	-	1	2	13%
Unidentified cormorant	-	1	11	38%
Unidentified bird	-	15	135	57%
Grand total	57,093	57,267	916,270	
Number of counts	1,362	1,308	20,921	
Number of unique species	22	21	36	

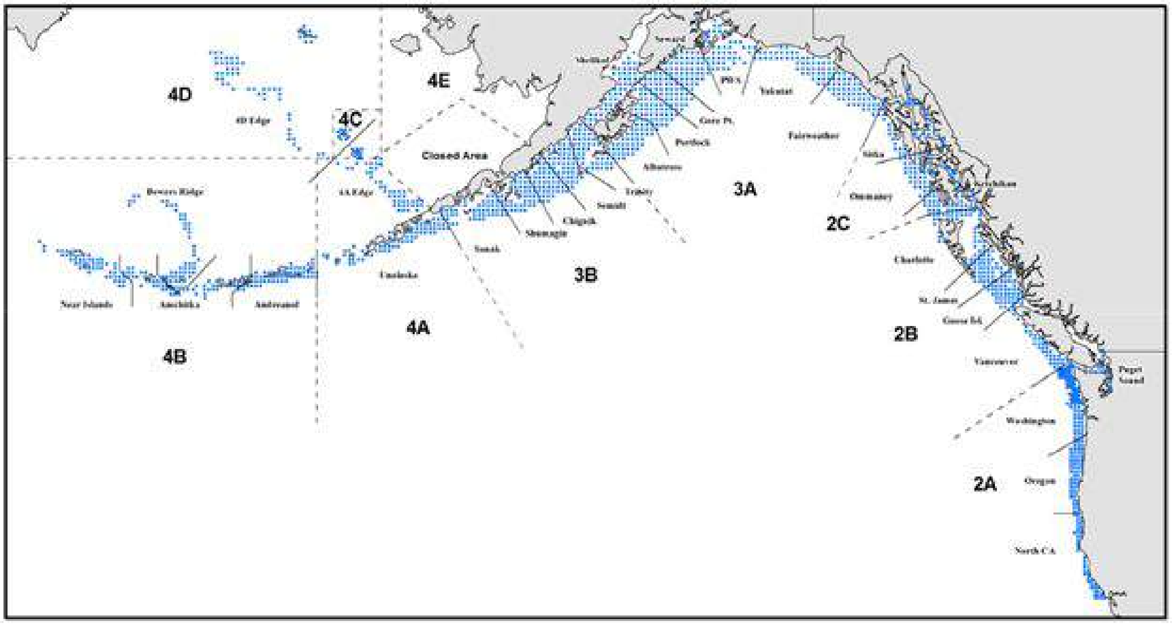

Figure 1. 2017 IPHC fishery-independent setline survey stations with regulatory area (two-character codes) and charter region (formal names) divisions.

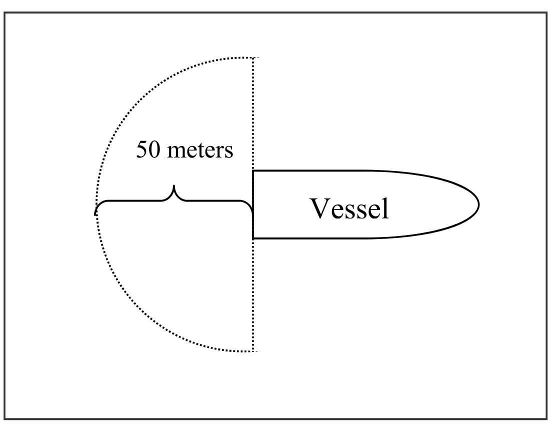

Figure 2. Diagram of the seabird 50-meter hemisphere (count zone) at the stern of the vessel where seabird counts were conducted.

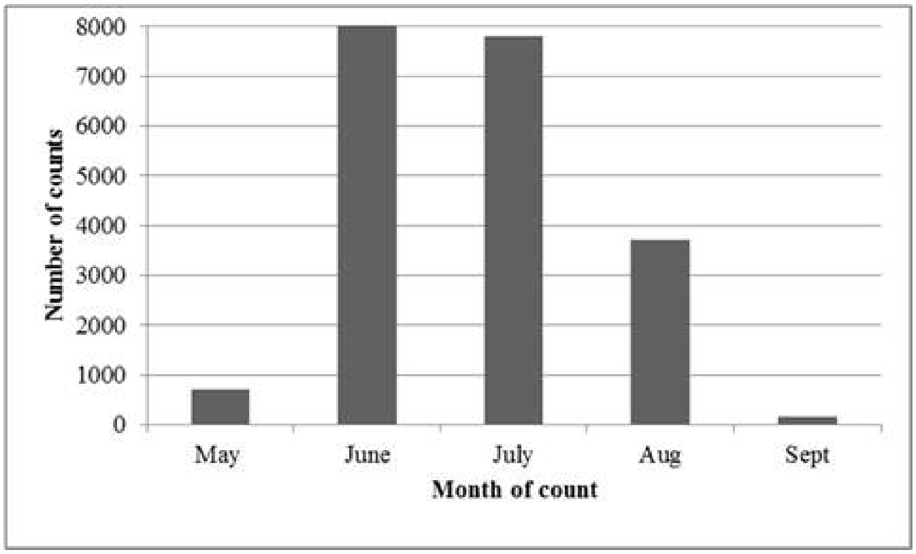

Figure 3. Overall seabird counts conducted on IPHC fishery-independent setline surveys by month, 2002-2017.

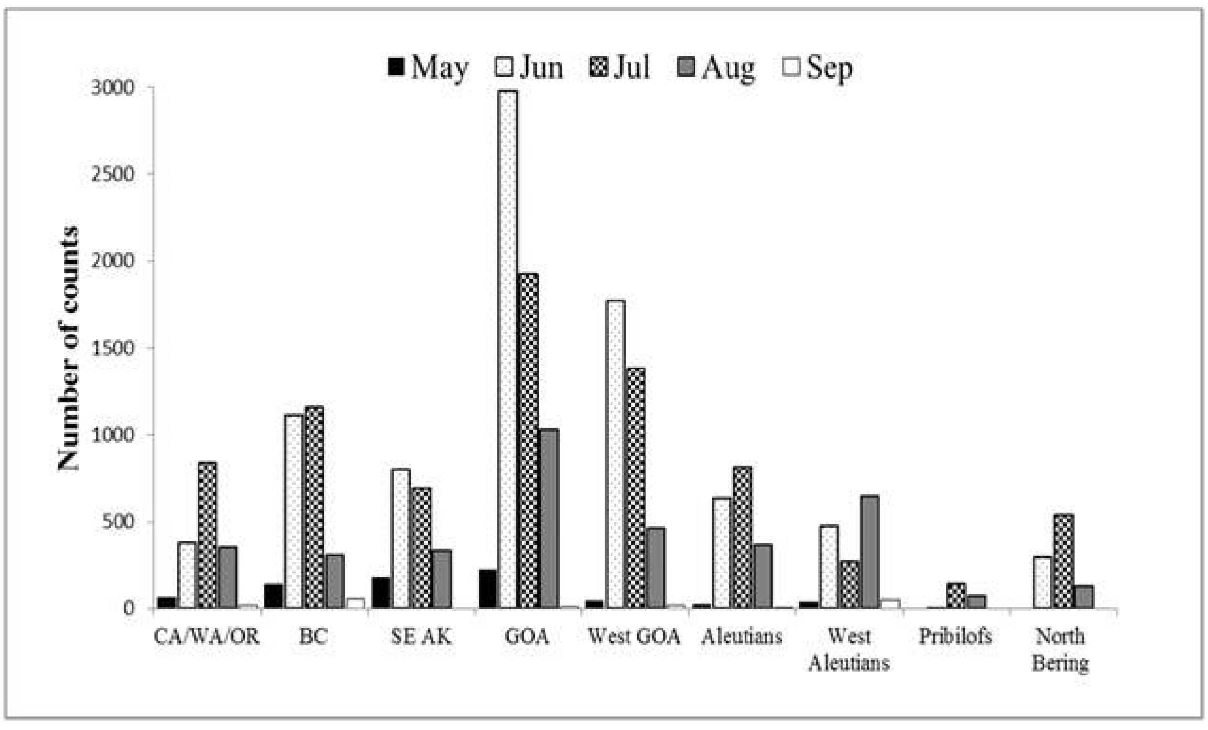

Figure 4. Total number of seabird counts conducted on IPHC fishery-independent setline surveys, by area and month, 2002-2017. Abbreviated locations are as follows: CA/WA/OR = California, Oregon, and Washington; BC = British Columbia; SE AK = southeast Alaska; GOA = central Gulf of Alaska; West GOA = western Gulf of Alaska.

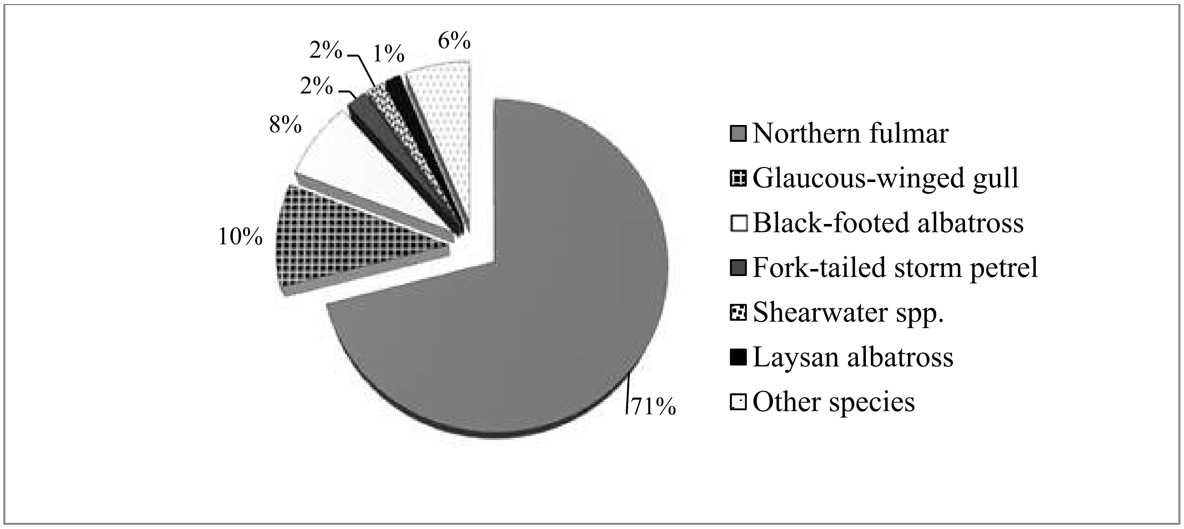

Figure 5. Most common seabird species by overall percentage occurence in counts on IPHC fishery-independent setline surveys, 2002-2017.

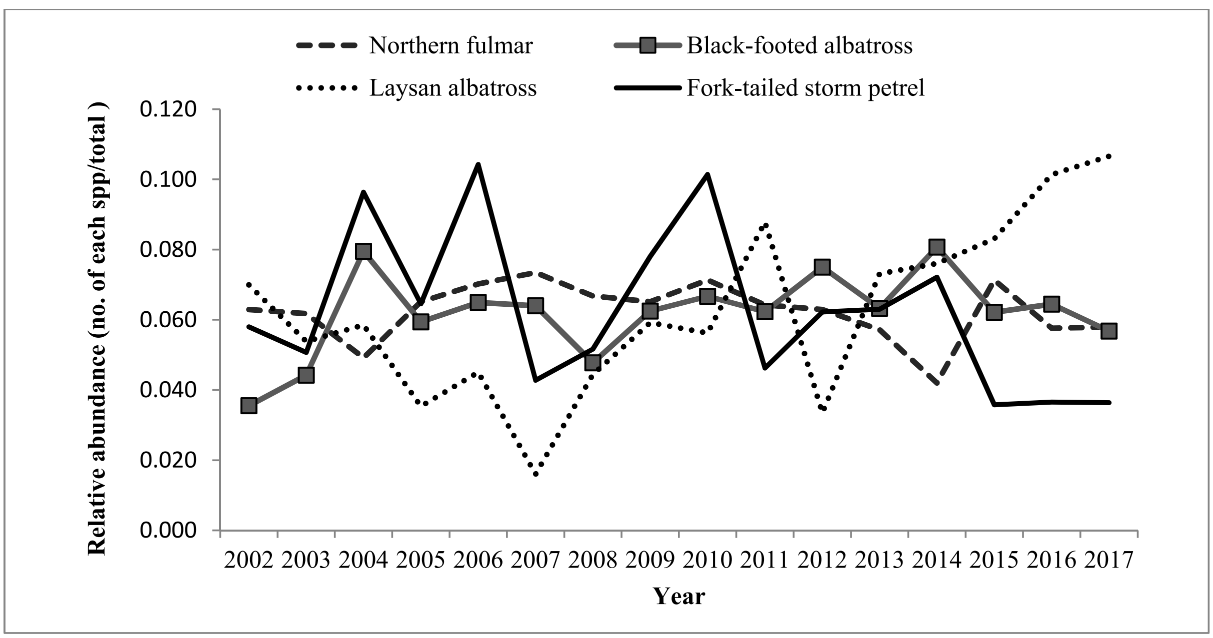

Figure 6. Relative abundance of the four most common seabird species observed on IPHC fishery-independent setline surveys, 2002-2017.

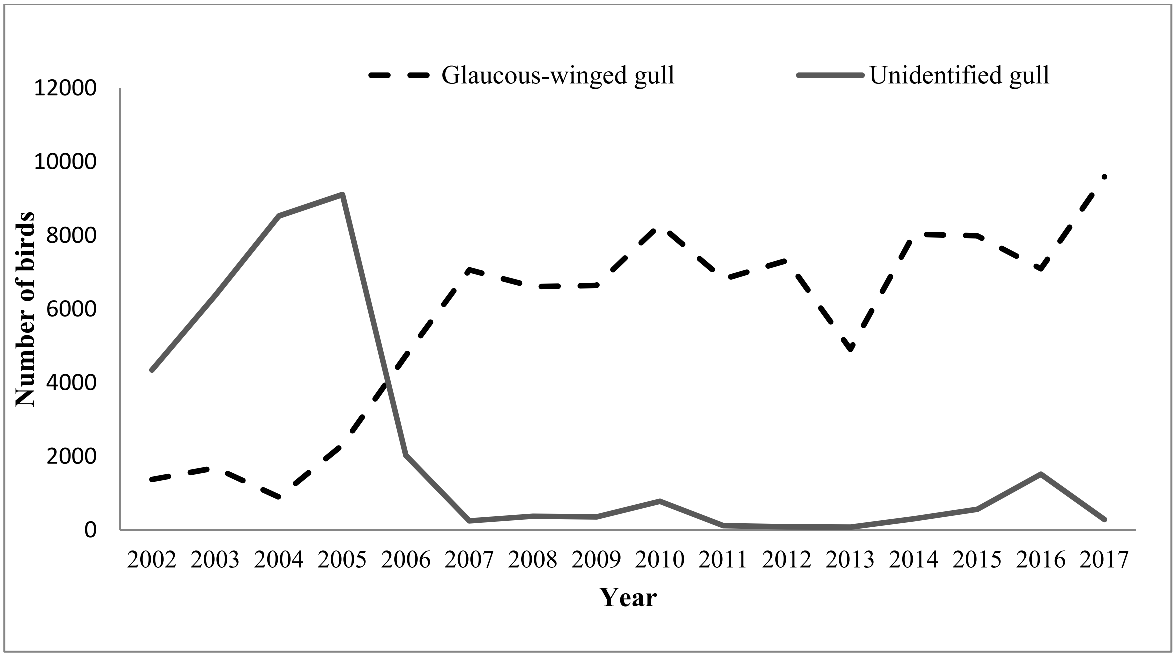

Figure 7. Glaucous-winged gull numbers versus unidentified gull numbers observed on IPHC fishery-independent setline surveys, 2002-2017.

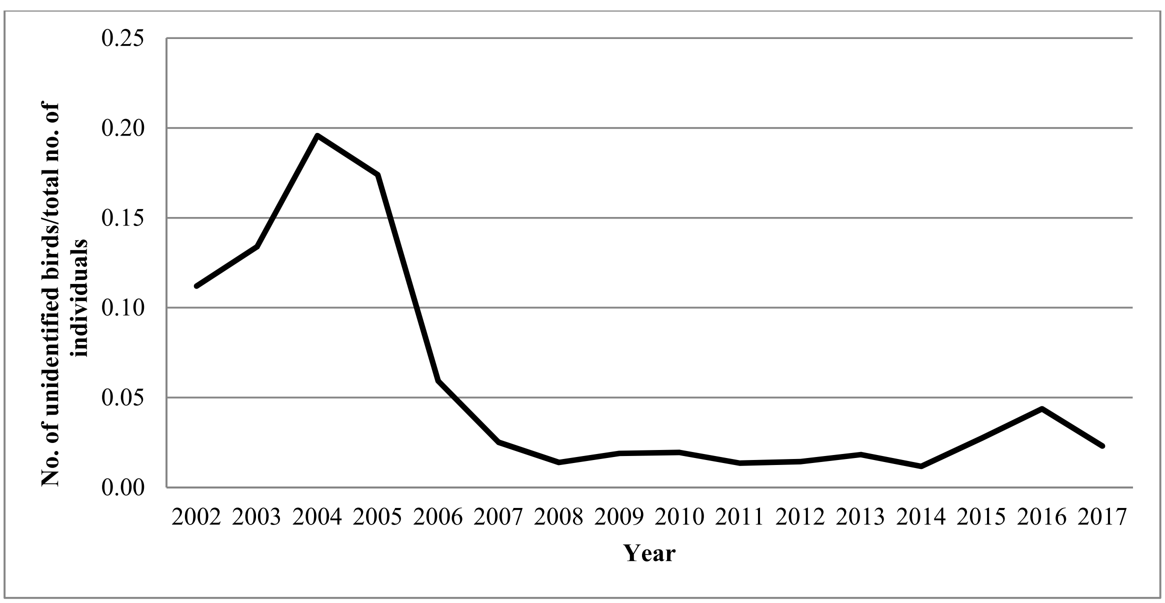

Figure 8. The ratio of number of unidentified seabirds to total individuals observed on IPHC fishery-independent setline surveys, 2002-2017.

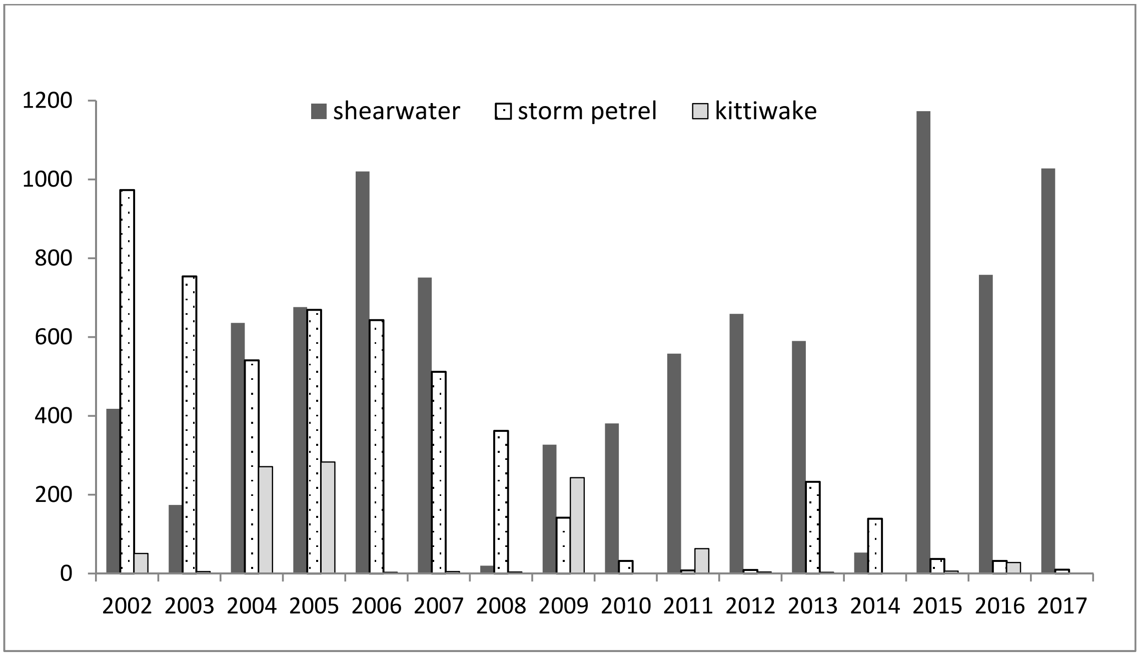

Figure 9. The most common unidentified seabird species by year, 2002-2017.

3.1 Executive Summary

Jamie Goen

Fishery-independent surveys produce important, high-quality abundance and trend information for assessment and management of the Pacific halibut stock. The International Pacific Halibut Commission (IPHC or Commission) has conducted fishery-independent setline surveys (FISS) in selected areas during most years since 1963, and has carried out a coast-wide survey with a consistent sampling design since 1998. The IPHC has also taken part in the National Marine Fisheries Service (NMFS) Bering Sea groundfish trawl survey since 1998 and the NMFS Aleutian Islands trawl survey since 2012. These two NMFS surveys contribute Pacific halibut data from areas either poorly covered or not covered by the Commission's own fishery-independent survey. In Chapter 3.1, we report on the results of the IPHC and the NMFS surveys, as well as analysis of data derived from them.

In Chapter 3.2, we document the IPHC fishery-independent setline survey for 2017, including design, implementation, and a synopsis of the additional special research projects conducted during the survey. The IPHC fishery-independent setline survey completed the fourth year in a series of planned survey expansions that will eventually cover all regulatory areas. For 2017, the expanded survey was in IPHC Regulatory Areas 2A and 4B. Chapter 3.3 describes the results of the IPHC's space-time modeling of weight per unit effort (WPUE) and numbers per unit effort (NPUE) from the IPHC's fishery-independent setline survey, including these expansions. This modeling approach was introduced in 2016 and is a clear improvement over the previous empirical method, as it makes greater use of the information within the data, and better accounts for uncertainty in the estimation. Chapter 3.3 also includes an evaluation of the need for future survey expansions in IPHC Regulatory Areas 2A and 4A.

Finally, data on Pacific halibut from the two NMFS trawl surveys in the Bering Sea and the Gulf of Alaska are described in Chapter 3.4.

3.2 Fishery-Independent Setline Survey (FISS) design and implementation in 2017, including current and future expansions (IPHC-2018-AM094-06)

Jamie Goen, Tracee Geernaert, Ed Henry, Eric Soderlund, Aaron Ranta, Tom Kong, Joan Forsberg

This paper was prepared for the 2018 International Pacific Halibut Commission (IPHC) Annual Meeting (IPHC-2018-AM094-06) and can be found on the IPHC website Annual Meeting page.

3.3 Space-time modelling of IPHC fishery-independent setline survey data (IPHC-2018-AM094-07)

Raymond Webster

The following subjects were described in a paper that was prepared for the 2018 IPHC Annual Meeting (IPHC-2018-AM094-07) and can be found on the IPHC website Annual Meeting page.

Subjects include:
- Results of space-time modelling of WPUE and NPUE time series
- Results of fishery-independent setline survey expansions in Regulatory Areas 2A and 4B in 2017
- Evaluating the need for future fishery-indpendent setline survey expansions in Regulatory Areas 2A and 4A.

3.4.1 Results from the Bering Sea NMFS trawl survey in 2017

Lauri L. Sadorus[1], Robert Lauth[2], Aaron Ranta[1]

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Abstract

The National Marine Fisheries Service groundfish trawl survey has taken place since 1979 and the International Pacific Halibut Commission (IPHC) has participated in the survey on an annual basis since 1998 by directly sampling Pacific halibut from survey catches. The 2017 standard survey took place aboard two vessels from 31 May to 7 August and an additional trip to sample the northern Bering Sea extended the survey to 31 August. IPHC field biologists were deployed on the *F/V Vesteraalen* for all trips. Lengths were collected for all Pacific halibut, and wire-tagged fish were released from the *Vesteraalen* and the *F/V Alaska Knight*. On the vessel staffed by IPHC, a total of 1,259 Pacific halibut were encountered. The Pacific halibut caught were randomly divided into two groups: one for biological sampling and and another one for tagging. In the tagging group, only those fish < 82 cm fork length were tagged and released while the remainder were measured and released as soon as possible. A total of 619 Pacific halibut otoliths were collected along with sex, maturity, and prior hooking injury information, and 503 fish were tagged and released. Tagging on the non-IPHC staffed vessel was more opportunistic due to logistical issues, and resulted in 252 Pacific halibut released. One hundred ninety-nine tissue samples for energetics analysis were obtained from a portion of the fish sampled for otoliths and fin clips for genetic analysis were obtained from both those energetics sample and all tagged Pacific halibut on the IPHC-staffed vessel. The Bering Sea abundance estimate was 53 million fish which represents a decline from 2016. The total biomass was estimated at 279 million pounds which continues a declining trend that began in 2011.

Introduction

The National Marine Fisheries Service (NMFS) has conducted annual bottom trawl surveys on the eastern Bering Sea (EBS) continental shelf since 1979. The survey was standardized in 1982 and an International Pacific Halibut Commission (IPHC) field biologist has been deployed on the survey every year since 1998 to collect Pacific halibut (*Hippoglossus stenolepis*) samples. The IPHC operates a coastwide longline survey as the primary fishery-independent source of data for the Pacific halibut stock assessment (Henry et al. 2017). However, Pacific halibut occupy a vast area of the Bering Sea shelf for which the IPHC lacks the financial resources to sample in its entirety on a regular basis. Therefore, in most years, the NMFS trawl survey is the only measure of abundance for much of this area. This paper presents abundance and biomass estimates for the EBS for the years 1982-2017, age composition for 2016 and 2017, and results from the 2017 survey.

Survey trawl gear has different size selectivity than setline gear, making it necessary to apply a selectivity curve to include these data directly in the Pacific halibut stock assessment that is generated by the IPHC. Pacific halibut are vulnerable to the trawl from about 20-100 cm fork length (FL)

(Clark et al. 1997), but a substantial portion of the commercial-sized population (O32 or ≥ 81.3 cm FL) exceeds 100 cm. In 2006, and again in 2015, the IPHC added shelf stations to its setline survey in the Bering Sea region in order to compare information from these stations with data collected on the NMFS trawl survey. After the study in 2006, the IPHC staff concluded that the trawl survey, along with periodic IPHC survey calibrations, provided an adequate accounting of Pacific halibut biomass on the EBS shelf (Clark and Hare 2007) and is a useful tool for constructing a population-density index for the IPHC stock assessment (Webster 2014). The 2015 calibration confirmed this earlier finding. In addition to its use as a stock assessment tool, trawl survey information is useful as a forecasting tool for cohorts approaching recruitment into the commercial fishery.

In 2017, an IPHC sampler was placed aboard the EBS trawl survey for the 20th consecutive year. Two chartered fishing vessels, *F/V Vesteraalen* and *F/V Alaska Knight*, were each staffed by six scientific crew members. The scientists carried out objectives related to stock assessment and year-class strength estimation for numerous species. The IPHC biologist was deployed on the *F/V Vesteraalen* to sample the Pacific halibut caught and to help NMFS personnel achieve their survey goals.

Objectives

The main objectives for the IPHC biologist in 2017 were:

- Record the fork length on 100% of the Pacific halibut caught on all standard groundfish tows;
- Collect sex, maturity, and prior hooking injury (PHI) data on 50% of the catch;
- Assess viability using NMFS observer criteria on the other 50% of the catch, and subsequently wire tag and release all those individuals that were determined to be viable and that were < 82 cm fork length. Measure and release those ≥ 82 cm fork length as soon as possible;
- Obtain tissue samples from a subsample of Pacific halibut for energetics analysis;
- Obtain fin clips from all tagged Pacific halibut and from the subsample of Pacific halibut selected for tissue samples.

The primary NMFS objective was to continue the annual series of crab and groundfish assessment surveys for the eastern Bering Sea to provide information to the following groups:

- The North Pacific Fishery Management Council for understanding the distribution, abundance, and biological condition of important groundfish and crab resources;
- The U.S. fishing industry for catch-per-unit-effort and size composition of commercially important groundfish species; and
- Stock assessment scientists to support ongoing studies on the biology, behavior, and dynamics of key ecosystem components.

Survey design, vessels, and itinerary

The current standard trawl survey includes 376 stations on a 20 nmi (1 nmi = 1.852 km) square grid design extending from inner Bristol Bay to St. Matthew Island, within the 200 m depth contour. The stations are placed at the center of each grid square, and additional stations are placed at the corners of grid cells in areas surrounding St. Matthew and the Pribilof Islands to better assess blue king crab (*Paralithodes platypus*) density. Additionally, in 2017, the survey extended into the northern Bering Sea which extended the range from St. Matthew Island to Norton Sound.

In 1987, twenty stations were added north of the standard survey sampling area to better assess abundance and distribution of walleye pollock (*Gadus chalcogrammus*) and snow crab (*Chionoecetes opilio*) populations. Data from these stations are included in the abundance estimates herein. From 2000 to 2004, and again from 2011 to 2012, several stations within the 0-30 m depth stratum were added to investigate the nearshore distribution of either juvenile yellowfin sole (*Limanda aspera*) or red king crab (*Paralithodes camtschaticus*). Some Pacific halibut were caught at these nearshore stations but the results were not incorporated into the NMFS abundance estimates because the stations were not part of the standard grid.

Since 1982, the EBS has been surveyed using a NMFS 83-112 Eastern trawl with a 25.3 m headrope and 34.1 m footrope. The trawl net was deployed with equipment that recorded data describing each tow. Through 2012, a Netmind[1] trawl mensuration system recorded net height and width, a Sea-Bird[2] data logger recorded temperature and depth, and a tilt sensor was used to detect when the footrope hit the bottom. In 2013, the Netmind system was replaced with the Marport[3] trawl mensuration system. A 30-minute tow was attempted at each station.

In 2017, the survey charter began on 31 May. Following several days of set-up and equipment testing, the *F/V Vesteraalen* conducted the first standard tow on 4 June. The northern extension was conducted at the end of the standard survey and the charter concluded in Dutch Harbor on 31 August.

Pacific halibut sampling in 2017

Pacific halibut were measured on all standard survey tows aboard both vessels. Pacific halibut from tows aboard the IPHC-staffed vessel were assigned randomly into one of two groups: one for biological sampling, and one for wire tagging; with the goal of assigning 50% of the fish to each group. This was achieved by laying out two fish at a time, rolling a set of dice, then assigning one fish to each group based on predetermined number designations. This step was repeated until all the fish were sorted. Fish in the tagging sample were kept briefly in a live tank while sorting was taking place, and then assessed for condition using NMFS observer criteria. Those fish with an assessment of Excellent and Poor category were outfitted with a wire tag through the operculum. Those fish assessed in the Dead category were measured and discarded. A fin clip was obtained from each tagged fish for genetic analyses. For a full description of the tagging project, see Forsberg et al. (2016).

Fish in the biological sample group were assessed for sex, maturity, and prior hooking injuries, and the otolith was removed for aging. An additional subsample was selected for the extraction of flesh samples as part of an energetics study and for fin clips which will be used for a genetics study. Northern extension stations were treated the same as standard stations for sampling. Pacific halibut caught in tows at corner crab stations, and during duplicate tows, were excluded from the regular sample.

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[2] Sea-bird Electronics Inc., 13431 NE 20th Street, Bellevue, WA, 98005.

[3] Marport Deep Sea Technologies, AIRMAR Technology Corporation, 35 Meadowbrook Drive, Milford, NH 03055, USA

Pacific halibut from the non-staffed IPHC vessel were measured for fork length and randomly divided into two groups: tagging and no sample. Tagging criteria was the same as for the IPHC-staffed vessel. Those fish in the no sample group were released. Because of vessel mechanical issues, Pacific halibut tagging was not continuous throughout the entire survey, but did take place during all trips.

Sex and maturity determinations were made via macroscopic gonad examination for each biologically sampled Pacific halibut, which is described in detail in the survey manual (IPHC 2017). Female fish were assigned to one of four stages of maturity: immature, ripening, ripe/spawning, and spent/resting. Males were assigned to one of two maturity stages: immature and mature. Immature fish, regardless of sex, were those that would not be expected to participate in the upcoming spawning season. The other stages represented various phases of the reproductive process, and fish in those categories were considered mature enough that they could participate in the upcoming spawning season.

Information concerning injuries to the mouth, jaw, or eye caused from longline gear (i.e., PHI) has been collected in recent years as part of an IPHC special project. The objective was to assess the types of PHI a fish might sustain and still survive.

Once the raw data and samples are collected at sea, there are several aspects of processing that occur to make the information useable. Pacific halibut ages are determined by reading the otoliths from each fish, and this procedure is detailed in Forsberg (2001). By 2003, all commercial and setline survey otoliths were read using the break-and-bake technique, but this procedure works better for older fish, whereas surface reading is better for the youngest fish. Therefore, trawl otoliths continue to be read using a combination of the two techniques. All Pacific halibut caught during the surveys on all vessels are measured for fork length and weighed. Swept-area estimates of abundance and biomass are calculated using these lengths and weights, the procedure for which is outlined in Clark et al. (1997) and Stauffer (2004).

Results

A total of 2,211 Pacific halibut were encountered by the two vessels during the survey (Fig. 1). A total of 235 tows were performed by the *F/V Vesteraalen* during the standard grid bottom trawl survey. On average, between four and five tows were conducted daily. The *F/V Vesteraalen* standard sample consisted of 1,194 Pacific halibut (Fig. 2). Of those, 591 otoliths were collected and 476 Pacific halibut were released with wire tags after a fin clip was collected for genetic testing. NOAA staff on the non-IPHC vessel also tagged a subsample of Pacific halibut resulting in 208 releases. Fish in the tagging sample that were > 82 cm in length were released alive if possible. Of the sampled fish caught by the *F/V Vesteraalen*, the split was 50/50 between number of females and males. Ninety-six percent of the females and 19% of the males were assessed as immature (Table 1). PHIs were found on 5.5% of the sampled fish. A total of 199 tissue samples were collected for an energetics study.

Additionally, 94 tows were made by the *F/V Vesteraalen* in the northern Bering Sea extension area. A total of 65 Pacific halibut were caught and 35 were retained for a biological sample. Of those, 71% (25) were females and 29% (10) were males (Table 2). The small sample size in the north makes comparisons difficult, but overall, Pacific halibut in the north had a larger median length of 61 cm compared to the median length in the standard survey at 51 cm. In addition, all of the females in the northern area were assessed as immature, and all of the males were assessed as mature. A total of 27 fish were tagged and released from the *Vesteraalen* and 28 from the *F/V Alaska Knight*.

Length and age distribution

Total Pacific halibut abundance in the EBS as estimated using the trawl survey catches in 2017 was 53 million fish (Fig. 3), which was a notable decrease following a stable levels over the past four years of estimates in the 62-66 million fish range. Biomass estimates continued to indicate a decline with a total in 2017 of 293 million pounds, compared to 339 million pounds in 2016. Note that the size break-outs for abundance in Figure 4 have been modified from earlier versions to better coincide with how the IPHC uses data in the stock assessment.

The 2017 survey indicated a continued decline in the overall stock in the Bering Sea and failed to indicate any large year or size classes approaching the Pacific halibut commercial fishery (Fig. 4). Very small fish (< 20 cm) were represented more strongly than usual, but mortality of these fish is high and does not necessarily indicate increased recruitment into the commercial fishery at 81.3 cm fork length. However, they are worth noting as the survey continues into the future.

The age composition for Pacific halibut sampled in both 2016 and 2017 is shown in Table 3. Ages in the samples ranged from 2-18 years, and 1-23 years for 2016 and 2017, respectively. The 5-year-olds (2011 year class) in 2016 were most abundant and represented 31% of the sample, and were the same year class that were also most abundant in the 2015 sample (Table 3a). In 2017, the 4-year-olds (2013 year class) were the largest sampled cohort making up 21% of the sample (Table 3b). Also notable in 2017 was that 5% of the fish were 1-year-olds (2016 year class), which are fish that are generally too small to be vulnerable to the trawl and are thus not often seen in the survey. Fish from the older year classes including the 2004 and 2005 year classes that once showed high abundance, have grown to a size where they are largely capable of avoiding survey trawl gear. This likely negatively influences catches of these fish (Clark et al. 1997).

In the northern Bering Sea extension, abundance estimates for 40-100 cm Pacific halibut showed a decrease from 2010 estimates, but showed slight increases in both the smaller and larger size classes (Fig. 5). Ages ranged from 4-13 years in 2017 (Table 4) which is similar to the 4-12 year range collected during the last survey in that area in 2010. Average age in 2017 was 6.4 years compared to 5.7 years in the standard survey to the south.

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Table 1. Assigned maturity status of Pacific halibut that were retained for biological sampling during the NMFS Bering Sea trawl survey in 2017. Females were assigned to one of four states: 1=immature, 2=ripening, 3=ripe/spawning, 4=spent/resting. Males were assigned to one of two states: 1=immature and 2=mature. Fish assigned to "Sex Unknown" were primarily those selected for the tagging sample.

	Females				Males				
Fork length (cm)	**1**	**2**	**4**	**Total**	**1**	**2**	**Total**	**Sex Unknown**	**Grand Total**
10-14	11			11	5		5	60	76
15-19	5			5				5	10
20-24	1			1	7		7	1	9
25-29	13			13	8		8	21	42
30-34	5			5	5	1	6	8	19
35-39	25			25	21	9	30	22	77
40-44	55			55	10	54	64	94	213
45-49	22			22		37	37	53	112
50-54	37			37	2	55	57	89	183
55-59	40			40		31	31	64	135
60-64	30			30		14	14	43	87
65-69	9	1		10		12	12	27	49
70-74	8			8		17	17	24	49
75-79	9			9		10	10	22	41
80-84	9			9		6	6	14	29
85-89	3			3		2	2	9	14
90-94	6	2	1	9		1	1	6	16
95-99	3	4		7		1	1	6	14
100-104	2			2				4	6
105-109	2	1	1	4				1	5
110-114		1		1					1
115-119								3	3
120-124			1	1				1	2
125-129								1	1
130-134								1	1
Grand Total	**295**	**9**	**3**	**307**	**58**	**250**	**308**	**579**	**1,194**

Table 2. Assigned maturity status of Pacific halibut that were retained for biological sampling during the NMFS Bering Sea trawl survey northern extension in 2017. Females were assigned to one of four states: 1=immature, 2=ripening, 3=ripe/spawning, 4=spent/resting. Males were assigned to one of two states: 1=immature and 2=mature. Fish assigned to "Sex Unknown" were those selected for the tagging sample.

	Females		Males		Sex	Grand
Fork length (cm)	**1**	**Total**	**2**	**Total**	**unknown**	**Total**
30-34			1	1		1
45-49					4	4
50-54	2	2			2	4
55-59	6	6	4	4	7	17
60-64	7	7			4	11
65-69	4	4	5	5	5	14
70-74	3	3			2	5
75-79	1	1			3	4
80-84	2	2				2
85-89					1	1
95-99					1	1
105-109					1	1
Grand Total	**25**	**25**	**10**	**10**	**30**	**65**

Table 3. Pacific halibut mean fork length (FL; cm) and age (years) composition from sampled fish for the a) 2016 and b) 2017 NMFS Bering Sea trawl survey standard grid.

a)

Age	Avg FL (cm)	Std dev FL (cm)	# fish aged	Year class
2	29.1	2.47	13	2014
3	33.4	6.10	60	2013
4	45.6	3.79	140	2012
5	49.2	3.93	161	2011
6	52.8	5.57	43	2010
7	64.0	5.29	14	2009
8	65.8	9.92	24	2008
9	68.5	7.23	11	2007
10	71.0	11.63	6	2006
11	76.6	15.67	11	2005
12	79.9	15.15	17	2004
13	89.0	10.93	11	2003
14	85.1	7.65	7	2002
15	86.7	5.03	3	2001
17	84.0	n/a	1	1999
18	89.0	n/a	1	1998
26	97.0	n/a	1	1990
Total	51.4	14.93	524	

b)

Age	Avg FL (cm)	Std dev FL (cm)	# fish aged	Year class
1	12.9	1.48	30	2016
2	24.5	3.00	12	2015
3	37.9	5.49	86	2014
4	42.3	4.64	122	2013
5	52.0	4.17	95	2012
6	55.6	4.48	82	2011
7	61.0	8.62	33	2010
8	66.1	8.97	14	2009
9	70.7	9.47	18	2008
10	68.0	10.04	20	2007
11	75.6	8.35	11	2006
12	83.0	10.07	20	2005
13	89.9	10.40	10	2004
14	84.5	14.73	8	2003
15	84.7	15.02	7	2002
16	95.3	10.60	3	2001
17	77.0	n/a	1	2000
23	91.0	n/a	1	1994
Total	51.1	18.06	573	

Table 4. Pacific halibut mean fork length (FL; cm) and age (years) composition from sampled fish for the northern Bering Sea extension in 2017.

Age	Avg FL (cm)	Std dev FL (cm)	# fish aged	Year class
4	55.0	7.07	2	2013
5	58.4	3.81	8	2012
6	64.6	4.50	8	2011
7	68.7	12.66	3	2010
8	60.5	6.36	2	2009
9	83.0	n/a	1	2008
12	68.0	n/a	1	2005
13	68.0	n/a	1	2004
Total	63.1	7.83	26	

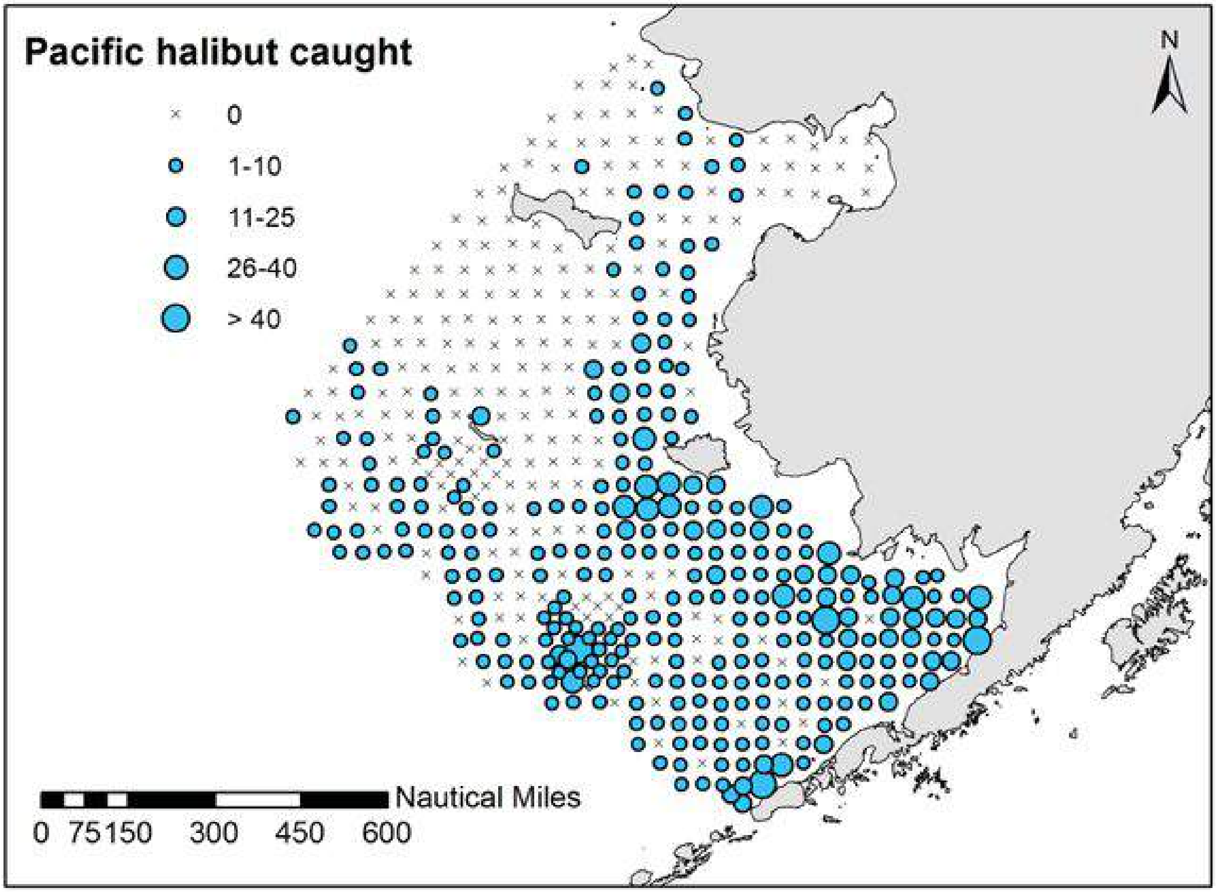

Figure 1. Number of Pacific halibut encountered at each survey station, by both vessels, during the 2017 NMFS Bering Sea trawl survey. Note that in 2017, additional stations were surveyed to the north of the standard grid (aka northern extension). Stations with an X indicate that no Pacific halibut were encountered.

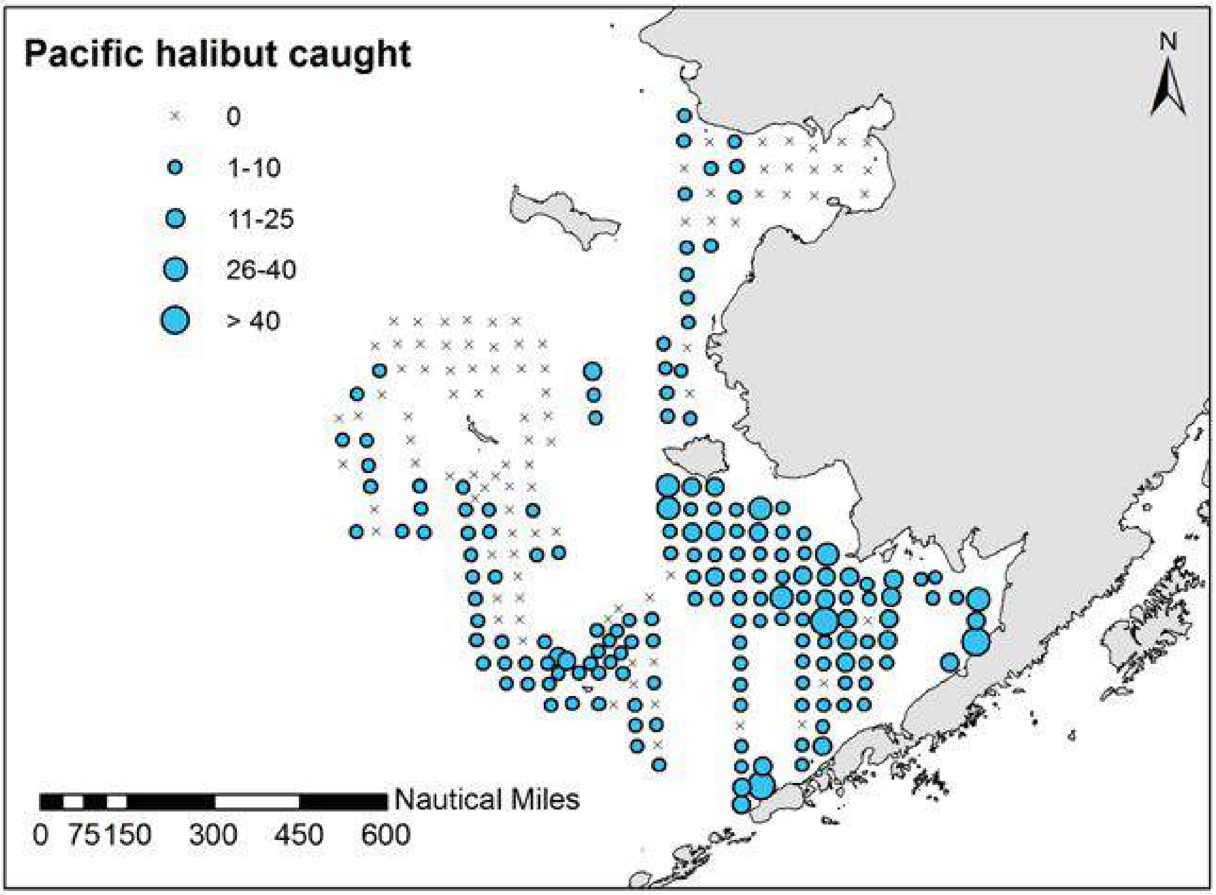

Figure 2. Number of Pacific halibut encountered by the *F/V Vesteraalen* during the 2017 NMFS Bering Sea trawl survey and subject to biological sampling or tagging. Stations with an X indicate that no Pacific halibut were encountered. Note that each station in the Bering Sea was occupied by only one vessel so while catches for each vessel were roughly representative of the area as a whole, sampling and tagging were not necessarily in proportion to abundance on a smaller spatial scale.

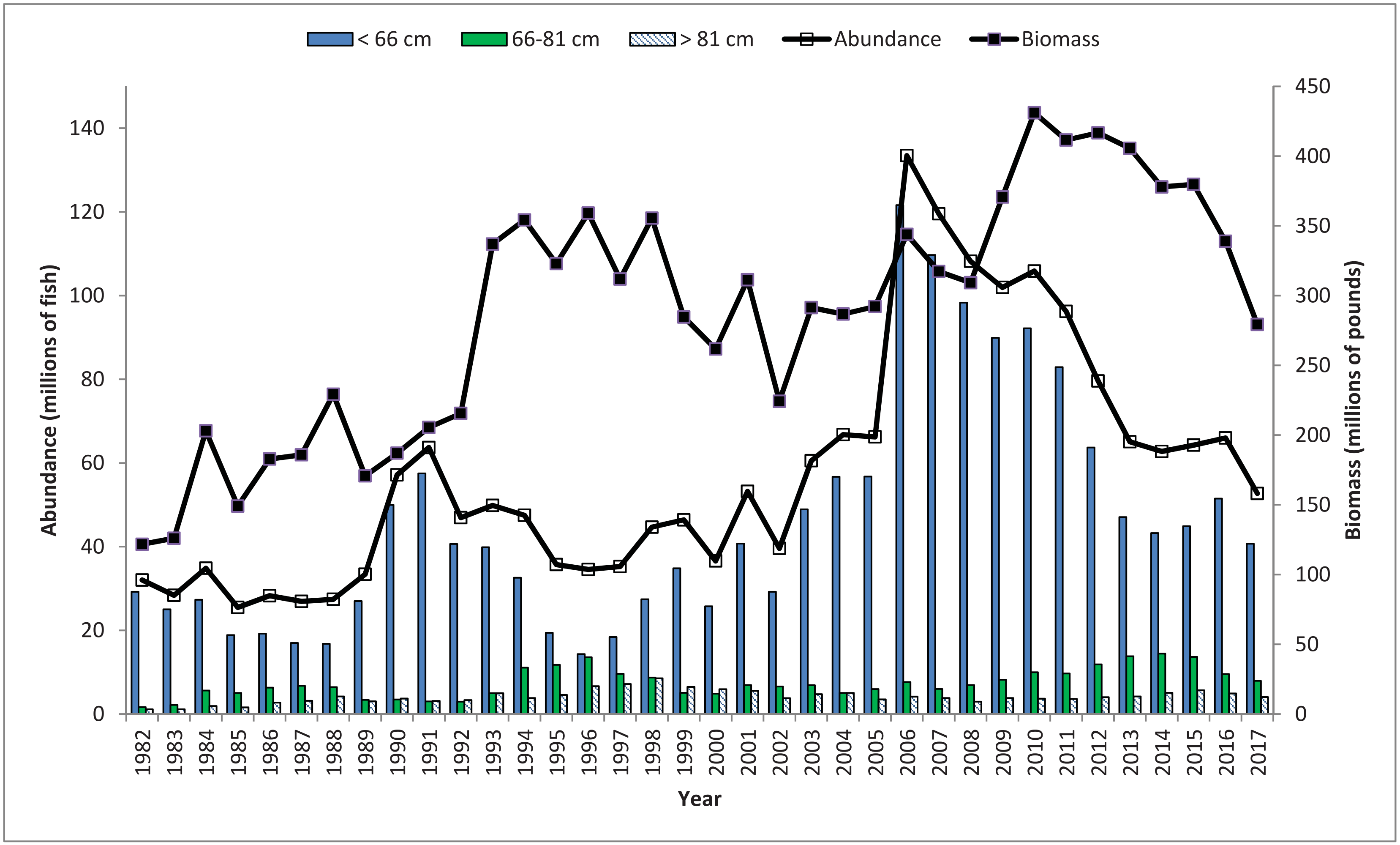

Figure 3. Abundance (numbers of fish) of Pacific halibut by length category and total biomass (pounds) as estimated by the NMFS Bering Sea standard trawl survey data from 1982-2017, using swept-area estimates.

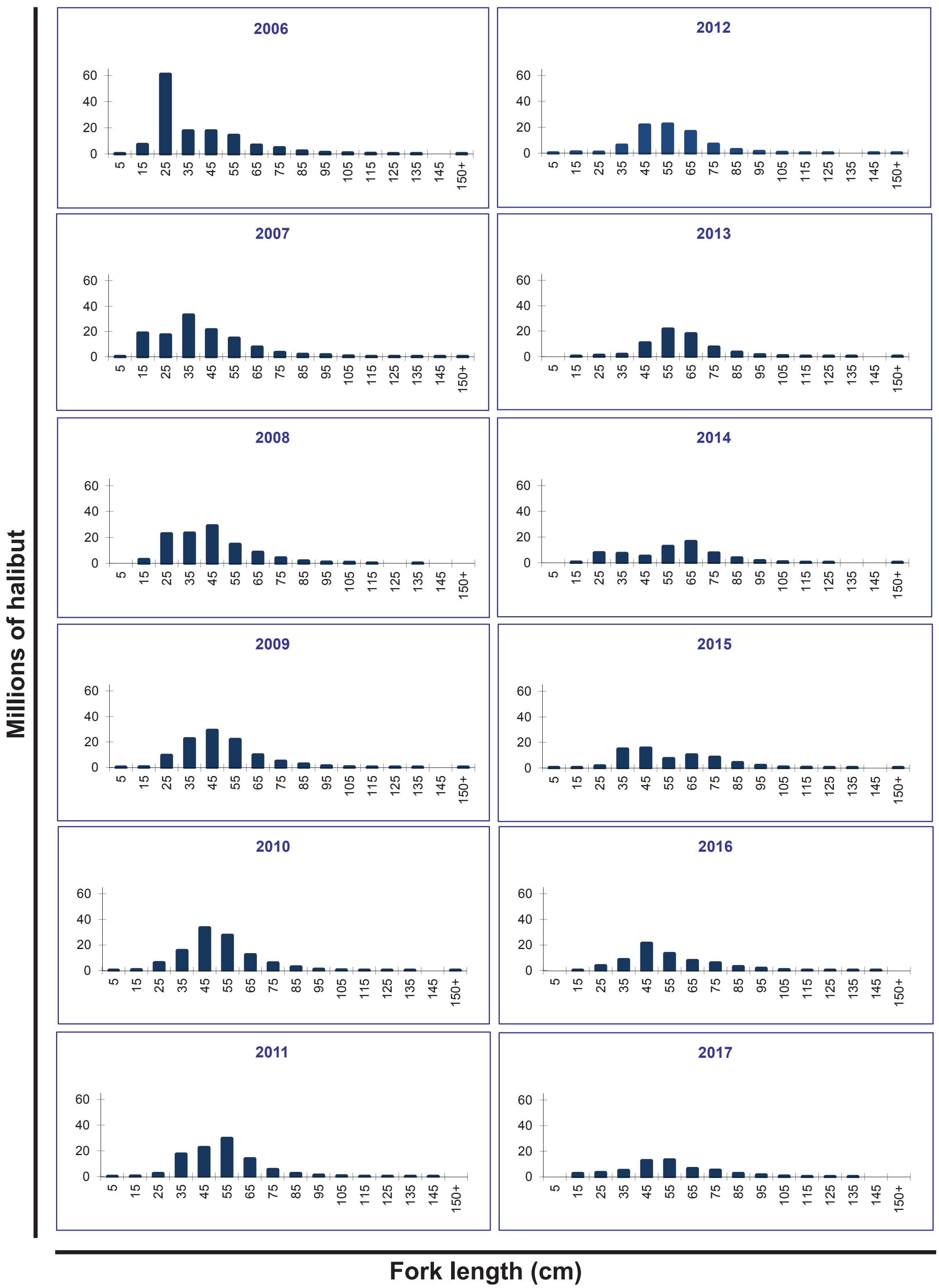

Figure 4. Pacific halibut abundance by 10-cm size bin in the Bering Sea as estimated by the NMFS Bering Sea standard trawl survey for the years 2005-2017. Note: Horizontal axis is fork length (cm) and the values showing on the graph represent the mid-point of each bin; vertical axis is millions of Pacific halibut.

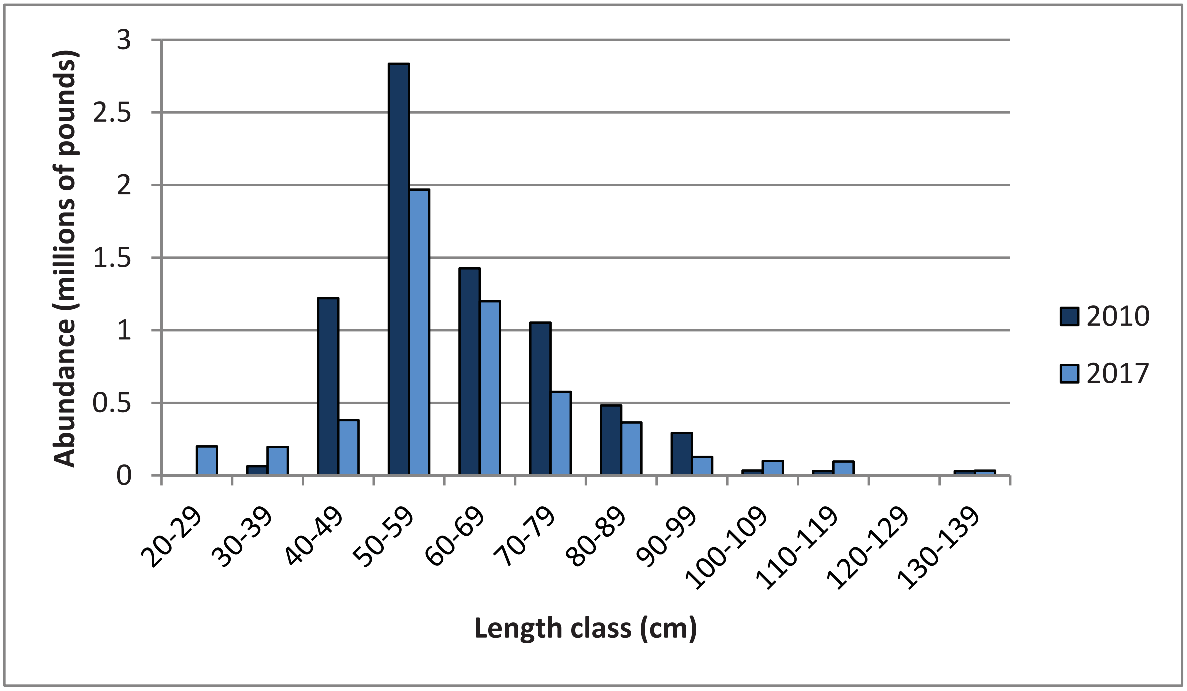

Figure 5. Estimated Pacific halibut abundance (number of fish) in the northern Bering Sea extension area surveyed in 2010 and 2017.

3.4.2 Results from the 2017 NOAA Fisheries Service Gulf of Alaska trawl survey

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Abstract

The NOAA Fisheries Service, Alaska Fisheries Science Center, conducted a bottom trawl survey of Gulf of Alaska groundfish and invertebrate resources in 2017 as a continuation of a series started in 1984. This survey is the tenth since changing the series from triennial to biennial in 1999. An International Pacific Halibut Commission biologist was deployed on one vessel for the duration of the survey to sample Pacific halibut for length, sex, maturity, otoliths, and prior hooking injuries. A total of 1,685 Pacific halibut were caught by the *F/V Ocean Explorer* and of those, 886 were sampled for length, otoliths, sex, maturity, and prior hooking injuries. The remaining 799 were measured and, if in suitable condition and < 82 cm fork length, were tagged and released, resulting in 713 total tag releases. Both abundance and biomass estimates declined slightly from 2016 values to 114 million Pacific halibut and 658 million pounds, respectively.

Introduction

The NOAA Fisheries Service (NFS) conducts bottom trawl surveys in the Gulf of Alaska (GOA) from the Islands of Four Mountains in the western GOA to Dixon Entrance in southeast Alaska. NFS scientists routinely collect catch and length data for Pacific halibut (*Hippoglossus stenolepis*), but since 1996 an International Pacific Halibut Commission (IPHC) biologist has been aboard these surveys to collect additional information. Survey trawl gear is size selective, making the data collected difficult to include directly in the stock assessment generated by the IPHC. Pacific halibut are vulnerable to the trawl from about 20-100 cm fork length (FL) (Clark et al. 1997), but a substantial portion of the commercial-sized population (O32 or ≥ 81.3 cm FL) exceeds 100 cm in FL. However, the trawl survey results provide a valuable comparison tool for the stock assessment, help identify trends in size-at-age, and are a useful index for assessing the relative abundance of cohorts approaching the commercial fishery.

The main objective of the survey as a whole was to gather data to extend this time series for monitoring trends in distribution, abundance, and biological condition of various groundfish stocks in the northeast Pacific Ocean. In 2017, two fishing vessels were chartered to carry out the survey. Each vessel was staffed with a crew of six scientists and a professional fishing crew and captain.

An IPHC sampler was aboard one of the vessels to collect detailed Pacific halibut data and to assist the NFS scientific crew in attaining their survey goals. The main objectives for the IPHC biologist in 2017 were:

- record the FL on 100% of the halibut caught on all standard groundfish tows;
- collect sex, maturity, and prior hooking injury (PHI) data as well as otoliths on 50% of the catch;

- assess viability using NFS observer criteria on the other 50% of the catch, and subsequently tag and release all those individuals that were < 82 cm in FL and determined to be suitable for tagging.

This report describes the results of the 2017 GOA trawl survey and also updates trawl-survey-based abundance and biomass estimates for the area.

Survey area, vessels, and itinerary

The NFS has conducted a triennial GOA continental shelf survey since 1984, and beginning in 1999 this area has been surveyed biennially. The survey region extends from the Islands of Four Mountains (170˚ W longitude x 53˚ 30' N latitude) to Dixon Entrance (132˚ W longitude x 54˚ N latitude). The primary NFS objective for the survey is to define the distribution and relative abundance of various groundfish and invertebrate species (von Szalay et al. 2016). Due to budget and manpower issues, the 2001 survey was truncated to include only the area from the Islands of Four Mountains to Montague Island (147˚ 30' W longitude x 60˚ N latitude) at the entrance of Prince William Sound. The full range survey was restored in 2003.

The 1993, 1996, and 2001 surveys placed stations at depths ranging between approximately 20 and 500 m. The 1999 and later surveys were extended into deeper waters of the GOA continental slope, to as deep as 1000 m, subject to budget and time constraints. The survey is conducted in the summer months (May to August) and given the fact that trawl gear catches smaller halibut relative to other methods such as longline, and smaller halibut are generally found on more shallow grounds than their larger counterparts, the variation in maximum depth has not appeared to affect Pacific halibut data collection.

A total of 536 stations were successfully completed during the 2017 survey. Two chartered vessels participated: *F/V Sea Storm and F/V Ocean Explorer*. The IPHC sampler was aboard the *F/V Ocean Explorer* for the duration of its survey operations.

The scientific crew boarded the *F/V Ocean Explorer* on May 24th in Dutch Harbor, AK and spent several days setting up and calibrating equipment. The first survey tow was conducted on May 30th. Four legs were conducted with ports of call in Sand Point, Kodiak, and Seward, AK. The final tow was made on August 5th and the vessel arrived in the final port of Ketchikan, AK that same day.

Survey design

The survey area was divided into 59 strata based on depth, major geographic features, and International North Pacific Fisheries Commission (INPFC) statistical areas (Fig. 1). The survey design was a stratified random sampling scheme based on a Neyman optimum allocation strategy utilizing data from previous surveys (Stauffer 2004; Clark et al. 1997). The number of samples to be taken within each stratum was based primarily on distribution and abundance estimates of groundfish from prior surveys and the relative commercial value of the major groundfish species. At least two samples were required from each stratum. The entire survey area was overlaid with a 5x5 km (25 km^2) grid. The station locations within each stratum, larger than 5 km^2, were randomly selected without replacement from all grid cells, or portions of grid cells. Grid cells that had been deemed not suitable for trawling in previous surveys were also excluded from the selection. The stations allocated to each stratum were then assigned to the survey vessels. Beginning with the

1996 survey, a 15-minute tow at a speed of 3 nmi/hr was attempted at each designated station. Prior to that year, a 30-minute tow conducted at the same speed was attempted. Both vessels started sampling at the western end of the survey area and proceeded eastward.

The bottom trawl used for all survey sampling was NMFS's standard Poly Nor'Eastern trawl equipped with rubber bobbin roller gear (Stauffer 2004). This trawl has a 27.2 m headrope and a 36.7 m footrope consisting of a 24.9 m center section with adjacent 5.9 m "flying wing" extensions. Accessory gear for the trawl includes 54.9 m triple dandylines and 1.8 x 2.7 m steel V-doors weighing 850 kg each.

Electronic sensors were attached to the trawl net to record data about each tow: acoustic sensors recorded net height and width while fishing; a bathythermograph[1] recorded temperature and depth; and a bottom contact sensor detected when the footrope was in contact with the bottom.

All tows were given a success rating based on whether the following operational guidelines for successfully completing a standard survey tow were met:

- Each tow's duration was at least 10 minutes (distance fished approximately 0.74 nmi (1.4 km) at a speed of approximately 3 knots) unless an extremely large catch altered the fishing configuration of the net. An appropriate length of trawl warp (towing wire) was deployed as specified in the standard survey scope table (Stauffer 2004).
- The goal of each tow was to not exceed 20 m of depth change over the 15-minute towing period. In areas where this was not possible, trawl warp was adjusted prior to the tow to reflect the change in depth.
- Net mensuration indicated fishing gear was operating within acceptable limits, taking into account that the net width tends to increase and net height decreases with increased warp lengths.
- Survey gear maintained continuous contact with the bottom.
- There were no significant hang-ups, gear damage, or gear conflicts.

Halibut sampling

All Pacific halibut caught on the surveys aboard all vessels were measured for fork length. All fish caught by the IPHC-staffed vessel, *F/V Ocean Explorer*, were assigned randomly into one of two groups: one for biological sampling, and one for wire tagging, with the goal of assigning 50% to each group. This was achieved by laying out two fish at a time, rolling a set of dice, and assigning one fish to each group based on predetermined number designations. Pacific halibut in the tagging sample were measured and if fork length was < 82 cm, they were then assessed for fitness using NMFS observer viability criteria. All those in the "excellent" and "poor" categories were tagged and released. Those assessed in the "dead" category were measured and discarded. Pacific halibut ≥ 82 cm FL and in the tagging sample were released. For a full description of the tagging project, see Forsberg et al. (2016). Fish in the biological-sample group were assessed for sex, maturity, PHI, and the otolith was removed for aging. The sex and maturity stage of each sampled fish was determined by macroscopic examination of the gonads. Female fish were classified into four stages of maturity: immature, ripening, ripe/spawning, and spent/resting. Males were classified into two maturity stages: immature and mature. Immature for both sexes meant that the fish was not expected to participate in upcoming winter spawning. The other stages represented

[1] Sea-bird Electronics Inc., 13431 NE 20th Street, Bellevue, WA, 98005.

various phases of the reproductive process and fish in those categories were considered mature enough that they could participate in the upcoming spawning season.

A PHI is an injury to the mouth, jaw, or eye caused from longline gear. PHI assessments have been collected for several years as part of an IPHC special project designed to look at types of hooking injuries a fish might sustain and still survive as well as to obtain injury rates in relation to geography and proximity to other fisheries. Each fish is given an injury rating (which includes none, minor, moderate, and severe) based on pre-determined criteria.

Relative biomass and abundance estimates were derived by calculating a mean population density of Pacific halibut for each stratum, multiplying the mean density by the stratum area, and then summing across strata (Clark et al. 1997). Estimates are not adjusted for size-specific selectivity, so the reader should exercise caution when drawing conclusions regarding fish that are underrepresented in the trawl survey, i.e., Pacific halibut less than about 20 cm and greater than about 90-100 cm in length. The results are reported by INPFC regions (Fig. 1), which are the area designations that are used by NFS to present their survey results. For comparison, INPFC regions correspond with IPHC regulatory areas as follows: *Shumagin* encompasses the eastern portion of IPHC Regulatory Area 4A and western Area 3B; *Chirikof* is almost completely contained within Area 3B, with the exception of a very small portion of Shelikof Strait; *Kodiak* and *Yakutat* are primarily in Area 3A; and *Southeast* corresponds to the eastern portion of Area 3A and the outside waters of Area 2C.

Pacific halibut ages are determined by reading the otoliths from each fish and this procedure is detailed in Forsberg (2001). By 2003, all commercial and setline survey otoliths were read using the break-and-bake technique but this procedure works better for older fish, whereas surface reading is better for the youngest fish. Therefore, trawl otoliths continue to be read using a combination of the two techniques. Aging of Pacific halibut in the 2017 sample has not been completed as of the writing of this report, so age composition information in this report includes through the previous survey.

2017 survey results

The *F/V Ocean Explorer* conducted 268 groundfish tows and 243 of these were successful. On average, four to six tows were attempted daily. A total of 4,645 Pacific halibut were caught and measured. Of those, 1,685 were caught by the *F/V Ocean Explorer* (Fig. 2) and were retained for either biological sampling or tagging.

Of the 886 Pacific halibut in the biological sample, 40% were female and 60% were male (Table 1). Of the females sampled, 20% were coded as mature, which is well above the ~10% observed in the past several trawl surveys. A total of 96% of the male Pacific halibut were coded as mature. All Pacific halibut in the biological sample were examined for PHI. A total of 95 fish (5.8%) showed some form of previous injury: 77 fish (4.7%) showed minor damage and 18 fish (1.1%) showed evidence of moderate damage. This is slightly higher than the ~3% PHI observed in recent GOA trawl surveys.

Within the tagging sample of 799 Pacific halibut, those assessed as being in either "excellent" or "poor" condition, and that were < 82 cm FL, were tagged and released. This resulted in 713 wire tag releases. Those determined to be "dead" or were ≥ 82 cm FL, were measured and discarded without tags (Forsberg et al. 2016).

Spatial distribution of all Pacific halibut caught on the survey by both vessels is shown in Figure 2.

Age composition, abundance, biomass, and distribution

Both the abundance and biomass estimates exhibited a fairly consistent decline beginning in 2003 with the exception of an abrupt, but short-lived increase in 2009. In 2013, the estimates began leveling off and this continued into 2017 with a slight decline from 2015 values (Fig. 3). The 2017 estimates were 114 million fish and 658 million pounds of biomass. Individual size class categories representing fish < 82 cm all exhibited the same trend as the overall, but there was a slight increase in the abundance of ≥ 82 cm fish. Recruitment at the smallest sizes which represent year classes from about 2014 to present, appears low compared to other recent survey years (Fig. 4).

The age composition for halibut sampled in 2015 is shown in Table 2. Ages in the sample ranged from 1 to 29 years. The 2005 year class continued to show strongly (9% of aged fish in the sample) despite those fish attaining larger sizes which make them less vulnerable to the trawl gear. The largest percentage of aged samples came from the 2012 and 2011 year classes which together were 38% of the sample. Mean ages and lengths of Pacific halibut by sex for the years during which Pacific halibut have been sampled (1999-present) are summarized in Table 3. In all years except 2017, females averaged slightly larger than their male counterparts. However, in all years, male average age was higher than for females. Minimum age was comparable, but maximum age of males was greater than for females in all years.

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Table 1. Maturity of Pacific halibut sampled during the NFS Gulf of Alaska trawl survey in 2017, aboard the *F/V Ocean Explorer*, as assessed by the IPHC sea sampler. For females: 1 =immature, 2=ripening, 3=ripe/spawning, and 4=spent/resting. For males: 1=immature, 2=mature, and U=unknown/could not be determined.

	Females					Males				Tagging sample	
Length (cm)	1	2	4	U	Total	1	2	U	Total	Sex unknown	Grand Total
10-14				2	2						2
15-19										1	1
20-24	1				1	1			1		2
25-29	1				1		1		1	6	8
30-34	7				7	6	2		8	7	22
35-39	7				7	4	16		20	21	48
40-44	31				31	6	51		57	71	159
45-49	60			3	63	3	76		79	136	278
50-54	50			1	51	2	85	1	88	120	259
55-59	28			1	29	1	50	2	53	77	159
60-64	16				16		49		49	64	129
65-69	12				12		51		51	52	115
70-74	14	1		1	16		48		48	70	134
75-79	14	8			22		54		54	60	136
80-84	15	18	2		35		12		12	44	91
85-89	7	13	4		24		7	1	8	38	70
90-94	6	4	2		12		2		2	12	26
95-99	2	8			10					7	17
100-104	1	3	1	1	6					3	9
105-109	3	4			7					6	13
110-114				1	1						1
120-124		1		1	2					3	5
160-164										1	1
Total	275	60	9	11	355	23	504	4	531	799	1,685

Table 2. Distribution of age (years) and average fork length (FL; cm) of Pacific halibut sampled in the 2015 NFS Gulf of Alaska bottom trawl survey.

Age (years)	Avg FL (cm)	Std Dev FL (cm)	# aged fish	Year class
1	17.4	1.82	16	2014
2	27.5	9.01	72	2013
3	35.7	4.85	381	2012
4	41.8	6.49	231	2011
5	49.6	7.34	88	2010
6	55.5	8.33	54	2009
7	59.9	6.73	93	2008
8	63.1	7.09	90	2007
9	65.0	8.12	100	2006
10	68.1	8.79	147	2005
11	69.9	8.51	99	2004
12	72.5	9.76	70	2003
13	73.6	12.90	53	2002
14	77.2	9.18	45	2001
15	77.7	7.95	23	2000
16	90.0	17.09	12	1999
17+	85.7	10.88	27	1998 and earlier
Average	53.2	18.18	1,601	

Table 3. Summary of Pacific halibut fork length (FL; cm) and age (years) observed during the Gulf of Alaska NFS trawl surveys 1999-2015. Note that mean length in this table was derived from only those fish that were also aged.

	Females					
Year	Mean FL (cm)	Std Dev FL (cm)	Mean age	Std Dev of age	Min age	Max age
1999	60.3	27.93	6.4	3.82	2	21
2001	53.8	26.37	5.7	3.92	1	21
2003	58.0	23.57	6.1	3.76	2	24
2005	62.4	21.35	6.6	3.64	2	22
2007	58.7	21.86	6.4	3.55	2	25
2009	58.1	19.09	6.6	2.82	2	23
2011	59.8	16.76	7.2	2.90	2	22
2013	60.5	18.34	8.1	3.86	2	19
2015	52.8	20.48	5.9	3.50	1	18

	Males					
Year	Mean FL (cm)	Std Dev FL (cm)	Mean age	Std Dev of age	Min age	Max age
1999	55.9	19.31	7.1	4.39	2	25
2001	52.0	21.27	6.5	4.69	2	28
2003	57.3	18.46	7.6	4.94	1	26
2005	60.7	16.46	8.2	4.92	2	30
2007	56.7	16.74	7.3	4.30	1	27
2009	55.5	14.83	7.1	3.37	2	27
2011	55.6	12.75	7.6	3.61	2	30
2013	55.3	13.26	8.3	4.06	2	33
2015	53.5	16.52	7.5	4.32	1	29

	All halibut					
Year	Mean FL	Std Dev FL	Mean age	Std Dev of age	Min age	Max age
1999	58.0	23.96	6.8	4.14	2	25
2001	52.8	23.73	6.1	4.38	1	28
2003	57.6	20.68	7.0	4.56	1	26
2005	61.4	18.71	7.5	4.48	2	30
2007	57.5	19.01	6.9	4.03	1	27
2009	56.6	16.78	6.9	3.17	2	27
2011	57.3	14.71	7.4	3.34	2	30
2013	57.4	15.75	8.2	3.98	2	33
2015	53.2	18.18	6.9	4.09	1	29

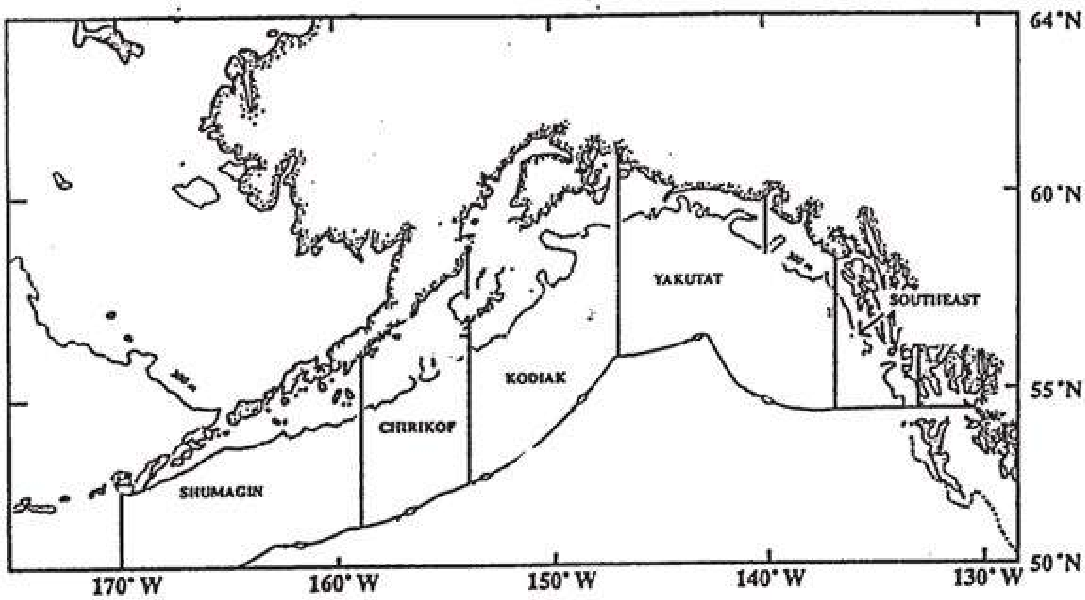

Figure 1. INPFC-defined regions in the Gulf of Alaska.

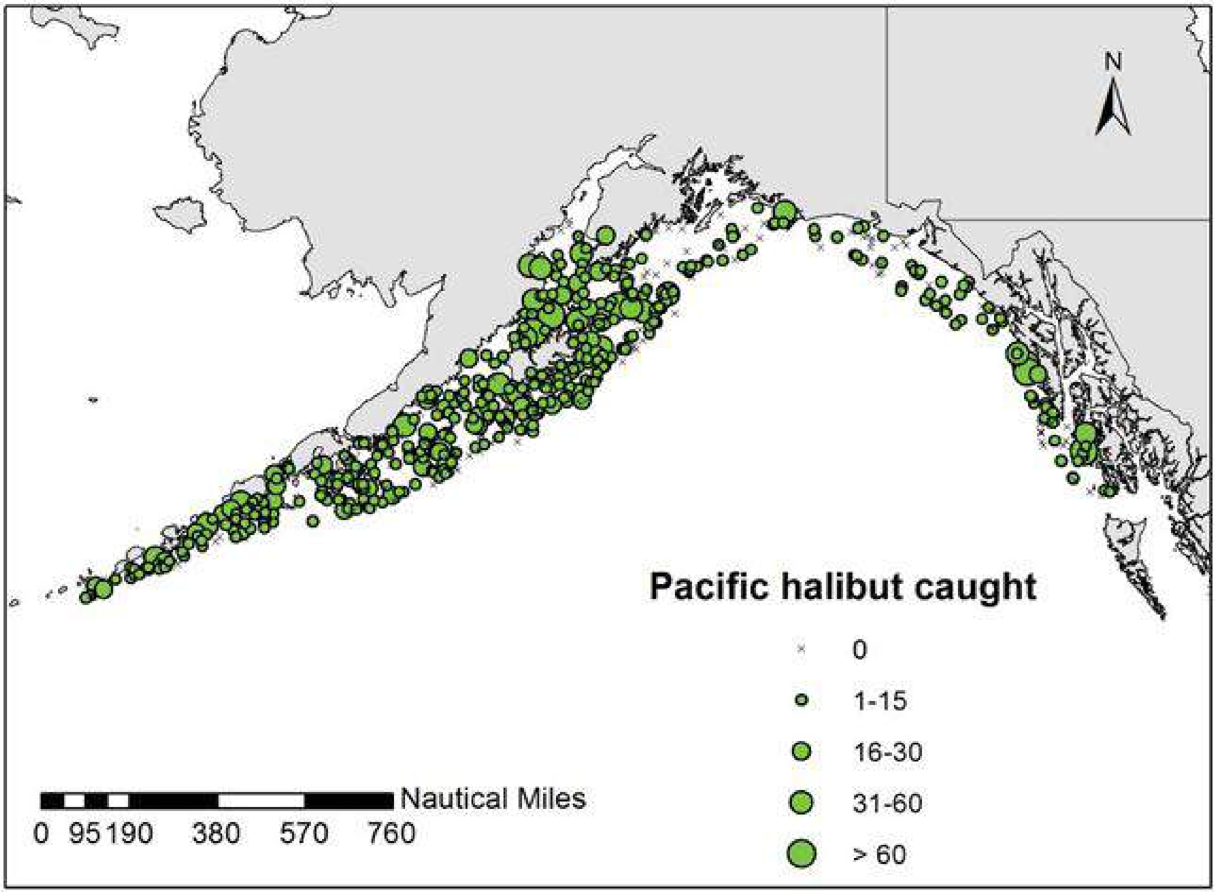

Figure 2. Spatial distribution, by location, of Pacific halibut caught by the *F/V Ocean Explorer* during the 2017 GOA bottom trawl survey.

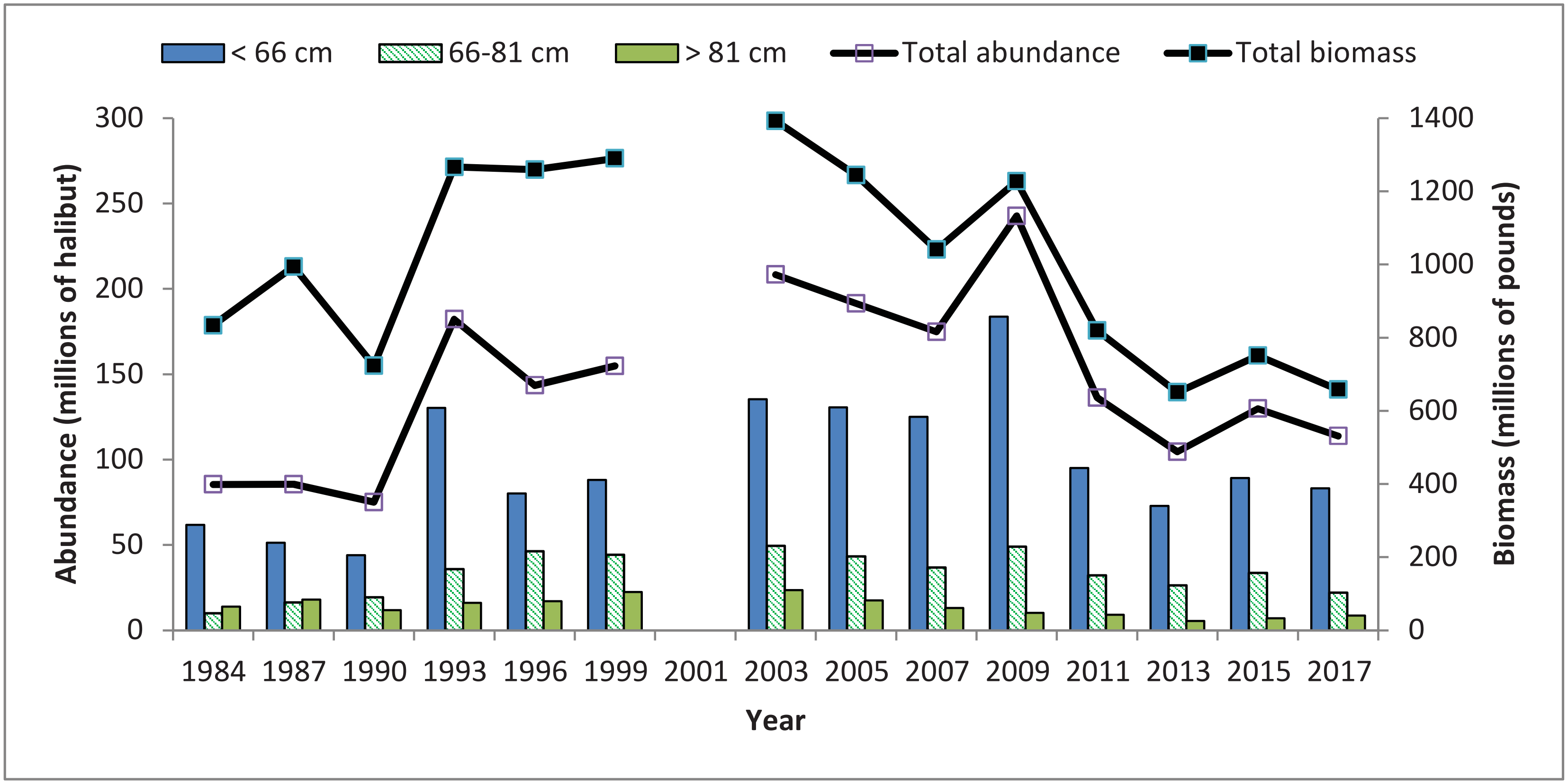

Figure 3. Estimated total abundance (millions of Pacific halibut; line with closed symbols) and abundance by size category (bars) along with total biomass (pounds; line with open symbols) for the survey years 1984-2017 as estimated using NFS Gulf of Alaska bottom trawl survey data. Note that the 2001 estimate is absent in this figure because the survey did not include all INPFC regions that year.

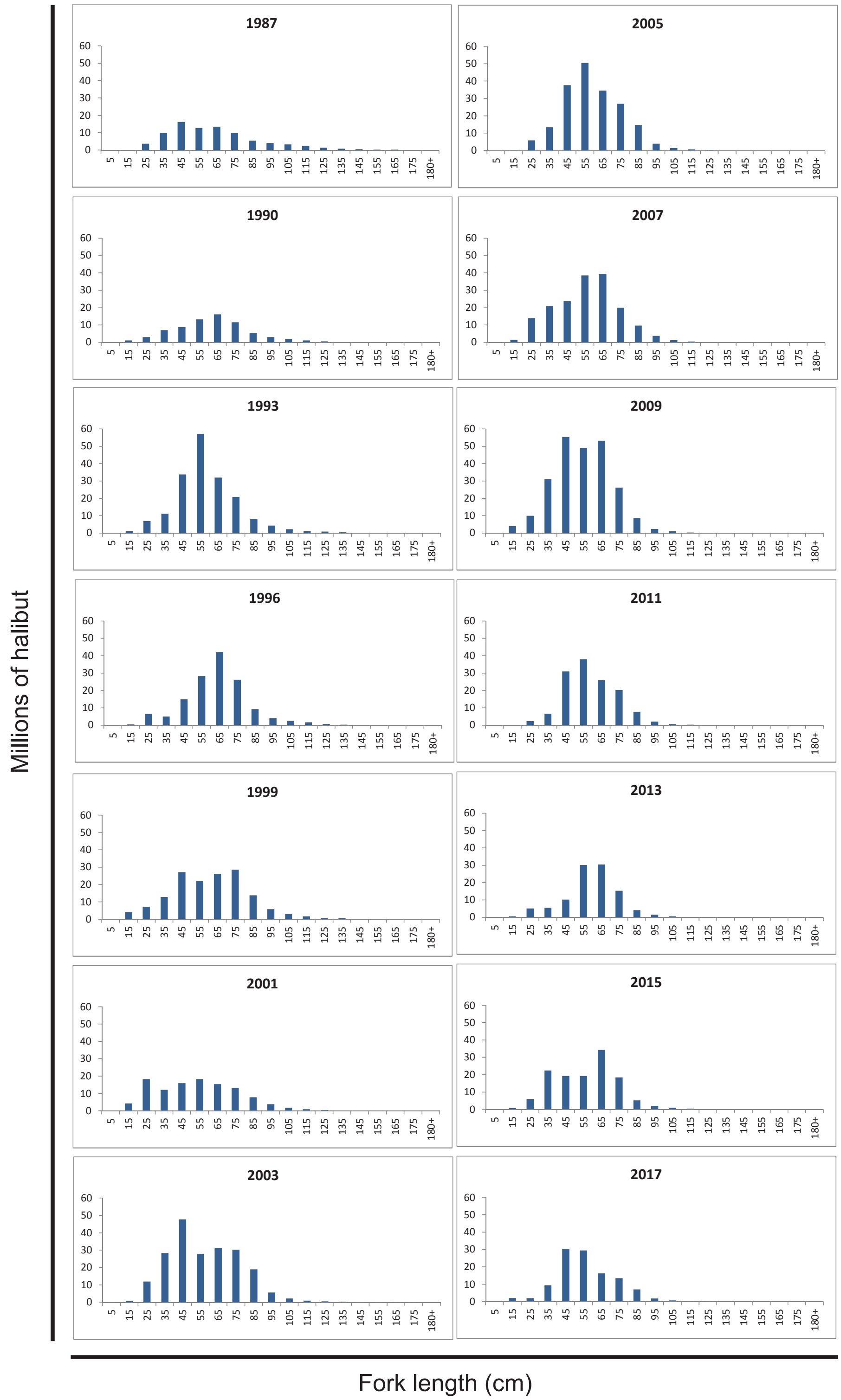

Figure 4. Pacific halibut abundance by 10- cm size bin in the Gulf of Alaska as estimated by the NFS GOA trawl survey for the years 1987-2017. Horizontal axis is fork length (cm) and the values showing on the graph represent the mid-point of each bin; vertical axis is millions of halibut. Note: The 2001 abundance estimates include only the Shumagin, Chirikof, and Kodiak regions; the Yakutat and Southeast regions were not surveyed. All other years include all areas.

To ensure that the most up to date information is available to Commissioners and stakeholders, the suite of stock assessment documents listed here are available on the IPHC website Annual Meeting page.

4.1 Summary of the data, stock assessment, and harvest decision table for Pacific halibut (*Hippoglossus stenolepis*) at the end of 2017 (IPHC-2018-AM094-08)

Ian Stewart, Allan Hicks, Raymond Webster, and David Wilson

4.2 Overview of data sources (IPHC-2018-AM094-09)

Ian Stewart and Raymond Webster

4.3 Stock assessment of the Pacific halbut stock at the end of 2017 (IPHC-2018-AM094-10)

Ian Stewart and Allan Hicks

4.4 Pacific halibut catch tables (IPHC-2018-AM094-11)

Ian Stewart

5.1 Executive Summary

Allan C. Hicks

The International Pacific Halibut Commission (IPHC) approved the formation of the Management Strategy Advisory Board (MSAB) in 2013 to oversee the Management Strategy Evaluation (MSE) process and to advise the Commission and Secretariat on the development and evaluation of candidate objectives and strategies for managing the fishery. The MSAB met twice in 2017. The first meeting (MSAB09) was held from 9-11 May and discussed the MSAB goals and objectives, the framework and design for simulations to evaluate fishing intensity, and management procedures to address distributing the TCEY. The second meeting (MSAB10), held from 23–26 October, reviewed the goals and objectives, discussed the results of the simulations examining fishing intensity, further discussed methods to distribute the TCEY, and prepared a program of work for 2018–2022. Reports from both meetings are available at the IPHC website (www.iphc.int).

Chapter 5.2 (IPHC-2018-AM094-12) provides an update of the MSE process for 2017. It is divided into six sections: goals and objectives, the framework for the simulations, scenarios and uncertainty, simulation results, ideas on distributing the TCEY, and a five-year program of work. This paper is a summary of the major progress made in 2017. For specfic details, see meeting documents from MSAB09 and MSAB10.

There are six goals defined by the MSAB: 1) biological sustainability, 2) fishery sustainability, access, and stability, 3) minimize discard mortality, 4) minimize bycatch and bycatch mortality, 5) serve consumer needs, and 6) preserve biocomplexity. The first four goals have one or more objectives associated with them, as well as corresponding performance metrics against which to evaluate each objective.

The simulation framework is composed of an operating model and a management procedure. The operating model is a representation of the population and fishery, and consists of things that we cannot, or choose not, to control. The management procedure consists of things that we can control and includes monitoring (i.e., data collection), an estimation model (i.e., the stock assessment), and a harvest rule (e.g., the fishing intensity). The results presented in 2017 assumed that the necessary observations for the harvest rule were known exactly. In other words, the management procedure had perfect information.

Uncertainty in the operating model came from many sources, including uncertainty in some parameters (e.g., natural mortality), simulated random recruitment, regime shifts that modify average recruitment, and variable size-at-age. Varaible recruitment and size-at-age were the two largest components to the overall variability.

The closed-loop simulations were used to investigate the fishing intensity in the scale component of the harvest strategy policy. Various values for the spawning potential ratio (SPR) and two values of the threshold (trigger) point in the harvest control rule (30% and 40%) were evaluated. The trigger point protects the spawning biomass when fishing intensity is high, and a higher trigger point results in more protection of the spawning biomass (e.g., maintains a higher stock status, on average). The trigger point causes similar yields at lower SPR values (high fishing intensity) because the overall fishing intensity from the harvest control rule is being reduced. However, this also results in higher annual variability of the TCEY. SPR values between 20% and 55% are likely to meet the goals and objectives defined by the MSAB.

Ideas on estimating the stock distribution and distributing the TCEY were discussed at both MSAB meetings in 2017. Stock distribution is the method used to determine how the population is distributed across different areas, is a scientific component, is best done using the IPHC fishery-independent setline survey (FISS), and is a useful tool to preseve biocomplexity. A biologically-based method to determine the distribution of the stock should use biologically define regions that can be further split into IPHC Regulatory Areas. Further distributing the TCEY can be done using distribution procedures such as different relative harvest rates in some areas or incorporating fishery-dependent data. These distribution procedures can operate on regions and IPHC Regulatory Areas.

A five-year program of work was developed that defines general tasks. A more specific three-year plan is to continue evaluating the scale component of the harvest strategy policy and present those results at the 2019 Annual Meeting (AM095). After that, work will continue on procedures to distribute the TCEY and results from evaluating procedures related to the scale and distribution components of the harvest strategy policy will be presented at the Annual Meeting in 2021 (AM097).

5.2 An update on the IPHC Management Strategy Evaluation (MSE) (IPHC-2018-AM094-12)

Allan C. Hicks and Ian Stewart

This paper was prepared for the 2018 International Pacific Halibut Commission (IPHC) Annual Meeting (IPHC-2018-AM094-12), and can be found on the IPHC website Annual Meeting page.

Reports of the Management Strategy Advisory Board

Agenda Item 7.2

IPHC-2017-MSAB09-R

IPHC-2017-MSAB10-R

Management Strategy Advisory Board

- 2017 Co-Chairpersons
  - Adam Keizer (Canada, DFO)
  - Rachel Baker (U.S.A., NOAA-Fisheries)

- MSAB met twice in 2017
  - MSAB09: 9-11 May
  - MSAB10: 23-26 October

Recommendations and Requests

- Objectives
- Simulation framework – scenario uncertainty, management procedures, performance metrics timeframe
- Program of Work: timelines

A review of the goals and objectives of the IPHC MSE process

MSAB10–Rec.01 (para. 11) *The MSAB* ***AGREED*** *to further revise the goals, objectives, and performance metrics, as detailed at Appendix IV, at MSAB11, and also* ***RECOMMENDED*** *that the Commission review and provide guidance on them at the 94th Session of the Commission, thereby providing clear direction for the IPHC Secretariat and MSAB for action in 2018*.

Objectives

- Maintain a minimum of number of mature female Pacific halibut coast-wide
- Avoid very low stock sizes
- Mostly avoid low stock sizes
- When Limit < Estimated Biomass < Threshold, limit the probability of declines

Objectives

- Maintain directed fishing opportunity
- Maximize yield in each regulatory area
- Maintain median catch
- Maintain average catch
- Limit annual changes in TAC, coast-wide and/or by Regulatory Area
- Minimize discard mortality in the longline fishery

Discussion of the performance metrics reported

MSAB10–Rec.02 (para. 32) *The MSAB* ***RECOMMENDED*** *that future iterations of the simulations focus on the reduced range of SPR targets (greater than 40%, less than 55%) based on preliminary interpretation of results, and that 2% intervals between SPR values is sufficient to interpret future results.*

MSAB Program of Work 2018-22

MSAB10–Rec.03 (para. 41) *The MSAB **RECOMMENDED** the updated Program of Work provided at Appendix VI, for the Commission's further consideration.*

3 year schedule

May 2018 Meeting
Review Goals
Look at results of SPR
Review Performance Metrics
Identify Scale MP's
Review Framework
Identify Preliminary Distribution MP's
October 2018 Meeting
Review Goals
Complete results of SPR
Review Performance Metrics
Identify Scale MP'S
Verify Framework
Identify Distribution MP's
Annual Meeting 2019
Recommendation on Scale Present possible distribution MP's

May 2019 Meeting
Review Goals
Spatial Model Complexity
Identify MP's (Distn Scale)
Review Framework
October 2019 Meeting
Review Goals
Spatial Model Complexity
Identify MP's (Distn Scale)
Review Framework
Review multi-area model development
Annual Meeting 2020
Update on progress
May 2020 Meeting
Review Goals
Review multi-area model
Review preliminary results
October 2020 Meeting
Review Goals
Review preliminary results
Annual Meeting 2021
Recommendations on Scale and Distribution

Recommendations x3

A review of the goals and objectives of the IPHC MSE process

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MSAB Program of Work 2018-22

MSAB10–Rec.03 (para. 41) *The MSAB* ***RECOMMENDED*** *the updated Program of Work provided at Appendix VI, for the Commission's further consideration.*

Requests x 7 (3 areas)

- IPHC meetings calendar (2018-20): MSAB
- Performance metrics
  - Connecting to fishery objectives
  - Time periods for evaluation
- Simulation framework
  - Interim coast-wide model
  - Variability and examining additional management procedures to evaluate fishing intensity

INTERNATIONAL PACIFIC

HALIBUT COMMISSION

Report of the IPHC Secretariat (2017)

Agenda Item 4

IPHC-2018-AM094-04

INTERNATIONAL PACIFIC HALIBUT COMMISSION

Staffing changes during 2017

FT Departures	Type	Hire Date	Departure Date	Position Title	Status
Melissa Knapp	Full time regular	1 June 2001	15 January 2017	Administrative Coordinator	Retired
Kelly McElligott	Full time regular	17 January 2017	27 December 2017	Data transcriber	Departed
FT Arrivals	**Type**	**Hire Date**	**Departure Date**	**Position Title**	**Status**
Kelly Chapman	Full time regular	1 January 2017	-	Front office assistant	Active
Kelly McElligott	Full time regular	17 January 2017	-	Data transcriber	Active

Meetings of the Commission and Subsidiary Bodies during 2017

	2017			
Meeting	No.	Original Date	Changes	Location
Annual Meeting (AM)	93rd	23-27 Jan	-	Victoria, Canada
Conference Board (CB)	87th	24-25 Jan	-	Victoria, Canada
Processor Advisory Board (PAB)	22nd	24-25 Jan	-	Victoria, Canada
Finance and Administration Committee (FAC)	--	23, 26 Jan, during AM	-	Victoria, Canada
Scientific Review Board (SRB)	10th	20-21 June	3d; 14-16 June	Seattle, USA
	11th	26-28 Sept	-	Seattle, USA
Management Strategy Advisory Board (MSAB)	9th	9-11 May	-	Seattle, USA
	10th	25-26 Oct	4d; 23-26 Oct	Seattle, USA
Scholarship Committee (SC)	(no meeting in 2017)			
Work Meeting (WM)	--	20-21 Sept	-	Bellingham, USA
Research Advisory Board (RAB)	19th	15 Nov	28 Feb 2018	Seattle, USA
Interim Meeting (IM)	93rd	28-29 Nov	-	Seattle, USA

IPHC FISHERY REGULATIONS (2017)

In 2017, the Commission adopted **four (4)** fishery regulations in accordance with Article III of the Convention, as follows:

IPHC Pacific halibut fishery regulations, Section 13. Size Limits

- IPHC-2017-AM093-R, para. 48: The Commission **ADOPTED** a proposal aimed at eliminating a recently identified bias in Pacific halibut removal estimates (net weight), by **requiring all commercial Pacific halibut to be landed and weighed with their heads attached** for data reporting purposes and to be subject to the 32-inch minimum size limit (IPHC-2017-AM093-PropA), which supersedes Section 13 of the IPHC Pacific halibut fishery regulations. An **exemption was agreed upon** whereby **vessels that freeze Pacific halibut** at sea may possess and land their frozen fish with the head removed subject to the 24-inch minimum size limit if possessed or landed with the head removed (Appendix VI).

2017 Exemption resulted in 31.9 t (~70K lbs) being landed with head-off by 28 vessels (in 56 landings)

IPHC Fishery Regulations (2017)

IPHC Pacific halibut fishery regulations, Section 18. Fishing Multiple Regulatory Areas

- IPHC-2017-AM093-R, para. 54: The Commission **ADOPTED** a proposal aimed at harmonising IPHC and NMFS regulations regarding fishing in multiple regulatory areas in Alaska (Appendix VII), which supersedes Section 18 of the IPHC Pacific halibut fishery regulations.

2017 Catch limits

- IPHC-2017-AM093-R, para. 71: The Commission **ADOPTED** catch limits for 2017 as provided at Appendix VIII.

Fishing periods

- IPHC-2017-AM093-R, para. 72: The Commission **ADOPTED** fishing periods for 2017 as provided at Appendix IX, thereby superseding Section 8 of the IPHC halibut fishery regulations.

Fisheries and Oceans Canada (DFO)

IPHC-2018-AM094-AR09	Fisheries and Oceans Canada 2017: IPHC Annual Report
IPHC-2018-AM094-AR10_Rev1	2017 Canadian Recreational Fishery Halibut Catch Report
IPHC-2018-AM094-AR11	Canadian report to the International Pacific Halibut Commission on 2017 halibut fishery enforcement activities

- 2018 Setline Survey expansion in IPHC Reg. Area 2B
  - Areas of concern (MPAs, RCAs)
  - Species of concern (yelloweye, bocaccio)
- Identification of concerns with the current process of estimating Pacific halibut biological distribution
  - *[Paper IPHC-2018-AM094-12, discussion at agenda item 7]*

NOAA Fisheries (NMFS)

IPHC-2018-AM094-AR02	**NMFS Report: Report on the 2017 Pacific halibut fisheries in Area 2A**
IPHC-2018-AM094-AR13	**Annual Report to the International Pacific Halibut Commission from the Alaska Region, National Marine Fisheries Service**

- Regulatory proposals for 2018
  - *[Papers IPHC-2018-AM094-PropB1 – PropB3, discussion at agenda item 8]*

North Pacific Fishery Management Council (NPFMC)

IPHC-2018-AM094-AR12	North Pacific Fishery Management Council (NPFMC): Annual management letter

- Halibut Management Framework actions
  - Abundance-based management (ABM) of Pacific halibut bycatch
  - Discard mortality rates (DMR) for Pacific halibut bycatch
- Joint IPHC-NPFMC meeting June 2017
- Management measures under consideration

Pacific Fishery Management Council (PFMC)

- IPHC Regulatory Area 2A Catch Sharing Plan
  - Small changes to recreational sector in WA approved for 2018
- Commercial derby fishery
  - Discussed at June, Sept, and Nov PFMC meetings
  - General agreement to move past derby, open to changes that are better for fish and fishers
  - No changes recommended for 2018
  - Council will discuss how to proceed at June 2018 meeting

ANNUAL REPORT (2016 & 2017)

The 2016 Annual Report is available for download from the IPHC website at the following link: http://iphc.int/library/documents/category/annual-reports

Previously, the IPHC Annual Report was published late in the following year, or even early in the subsequent year (13-14 months after the end of the year being reported on). Unfortunately, this decreased the utility of the report for user groups and led to confusion about the state of the fishery and resource, as well as the current decisions of the Commission.

In 2017, we undertook an accelerated production timeline for the IPHC 2016 Annual Report, which the IPHC Secretariat staff produced some six months ahead of schedule. It is our intention to further accelerate the 2017 Annual Report production process, thereby ensuring users of the report receive the summary information as close to the relevant year as possible. Your continued feedback on the content, format and presentation of the Annual Report is welcome.

In 2018, the Annual Report for 2017 is expected to be published by the end of February 2018.

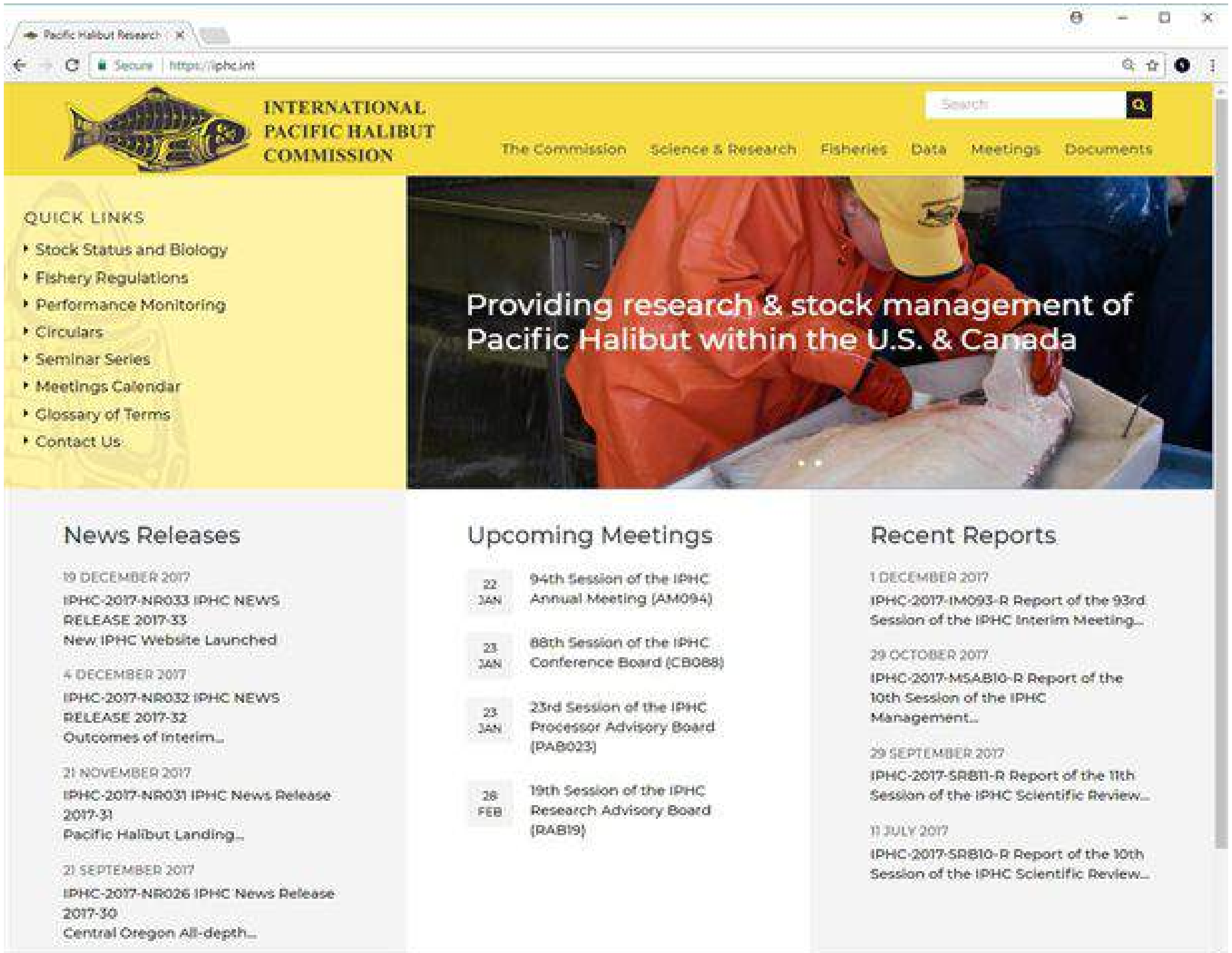
IPHC Website

www.iphc.int

INTERNATIONAL PACIFIC HALIBUT COMMISSION

New IPHC Website

- The IPHC Secretariat launched our new website on Friday, 15 December 2017: http://iphc.int/.
- The new website is the culmination of a year long project by IPHC Secretariat staff which commenced on 15 September 2016, when the IPHC Secretariat chartered a website improvement team with members from the Seattle-based staff.
- The team's focus was on improving the distribution of public domain information.
- In November 2016, support for the team's efforts were enhanced by ensuring funding was available to hire a professional website designer.
- Our new website has five categories of content which include 'The Commission, Science and Research, Fisheries, Data, Meetings, and Documents'.
- The Seattle-based staff will continue to develop different ways to publish data and statistics for our stakeholders.


Pacific Halibut Research
Secure https://iphc.int
INTERNATIONAL PACIFIC HALIBUT COMMISSION
Search
The Commission
Science & Research
Fisheries
Data
Meetings
Documents
QUICK LINKS
Stock Status and Biology
Fishery Regulations
Performance Monitoring
Circulars
Seminar Series
Meetings Calendar
Glossary of Terms
Contact Us
Providing research & stock management of Pacific Halibut within the U.S. & Canada
News Releases
19 DECEMBER 2017
IPHC-2017-NR033 IPHC NEWS RELEASE 2017-33
New IPHC Website Launched
4 DECEMBER 2017
IPHC-2017-NR032 IPHC NEWS RELEASE 2017-32
Outcomes of Interim...
21 NOVEMBER 2017
IPHC-2017-NR031 IPHC News Release 2017-31
Pacific Halibut Landing...
21 SEPTEMBER 2017
IPHC-2017-NR026 IPHC News Release 2017-30
Central Oregon All-depth...
Upcoming Meetings
22 JAN 94th Session of the IPHC Annual Meeting (AM094)
23 JAN 88th Session of the IPHC Conference Board (CB088)
23 JAN 23rd Session of the IPHC Processor Advisory Board (PAB023)
28 FEB 19th Session of the IPHC Research Advisory Board (RAB19)
Recent Reports
1 DECEMBER 2017
IPHC-2017-IM093-R Report of the 93rd Session of the IPHC Interim Meeting...
29 OCTOBER 2017
IPHC-2017-MSAB10-R Report of the 10th Session of the IPHC Management...
29 SEPTEMBER 2017
IPHC-2017-SRB11-R Report of the 11th Session of the IPHC Scientific Review...
11 JULY 2017
IPHC-2017-SRB10-R Report of the 10th Session of the IPHC Scientific Review...

Interactive Maps and Data

INTERNATIONAL PACIFIC HALIBUT COMMISSION

Interactive Maps and Data

Goal:

To share raw FISS data in a way that makes it **easier**

- **to see trends**
- **to dive deeper** into survey data

Interactive Maps and Data

2017 IPHC Stock Assessment Survey
All Regions

Station	Reg Area	Region	Date Fished	Latitude	Longitude	Depth (F)	Skates Set[1]	O32 Halibut Lbs.[2]	O32 Halibut #'s	U32 Halibut Lbs.[2]	U32 Halibut #'s	Bycatch (numbers)[3] Sablefish	P. Cod	Rockfish
1105	2A	Oregon	7/7	44° 30.03'	-124° 54.01'	240	6.0	0	0	0	0	15	0	0
1107	2A	Washington	8/2	46° 10.05'	-124° 10.00'	31	6.1	27	1	0	0	0	0	0
1108	2A	Washington	8/1	46° 10.00'	-124° 24.00'	67	6.1	29	2	0	0	0	0	0
1115	2A	Washington	8/8	47° 29.97'	-124° 38.00'	36	6.0	0	0	0	0	0	0	0
1116	2A	Puget Sound	9/7	47° 20.12'	-122° 27.77'	45	6.0	0	0	0	0	0	0	0
1117	2A	Puget Sound	9/7	47° 29.05'	-122° 26.16'	81	6.0	0	0	0	0	0	0	0
1118	2A	Puget Sound	9/6	47° 50.77'	-122° 25.00'	91	6.0	0	0	0	0	0	0	0
1119	2A	Puget Sound	9/6	47° 50.60'	-122° 38.30'	38	6.0	0	0	0	0	0	0	0
1121	2A	Puget Sound	9/5	48° 10.05'	-122° 53.83'	44	6.1	37	1	0	0	0	0	0
1122	2A	Puget Sound	9/4	48° 11.01'	-123° 19.94'	50	6.1	63	3	0	0	0	0	0
1123	2A	Puget Sound	9/4	48° 10.02'	-123° 37.90'	34	6.0	160	4	0	0	0	0	0
1124	2A	Puget Sound	9/5	48° 20.00'	-122° 54.92'	51	6.0	100	4	0	0	0	0	0
1125	2A	Puget Sound	9/5	48° 20.02'	-123° 07.88'	64	5.9	176	7	9	1	0	0	0
1126	2A	Washington	8/20	48° 18.90'	-124° 22.53'	33	6.0	62	2	0	0	0	0	0
1127	2A	Puget Sound	9/3	48° 41.01'	-123° 07.82'	45	6.0	0	0	0	0	0	0	0
1128	2A	Puget Sound	9/2	48° 49.97'	-122° 52.98'	40	4.6	0	0	0	0	0	0	0
1509	2A	Washington	8/26	48° 05.04'	-125° 16.00'	129	6.0	184	10	105	12	16	0	2
1513	2A	Washington	8/29	48° 14.99'	-125° 16.00'	65	5.4	384	20	83	9	1	0	6
1515	2A	Washington	8/28	48° 14.97'	-125° 31.00'	76	6.0	37	2	11	1	2	0	0
1517	2A	Washington	8/22	48° 20.02'	-124° 53.00'	112	6.0	134	6	0	0	11	0	1
1519	2A	Washington	8/25	48° 19.98'	-125° 07.98'	72	6.0	49	3	37	4	1	0	0
1522	2A	Washington	8/22	48° 25.04'	-125° 01.00'	117	6.0	54	2	0	0	19	0	0
1525	2A	Washington	8/22	48° 30.00'	-124° 52.92'	61	6.0	11	1	0	0	3	0	0
1601	2A	Oregon	6/12	42° 20.04'	-124° 27.21'	16	6.0	29	1	0	0	0	0	0
1602	2A	Oregon	6/12	42° 29.95'	-124° 30.97'	21	6.0	53	2	0	0	0	0	0
1603	2A	Oregon	6/17	43° 10.09'	-124° 26.25'	13	6.0	0	0	0	0	0	0	0
1615	2A	Washington	9/16	46° 20.08'	-124° 10.00'	14	6.0	33	1	0	0	0	0	0
1616	2A	Washington	9/16	46° 29.95'	-124° 09.00'	15	6.0	0	0	0	0	0	0	0
1617	2A	Washington	9/17	46° 50.05'	-124° 09.00'	7	6.0	0	0	0	0	0	0	0
1618	2A	Washington	9/18	47° 20.03'	-124° 23.99'	16	6.0	0	0	0	0	0	0	0
1619	2A	Washington	9/18	47° 30.04'	-124° 23.00'	6	6.0	0	0	0	0	0	0	0

Interactive Maps and Data

- What is available and where to find it
- Usage and orientation tips
- Data exploration example

Interactive Maps and Data

What is available?

Raw FISS catch per unit effort (CPUE)

Numbers per unit effort (count/skate) **NPUE**

Weight per unit effort (lbs/skate) **WPUE**

Aggregated by

U32 – Sub-legal size; < 32”

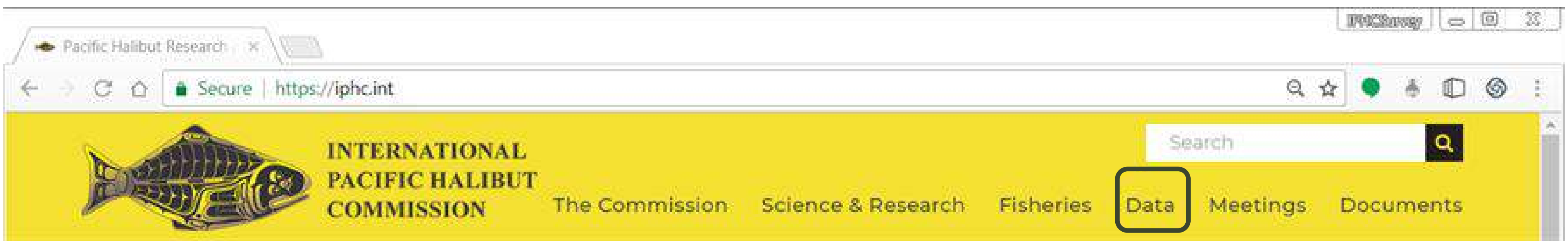
O32 – Legal size; >= 32”

All sizes

Interactive Maps and Data

Where? IPHC's new website

- http://iphc.int/data/setline-survey-catch-per-unit-effort



Interactive Maps and Data

Where? IPHC's new website

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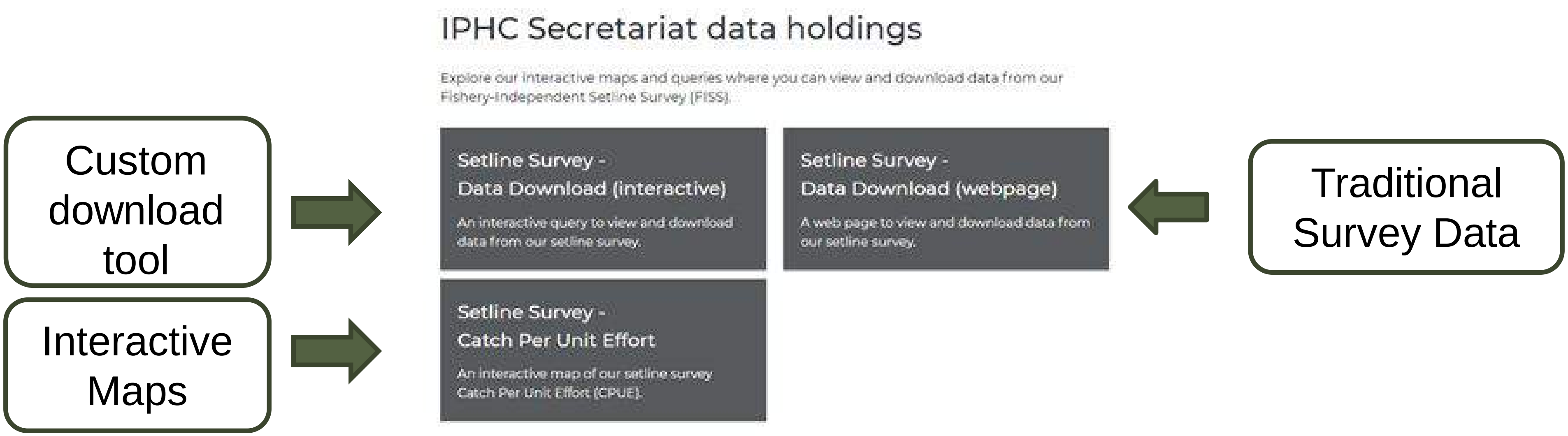


Interactive Maps and Data

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
1	YearHeade	Station	Purpose	Date	Stlkey	Year	O32 count	O32 weigh	U32 weigh	U32 count	Effective s	Max depth	Min depth	Avg no. ho	No. skates	Statarea	Year Creat	Total halib	Total net v	Lat - Grid t	Lon - Grid	Lat - fishe	Lon - fishe
2	2014	3083	Standard g	1-Jul-14	20141007	2014	45	1,101	771	119	7.03	71	56	100	7	160	1998	164	1,872	56.5	-135.25	56 29.99	135 15.23
3	2014	3113	Extra stati	22-Jun-14	20140987	2014	80	1,771	487	61	6.96	89	36	99	7	181	1998	141	2,258	58	-136.667	58 00.00	136 39.91
4	2014	3092	Standard g	29-Jun-14	20141002	2014	29	1,077	557	81	6.96	60	53	100	7	170	1998	110	1,634	57	-136	57 00.02	136 00.48
5	2014	3110	Standard g	25-Jun-14	20140995	2014	75	2,058	560	69	6.96	60	42	99	7	181	1998	144	2,618	57.833	-136.567	57 49.83	136 33.98
6	2014	3103	Standard g	26-Jun-14	20140998	2014	57	1,248	596	83	6.96	98	91	99	7	170	1998	140	1,844	57.333	-136.217	57 19.99	136 12.80
7	2014	3119	Extra stati	21-Jun-14	20140984	2014	29	634	642	87	6.96	66	51	100	7	182	1998	116	1,276	58.25	-135.667	58 15.01	135 40.06
8	2014	3079	Standard g	2-Jul-14	20141010	2014	58	1,569	479	66	6.96	90	86	99	7	160	1998	124	2,048	56.333	-135.233	56 20.02	135 14.48
9	2014	3086	Standard g	30-Jun-14	20141005	2014	37	1,345	380	52	6.96	77	73	99	7	160	1998	89	1,724	56.667	-135.567	56 39.97	135 34.07
10	2014	3106	Standard g	26-Jun-14	20140997	2014	24	515	458	68	6.96	63	44	99	7	170	1998	92	973	57.5	-136.233	57 30.00	136 14.18
11	2014	3108	Standard g	25-Jun-14	20140996	2014	64	1,219	377	48	6.96	95	83	99	7	170	1998	112	1,595	57.667	-136.55	57 40.22	136 32.96
12	2014	3089	Standard g	30-Jun-14	20141003	2014	39	795	436	58	6.96	106	100	99	7	160	1998	97	1,231	56.833	-135.867	56 50.20	135 52.05
13	2014	3080	Standard g	2-Jul-14	20141009	2014	45	1,155	306	42	6.96	115	108	99	7	160	1998	87	1,461	56.333	-135.533	56 20.03	135 31.63
14	2014	3097	Standard g	29-Jun-14	20141000	2014	8	279	299	43	6.96	51	32	99	7	170	1998	51	578	57.167	-135.9	57 10.01	135 54.22
15	2014	3084	Standard g	1-Jul-14	20141008	2014	52	2,081	350	43	6.96	96	76	99	7	160	1998	95	2,431	56.5	-135.55	56 30.00	135 33.02
16	2014	3098	Standard g	29-Jun-14	20141001	2014	28	466	153	17	6.96	133	109	99	7	170	1998	45	619	57.167	-136.2	57 10.00	136 11.82
17	2014	3120	Extra stati	22-Jun-14	20140985	2014	60	2,540	333	46	7.03	143	72	100	7	182	1998	106	2,872	58.25	-136.433	58 15.07	136 26.08
18	2014	3078	Standard g	3-Jul-14	20141012	2014	49	1,846	263	34	6.96	79	46	99	7	160	1998	83	2,109	56.333	-134.933	56 19.89	134 56.04
19	2014	3087	Standard g	30-Jun-14	20141004	2014	45	1,060	257	33	6.96	138	126	100	7	160	1998	78	1,317	56.667	-135.867	56 40.06	135 52.02
20	2014	3123	Standard g	17-Jun-14	20140980	2014	30	817	219	27	6.96	177	87	100	7	183	1998	57	1,036	58.5	-135.033	58 29.85	135 01.72
21	2014	3115	Standard g	21-Jun-14	20140983	2014	24	382	211	29	7.03	111	85	100	7	182	1998	53	593	58.167	-135.333	58 10.02	135 19.71
22	2014	3114	Standard g	21-Jun-14	20140982	2014	57	1,382	305	41	6.96	217	64	99	7	171	1998	98	1,686	58.167	-135.017	58 10.00	135 01.80
23	2014	3111	Standard g	25-Jun-14	20140994	2014	3	85	12	2	7.03	201	196	100	7	181	1998	5	97	57.833	-136.883	57 49.77	136 52.86
24	2014	3116	Standard g	22-Jun-14	20140986	2014	64	2,379	61	8	7.03	172	50	100	7	181	1998	72	2,440	58.167	-136.6	58 09.12	136 36.34
25	2014	3122	Standard g	17-Jun-14	20140979	2014	13	368	13	2	6.96	325	120	99	7	171	1998	15	381	58.333	-135.033	58 20.05	135 01.92
26	2014	3085	Standard g	1-Jul-14	20141006	2014	48	1,970	48	6	6.96	35	20	99	7	160	1998	54	2,018	56.667	-135.25	56 39.78	135 15.00
27	2014	3102	Standard g	26-Jun-14	20140999	2014	38	1,519	43	6	6.96	105	21	100	7	170	1998	44	1,561	57.333	-135.917	57 20.04	135 54.97
28	2015	3083	Standard g	4-Jul-15	20150927	2015	56	1,520	533	76	7.03	62	57	100	7	160	1998	132	2,052	56.5	-135.25	56 30.01	135 15.35
29	2015	3113	Extra stati	25-Jun-15	20151347	2015	131	2,380	715	90	7.03	85	37	100	7	181	1998	221	3,094	58	-136.667	58 00.00	136 39.64
30	2015	3092	Standard g	29-Jun-15	20151359	2015	68	1,390	889	109	6.96	60	53	99	7	170	1998	177	2,279	57	-136	56 59.99	136 00.42
31	2015	3110	Standard g	27-Jun-15	20151352	2015	77	1,498	675	85	6.96	63	46	100	7	181	1998	162	2,173	57.833	-136.567	57 50.01	136 34.51

download_preview_crosstab (6)

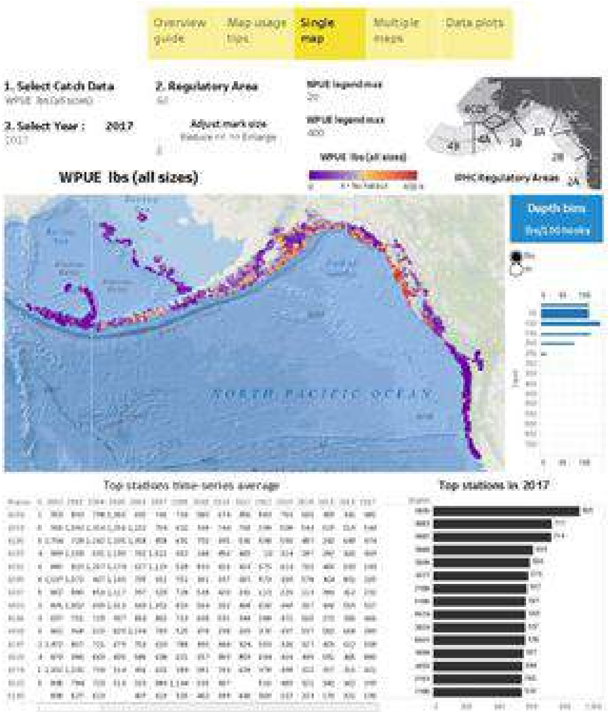
Meetings Calendar

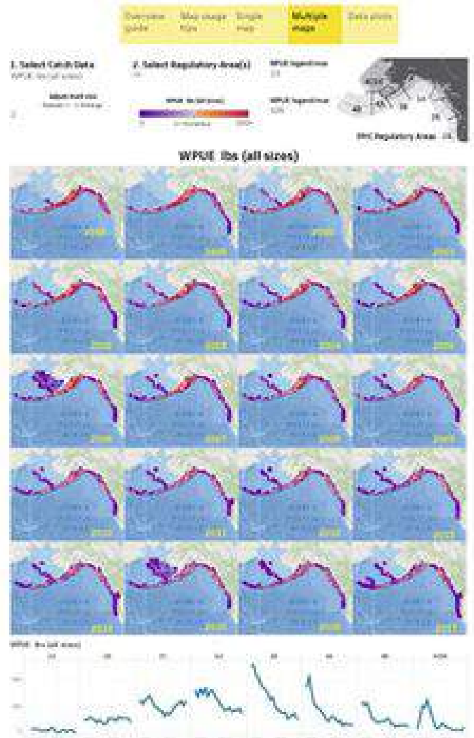
Glossary of Terms

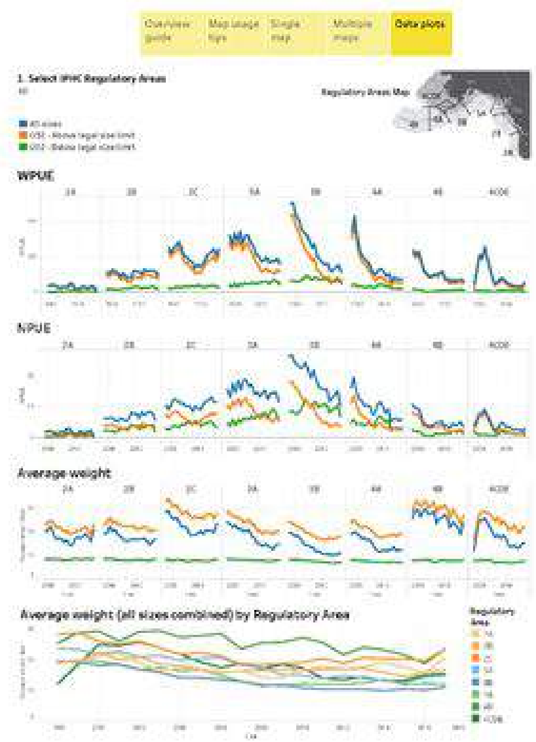
survey Catch Per Unit Effort (CPUE).

fishing vessels, Pacific Halibut, and IPHC historical photos.

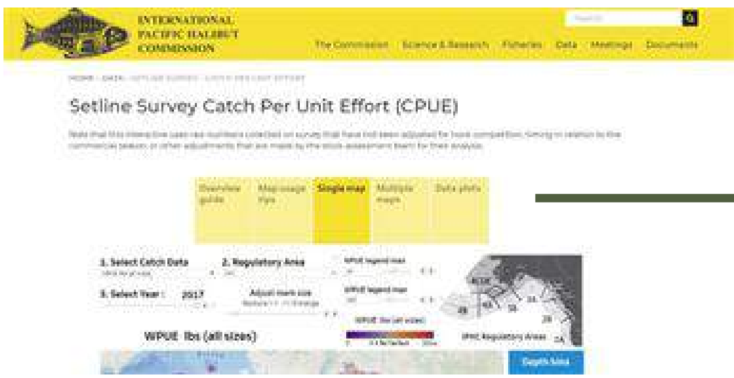
Interactive Maps and Data







Interactive Maps and Data



Overview guide

- Definitions
- Description of components
- Tips for getting started
- How to adjust custom controls

Map usage tips

- To avoid frustration
- Map controls
- Navigating and panning
- Selecting stations and regions
- Adjusting mark size

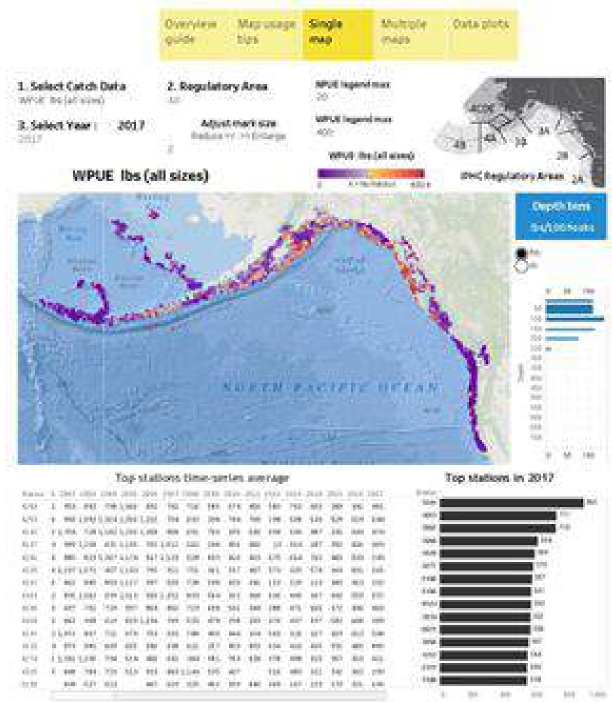
Interactive Maps and Data

Single Map Components

Filters and Controls

CPUE map

Time-series average top stations



Effort and average CPUE by depth bin

Top stations in selected year

Interactive Maps and Data

Filters and Controls

1. Select Catch Data

WPUE lbs (all sizes)

- NPUE total (all sizes)
- NPUE < 32" (81.3 cm)
- NPUE >= 32" (81.3 cm)
- WPUE lbs (all sizes)
- WPUE lbs < 32" (81.3 cm)
- WPUE lbs >= 32" (81.3 cm)

2. Regulatory Area

(All)

- ☑ (All)
- ☑ 2A
- ☑ 2B
- ☑ 2C
- ☑ 3A
- ☑ 3B
- ☑ 4A
- ☑ 4B
- ☑ 4CDE

Cancel | Apply

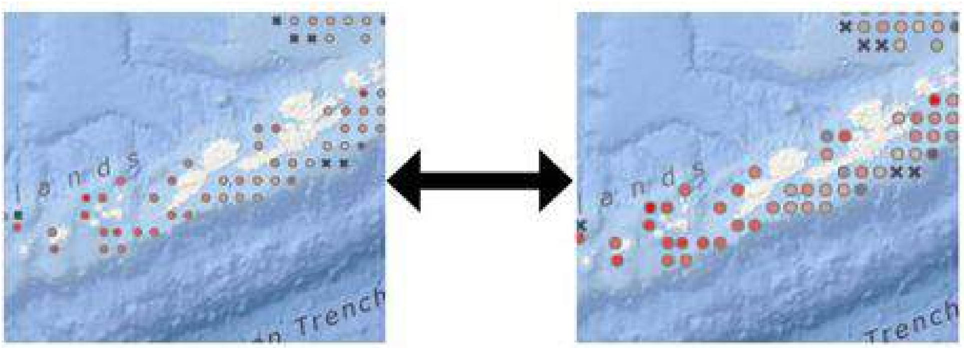
3. Select Year : 2017

Interactive Maps and Data

Filters and **Controls**

Adjust mark size

Reduce << >> Enlarge



NPUE legend max

20

WPUE legend max

300

WPUE lbs (all sizes)

0 X = No halibut 300+

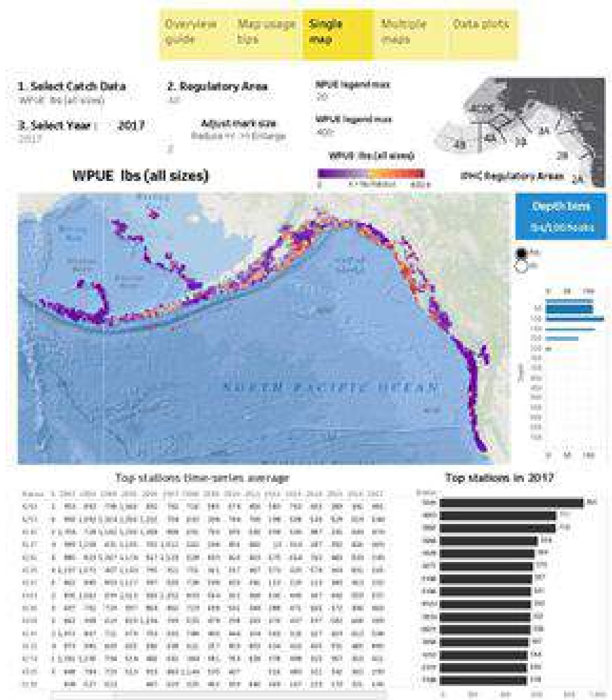
Interactive Maps and Data

Single Map Components

Filters and Controls

CPUE map

Time-series average top stations



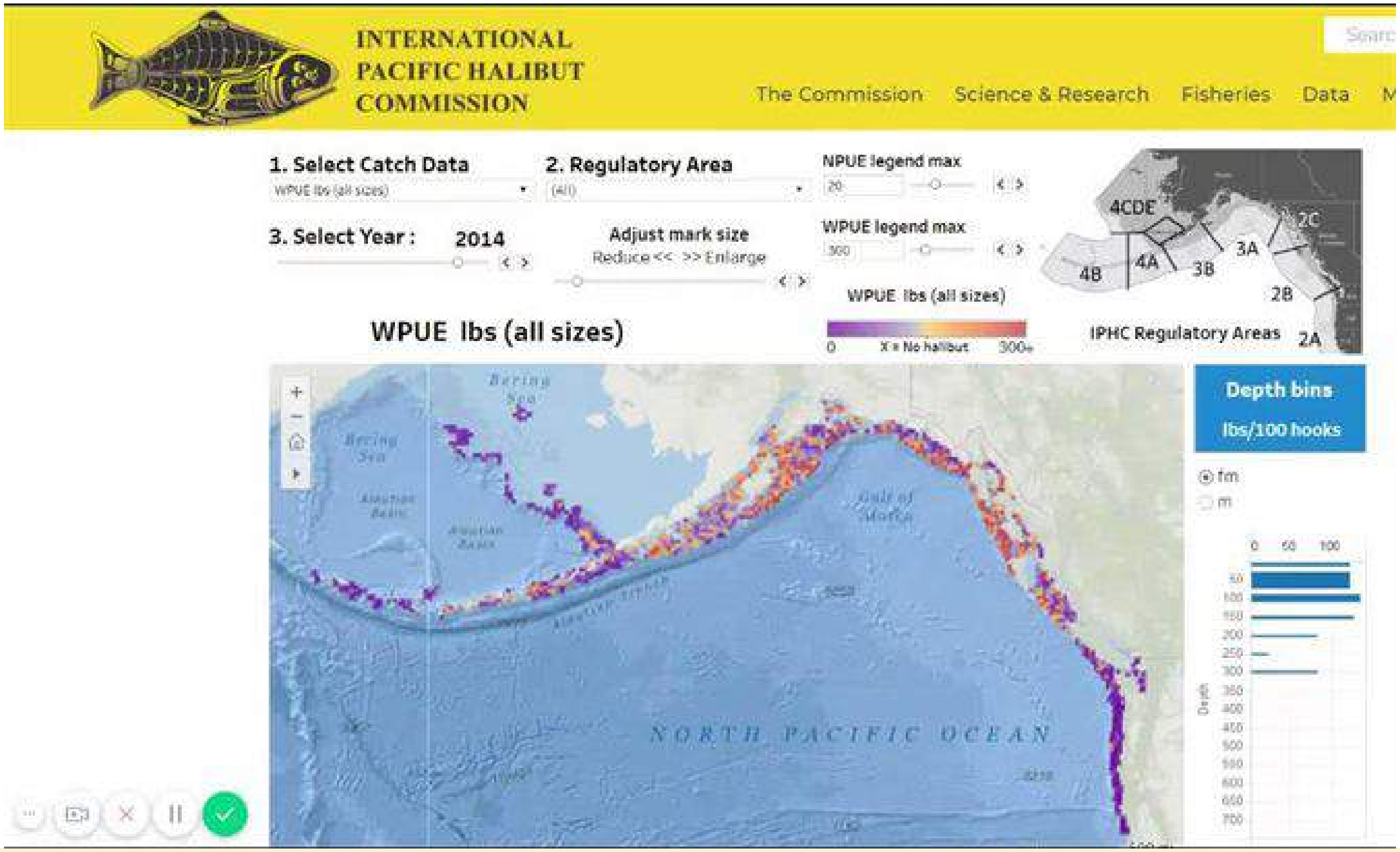
Effort and average CPUE by depth bin

Top stations in selected year

Interactive Maps and Data

CPUE Map

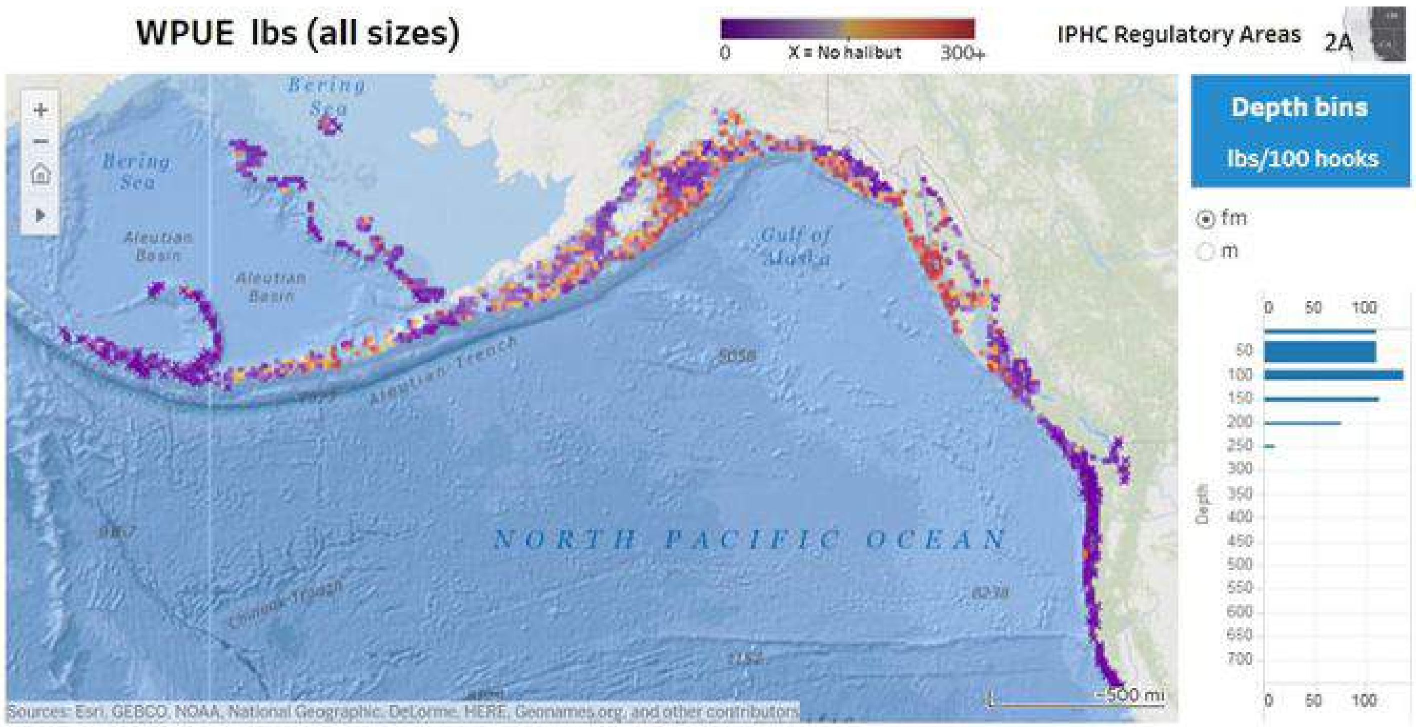
Dynamic
Tooltips



Interactive Maps and Data

Depth bins

Highlighting



Interactive Maps and Data - Example

Data exploration journey

One question leads to another,

which leads to another….

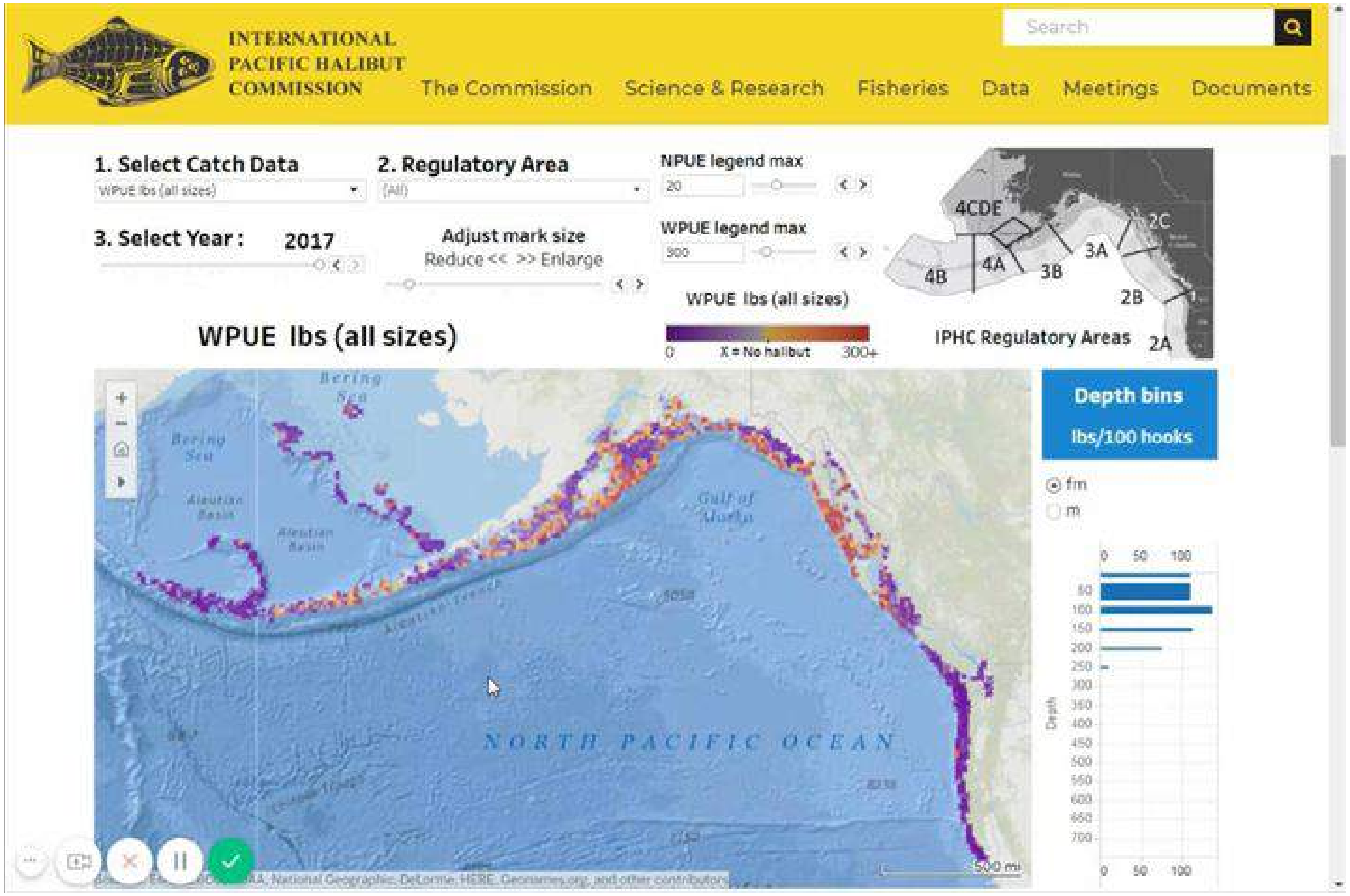
…and reaches a deeper understanding

Interactive Maps and Data - Example

In 2017, commercial fishers in 2C reported that catch rates were better this year than in recent memory.

- Did the Fishery-Independent Setline Survey experience high catches there as well?

Example



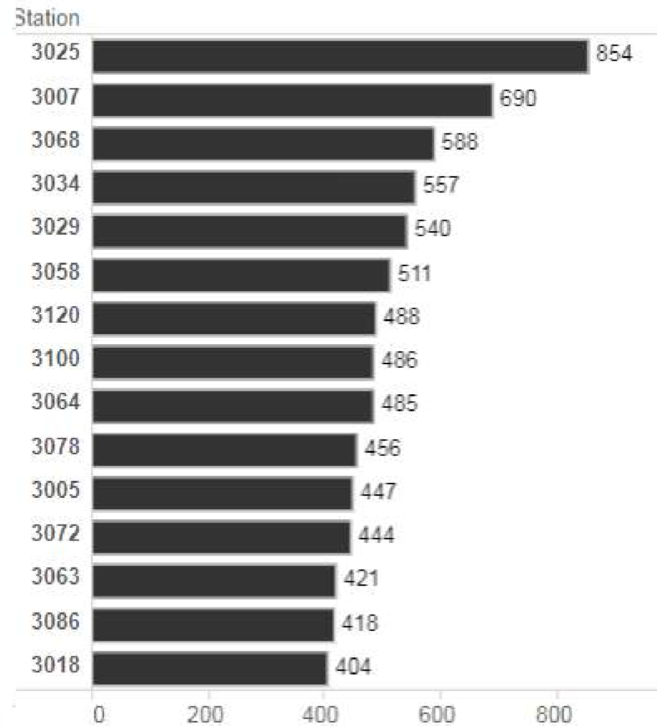
INTERNATIONAL PACIFIC HALIBUT COMMISSION
Search
The Commission
Science & Research
Fisheries
Data
Meetings
Documents
1. Select Catch Data
WPUE lbs (all sizes)
2. Regulatory Area
(All)
NPUE legend max
WPUE legend max
3. Select Year :
2017
Adjust mark size
Reduce << >> Enlarge
WPUE lbs (all sizes)
0
X = No halibut
300+
IPHC Regulatory Areas
4CDE
4B
4A
3B
3A
2C
2B
2A
Depth bins
lbs/100 hooks
fm
m
Depth
NORTH PACIFIC OCEAN
Gulf of Alaska
Bering Sea
Aleutian Basin
500 mi

Interactive Maps and Data - Example

Top stations time-series average

Station	1	2002	2003	2004	2..	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
3058	9	660	602	331	562	407	276	63	146	218	195	525	237	543	499	207	511
3025	0	857	884	625	546	565	530	439	131	210	798	553	260	327	435	305	854
3053	3	535	557	432	480	382	278	72	163	46	146	272	300	357	256	434	303
3063	4	246	342	387	443	143	365	30	143	85	69	202	429	384	497	201	421
3120	0	672	489	265	411	155	265	193	295	240	269	470		361	544	275	488
3067	2	504		325	391	213	52	104	178	176	201	261	432	353	454	320	309
3074	6	521	879	440	386	360	389	210	133	227	56	674	428	419	394	387	395
3068	5	495	263	463	364	259	241	194	519	478	290	368	554	235	558	384	588
3057	2	624	273	400	348	200	401	202	170	123	166	79	396	499	305	310	312
3019	9	623	688	153	323	162	253	201	317	198	210	332	244	189	255	225	319
3064	0	670	497	205	299	107	320	71	317	71	146	295	283	409	828	79	485
3072	1	150	563	324	235	162	146	191	148	96	174	190	371	324	503	508	444
3018	9	337	329	92	221	346	267	208	158	131	130	186	226	301	157	248	404
3050	7	978	532	693	139	324	575	140	123	229	261	241	210	209	348	421	272
3007	8	773	758	120	125	619	434	184	265	309	242	286	246	254	356	160	690

Top stations in 2017

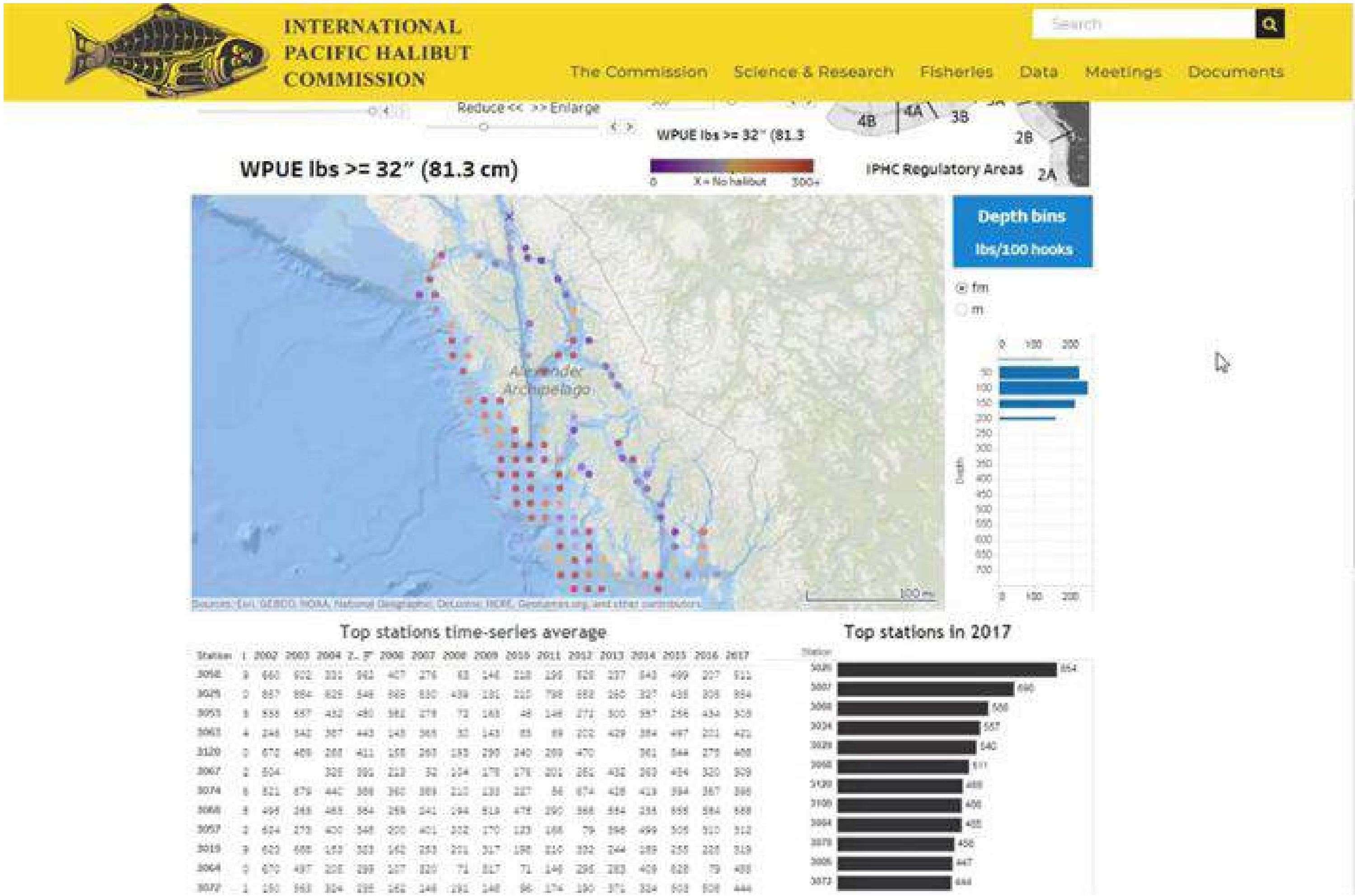


Interactive Maps and Data - **Example**

Legal-sized catch on survey was also high in 2017.

Where was the top station in 2C? How were catches at nearby stations?

Example



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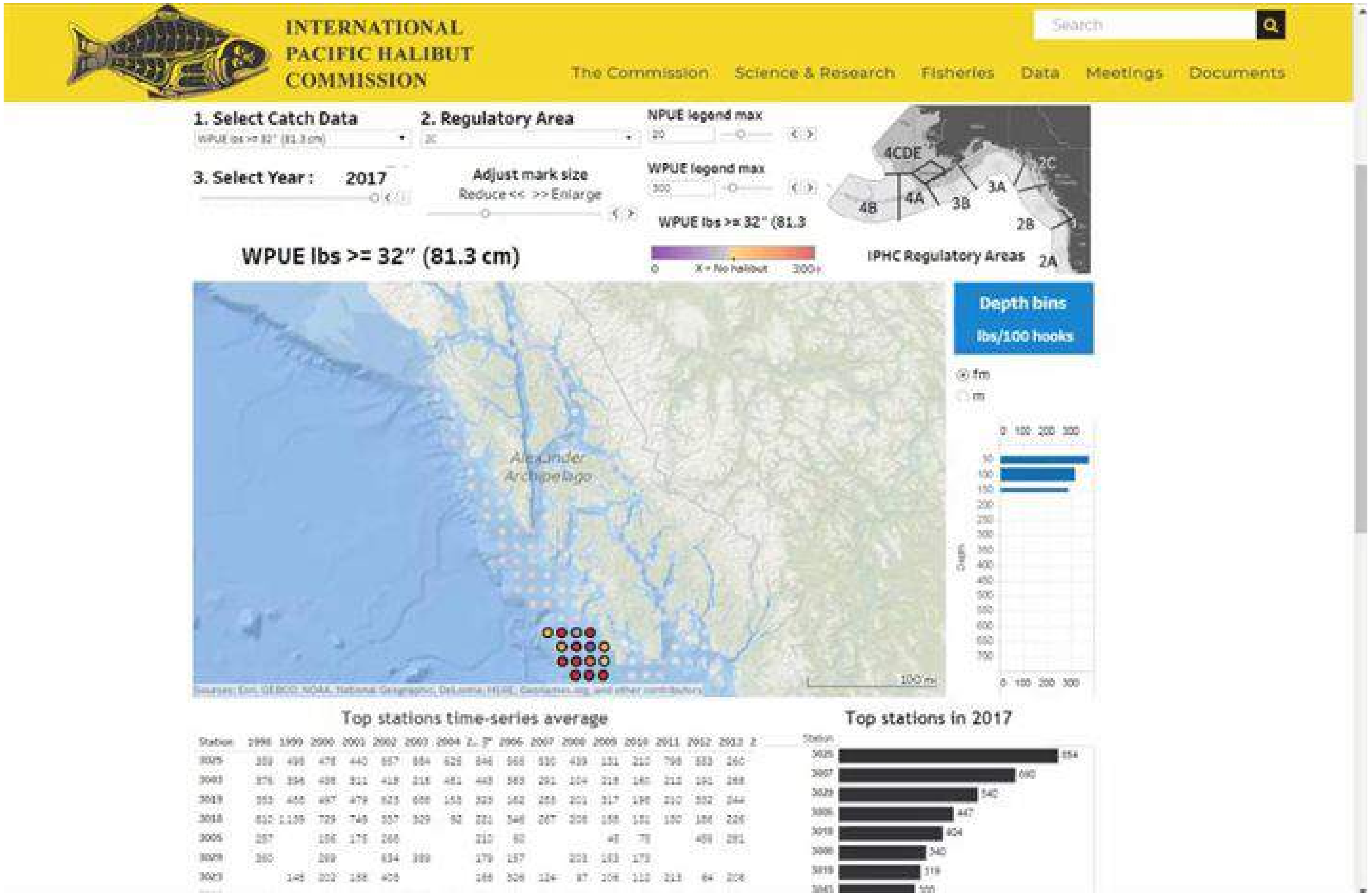
Documents
Reduce << >> Enlarge
WPUE lbs >= 32" (81.3 cm)
IPHC Regulatory Areas
Depth bins
lbs/100 hooks
Alexander Archipelago
Top stations time-series average
Top stations in 2017

Interactive Maps and Data - Example

How was the FISS catch rate of sublegal-sized halibut (U32)?

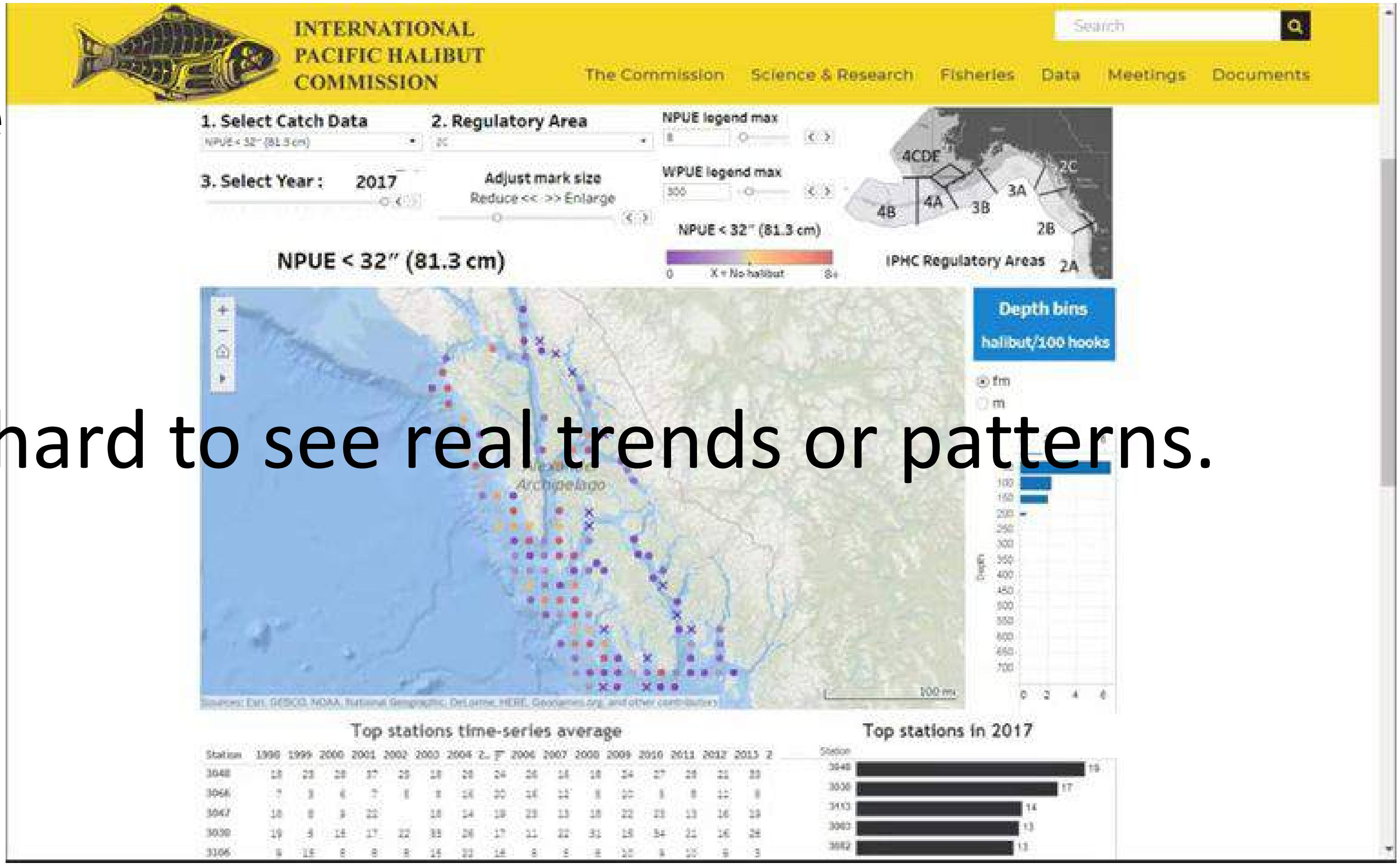
Example


INTERNATIONAL
PACIFIC HALIBUT
COMMISSION
Search
The Commission
Science & Research
Fisheries
Data
Meetings
Documents
1. Select Catch Data
2. Regulatory Area
NPUE legend max
3. Select Year : 2017
Adjust mark size
Reduce << >> Enlarge
WPUE legend max
WPUE lbs >= 32" (81.3
WPUE lbs >= 32" (81.3 cm)
IPHC Regulatory Areas
4CDE
4B
4A
3B
3A
2C
2B
2A
Depth bins
lbs/100 hooks
fm
m
Alexander
Archipelago
Top stations time-series average
Top stations in 2017

Interactive Maps and Data - Example

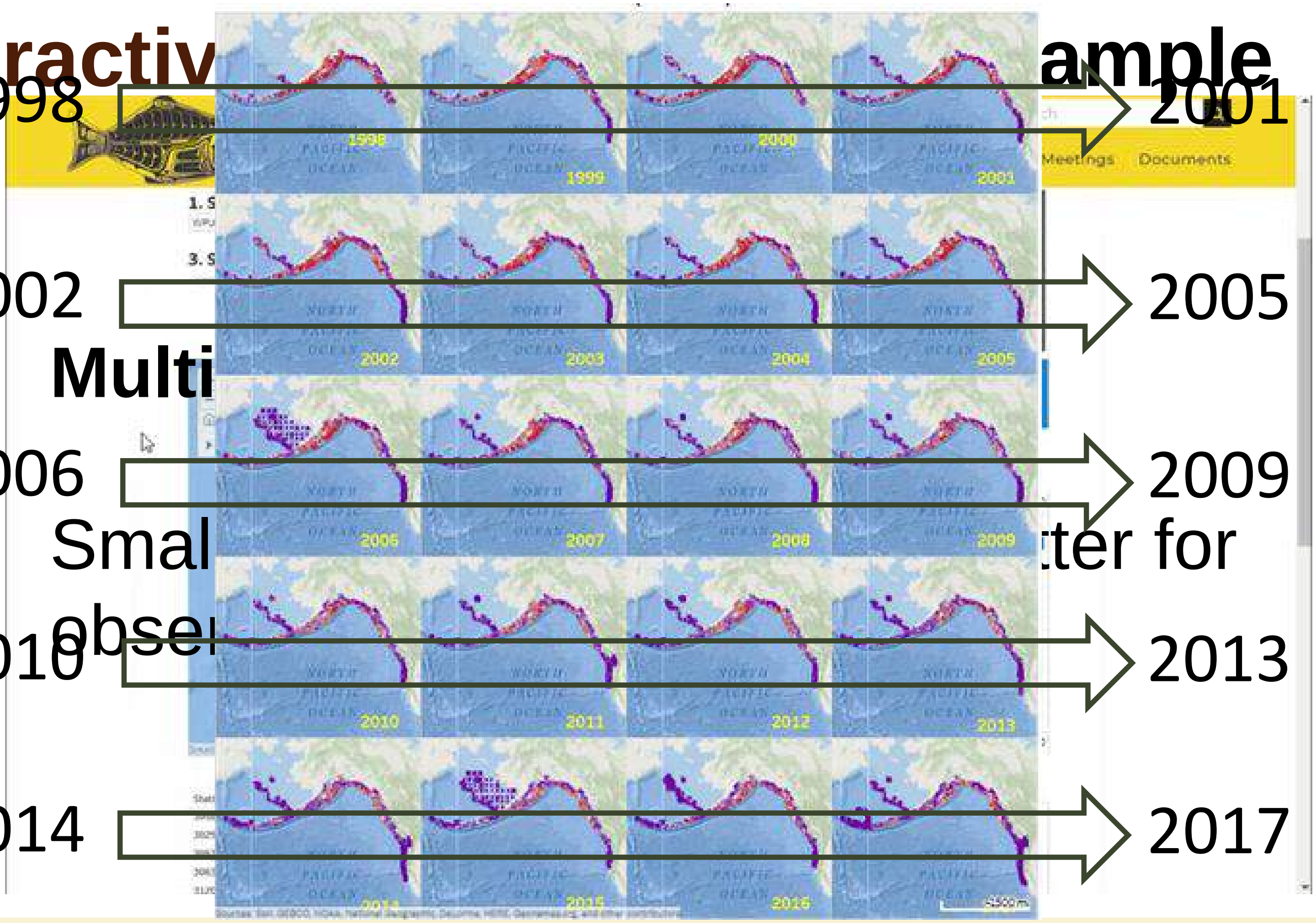
Now, I want to see how the RAW FISS CPUE changes over time in 2C.

Example



It’s hard to see real trends or patterns.

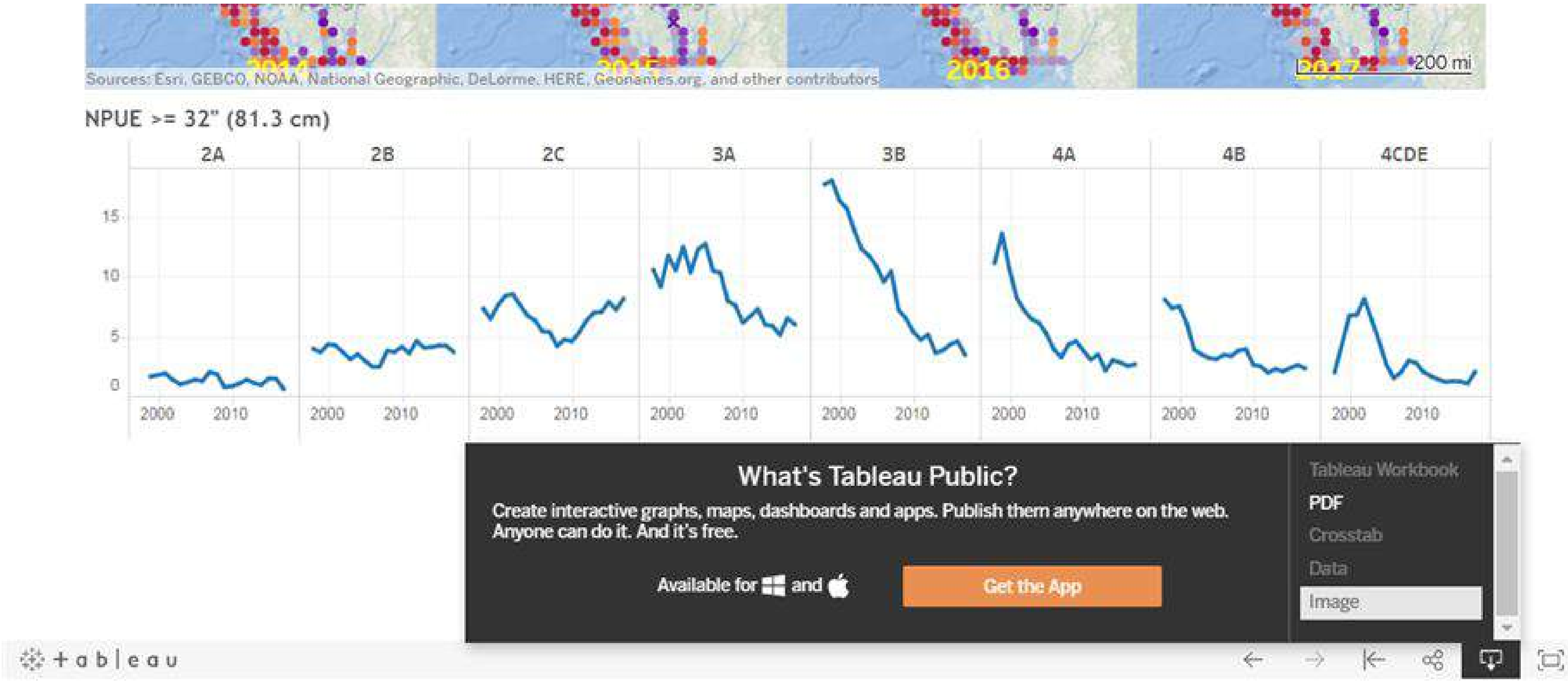
Interactiv… ample



Multi

Smal… ter for obse…

Interactive Maps and Data - Example



Interactive Maps and Data - Example

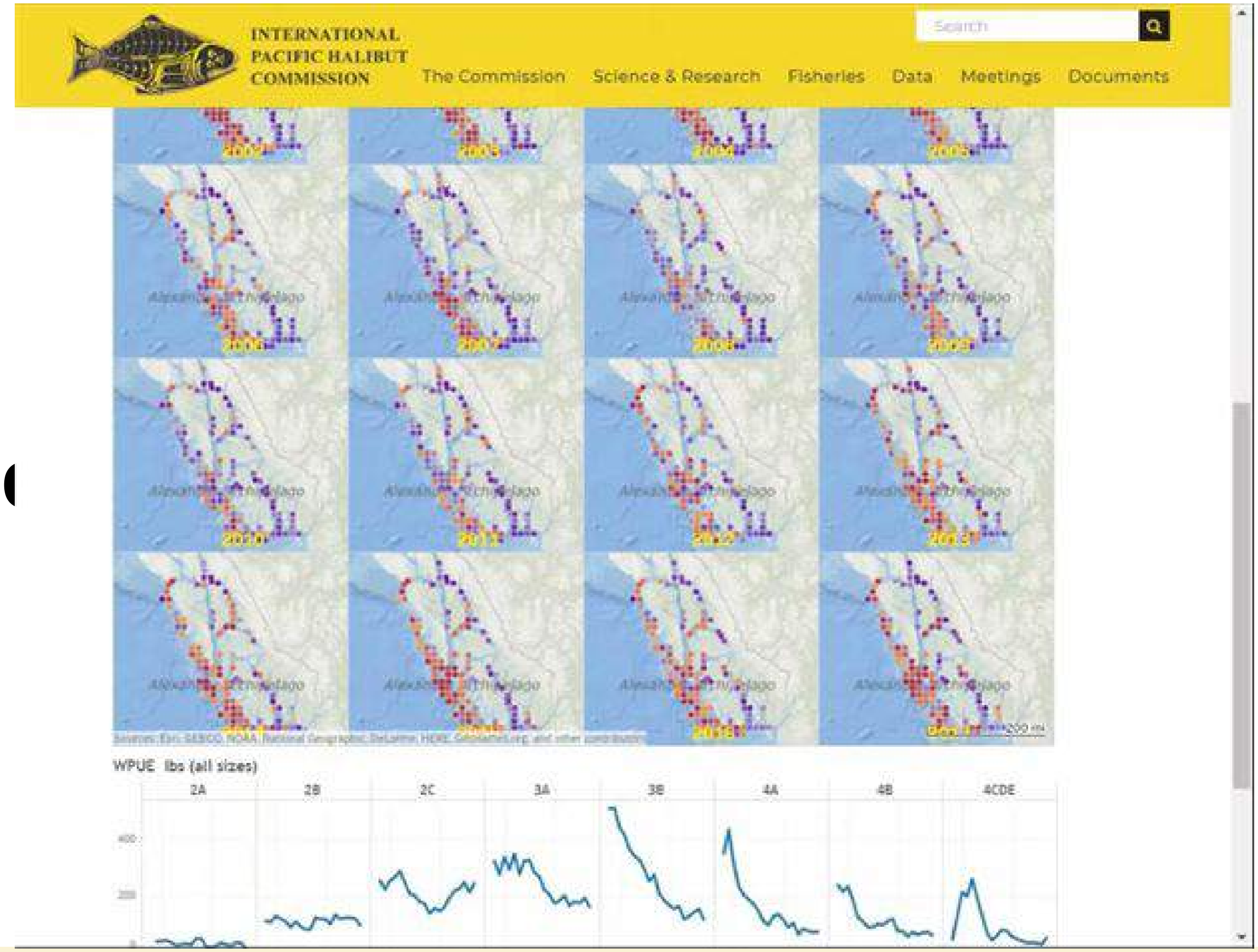
Now, let's explore the interplay between U32 and O32 and combined CPUE over the time series.

Interactive Maps and Data - Example

Data Plots Panel

- NPUE
- WPUE
- Average weight

Exampl



INTERNATIONAL
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Science & Research
Fisheries
Data
Meetings
Documents
WPUE lbs (all sizes)
2A
2B
2C
3A
3B
4A
4B
4CDE

Interactive Maps and Data

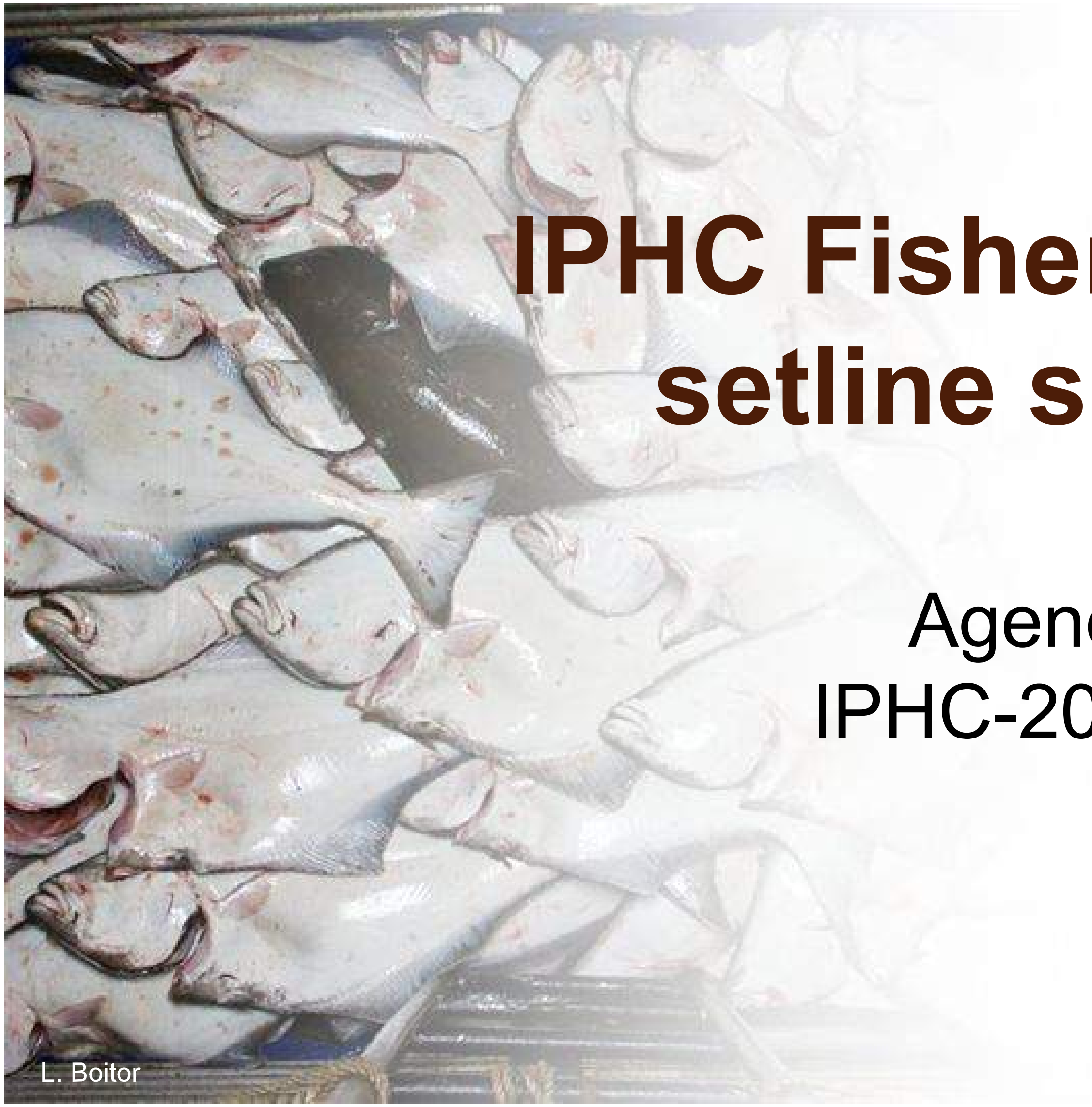
Have questions?
Want a demonstration?

Find me today near registration in the
Ballroom Foyer.

eric@iphc.int

INTERNATIONAL PACIFIC

HALIBUT COMMISSION



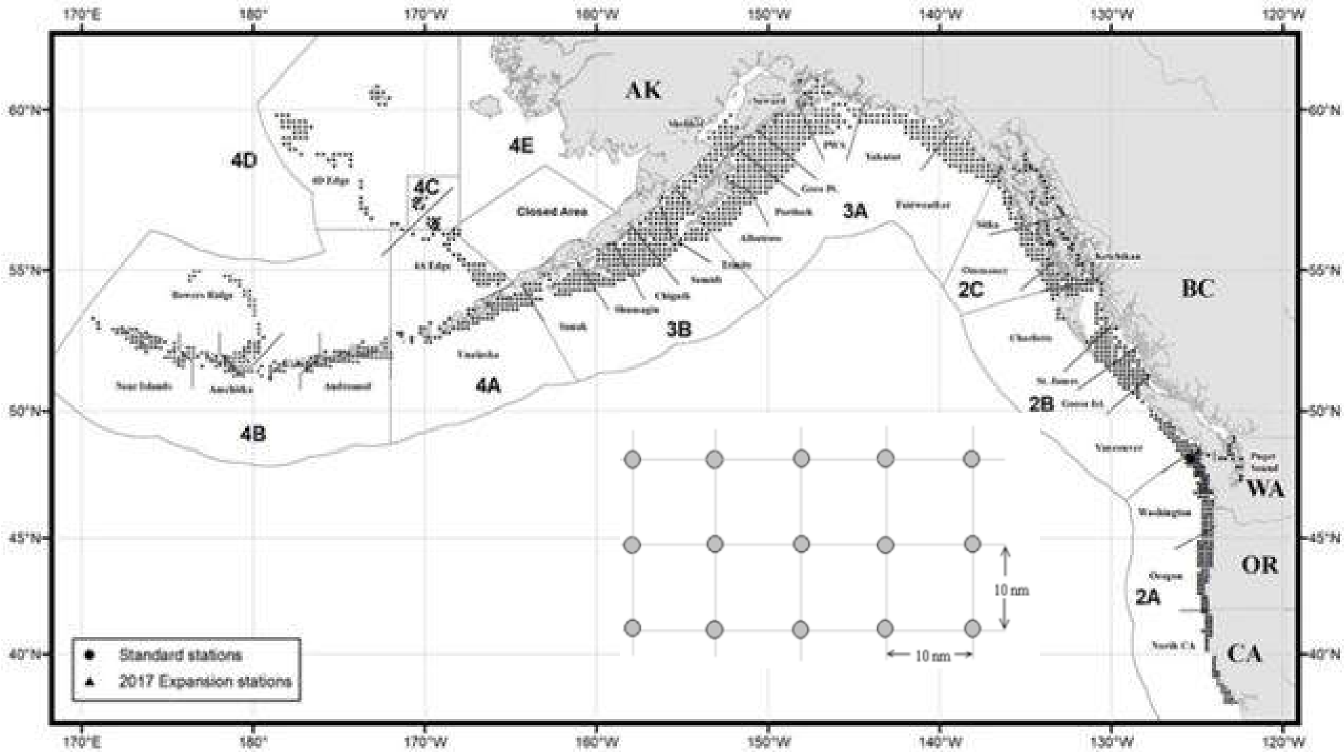
IPHC Fishery-independent setline survey (FISS)

Agenda Item 6.1
IPHC-2018-AM094-06

INTERNATIONAL PACIFIC HALIBUT COMMISSION

Standardization

Fixed FISS station positions



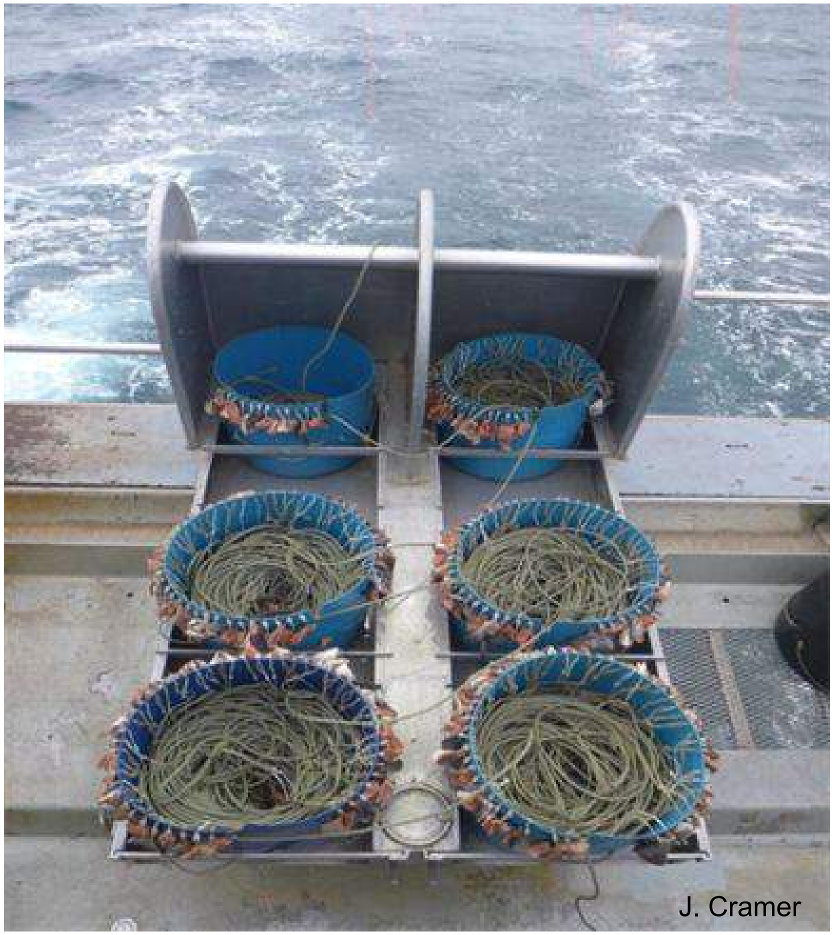
Standardization

Gear

- Fixed gear
- 1,800 foot skates

Each skate

- 100 #3 (16/0) circle hooks threaded through the front of the hook on 24”-18” gangions
- 18’ spacing
- 5-10 lb weights between skates



Standardization

Bait

- Frozen chum salmon
- Number 2 semi bright or better
- Cut 1/4 to 1/3 pound

Primary objective

Standardized, fishery-independent data for Pacific halibut stock assessment

- WPUE, sex specific length-at-age, age composition
- Data on undersized Pacific halibut
- Pacific halibut distribution and abundance trends (changes in sex, length, maturity, and age over the grounds)

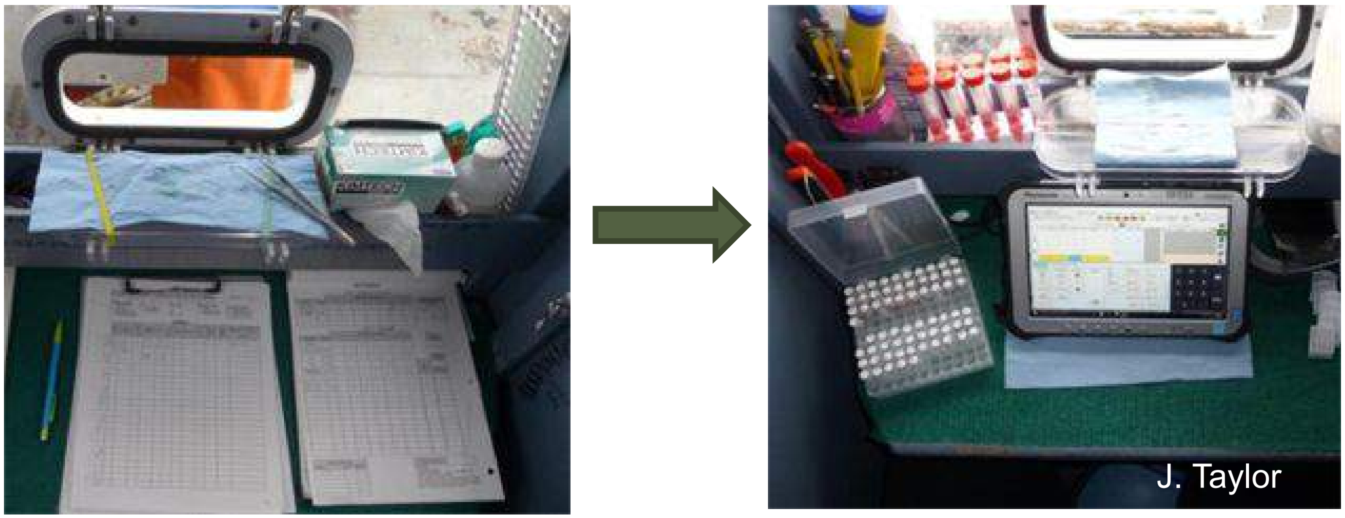

L. Boitor


L. Boitor


A. McDermott


L. Boitor

New in 2017:
Electronic data recording coastwide



- First year tablets coastwide (all areas except Reg. Area 2A, 2016 pilot year with 6 vessels)
- Improved data quality, timeliness of data availability, redirect Secretariat time from data entry/verification
- IPHC continuing to take feedback and refine

Secondary objectives

Platform for specialized data collection projects

- Oceanographic data
- Genetics, condition factor
- Prior hooking injuries
- Marine mammal / Seabird occurrence / interactions
- Environmental Contamination (ADEC)
- *Ichthyophonus*
- Archive otolith collection
- Tagging: Pop-up Archival Transmitting (PAT) tags, wire tags, internal tags


L. Boitor

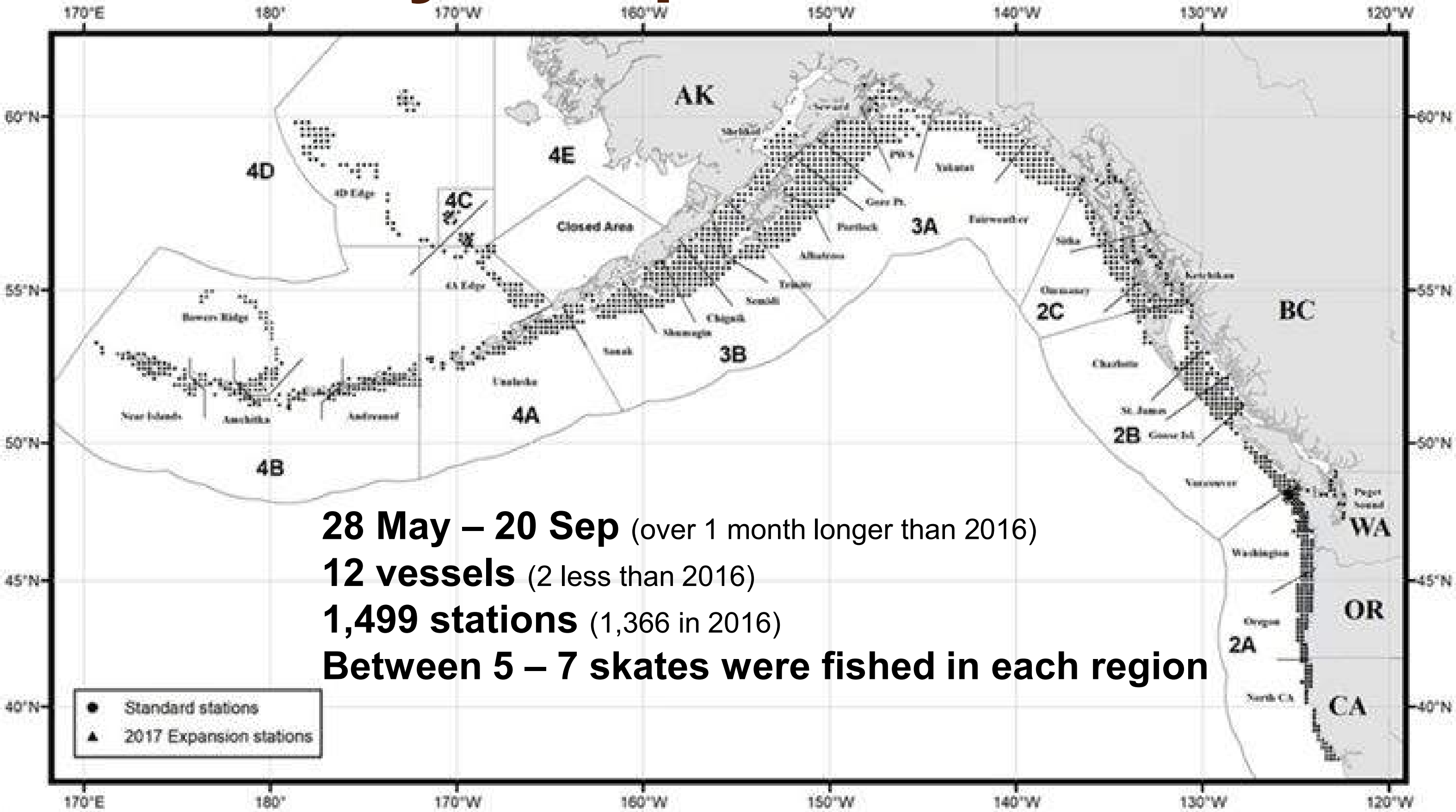

Cal Blood

Secondary objectives

Platform for specialized data collection projects

- NMFS
  - Pacific cod sampling
  - Electronic monitoring system tests
  - Shark sampling (Spiny dogfish, Six gill, Sleeper shark)
  - IPHC on NMFS trawl survey
- DFO
  - Rockfish biological samples
  - 100% hook occupancy
  - Shark sampling
- CDFW, ODFW, WDFW
  - Rockfish sampling cooperation

2017 Fishery-independent setline survey



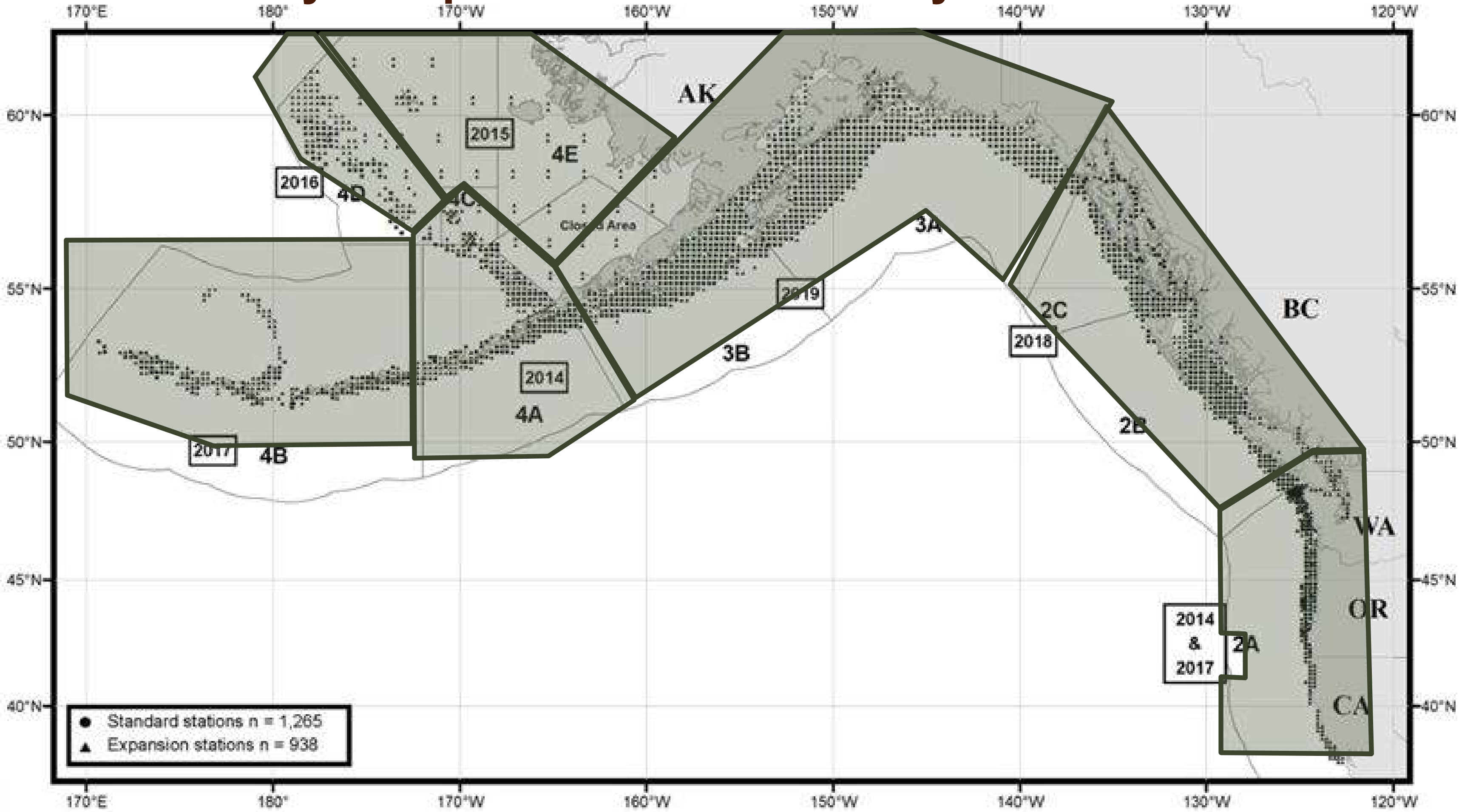
28 May – 20 Sep (over 1 month longer than 2016)

12 vessels (2 less than 2016)

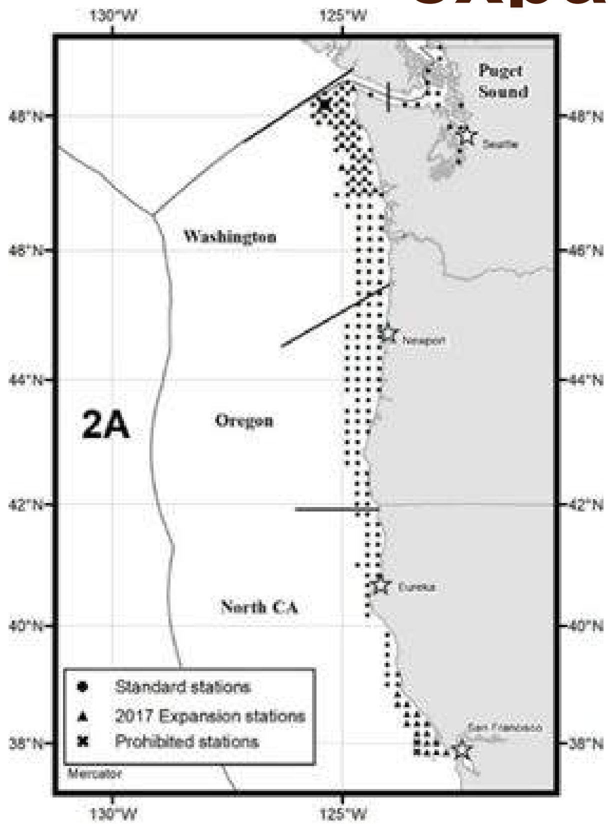
1,499 stations (1,366 in 2016)

Between 5 – 7 skates were fished in each region

Fishery-independent setline survey stations 2014-19



2017 Fishery-independent setline survey expansion in 2A



<u>212 Total setline survey stations with 81 Expansions</u>

Puget Sound – 14 expansion

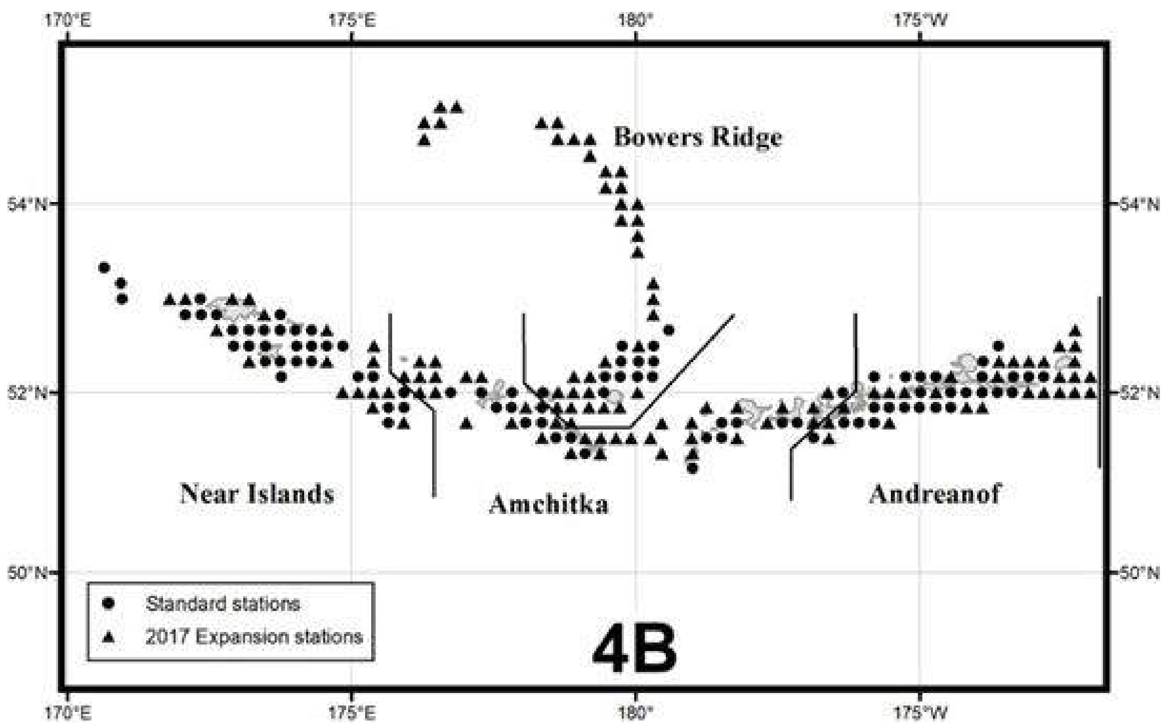
WA – 49 standard grid stations
8 rockfish index
13 expansion stations
26 new dense grid

OR – 47 standard grid
13 expansion stations

N. CA -27 previously fished expansion
15* new expansion

(*2 not permitted because of habitat closures)

2017 Fishery-independent setline survey expansion in 4B



<u>113 NEW stations, 202 total</u>

Near Islands - 49 (17 new)
Amchitka - 49 (31 new)
Bowers Ridge - 50 (37 new)
Andreanof – 54 (28 new)

2018 Fishery-independent setline survey expansion & station vetting

Reg. Area 2B expansion (103 expansion stations proposed)

- Areas of concern (MPAs, RCAs)
- Species of concern (yelloweye, bocaccio)

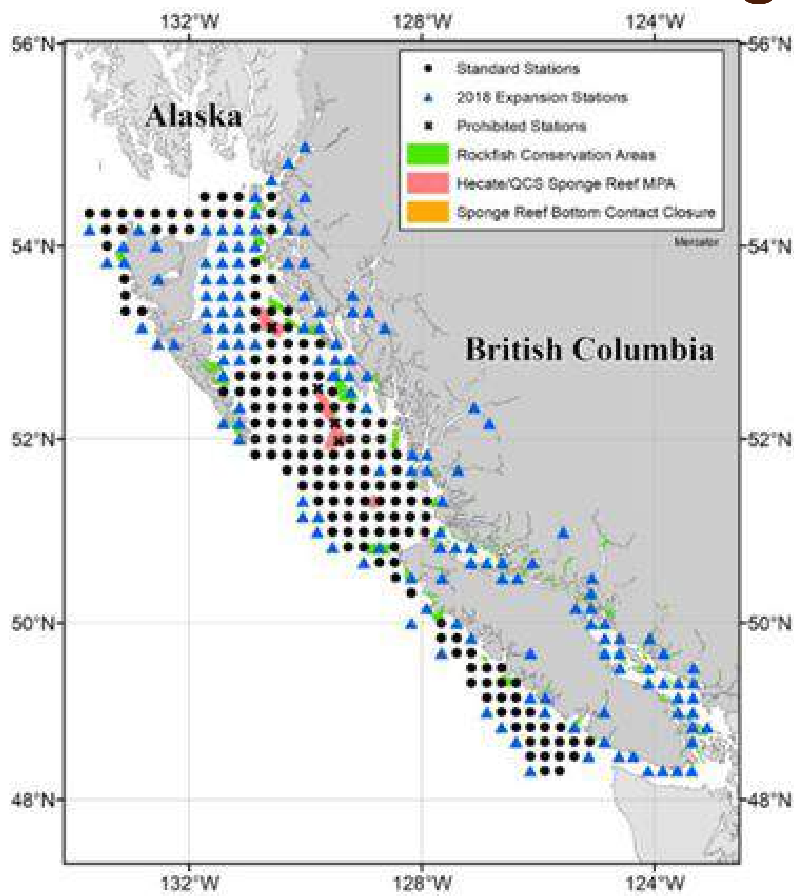
DFO/IPHC coordination

- Staff met in Mar, May, Aug (re: MPA decision), and Nov 2017 for planning and to outline information needs

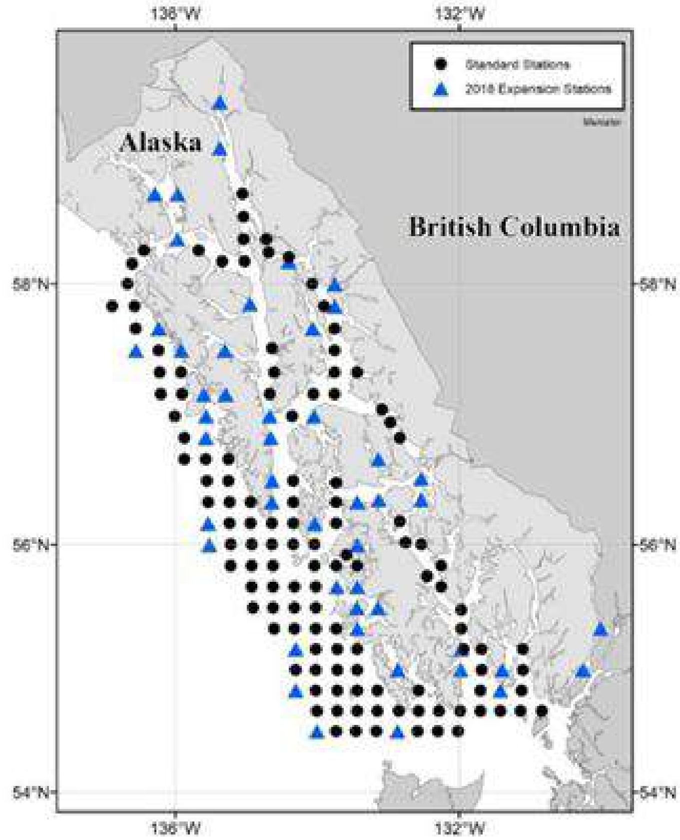
Reg. Area 2C expansion (55 expansions proposed)

- Working with Glacier Bay National Park on stations within boundaries

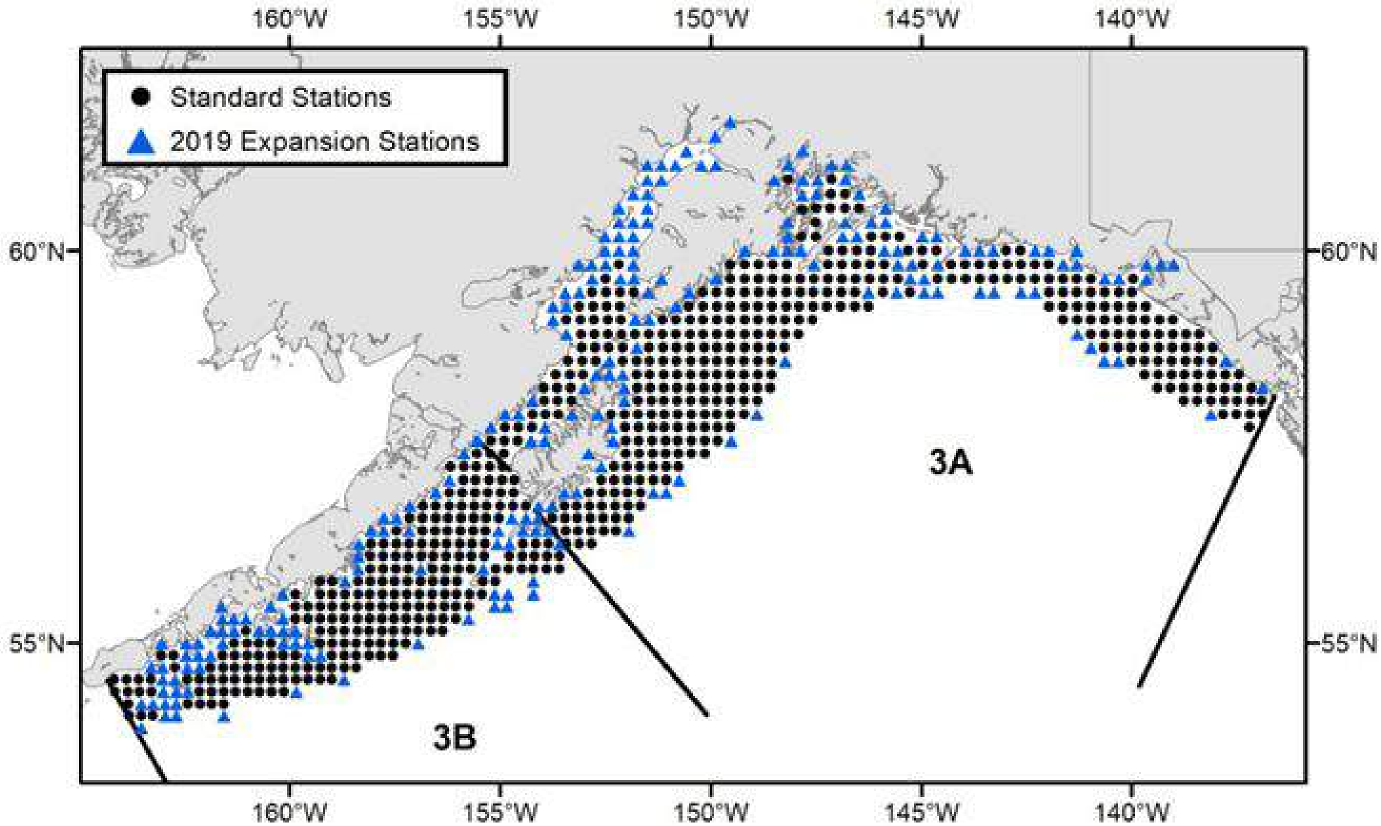
Proposed 2018 stations in IPHC Regulatory Area 2B



Proposed 2018 FISS stations in IPHC Regulatory Area 2C



Proposed 2019 FISS stations in IPHC Regulatory Areas 3A/3B




IPHC

INTERNATIONAL PACIFIC HALIBUT COMMISSION

Space-time modelling of fishery-independent setline survey data

Agenda Item 6.1
IPHC-2018-AM094-07

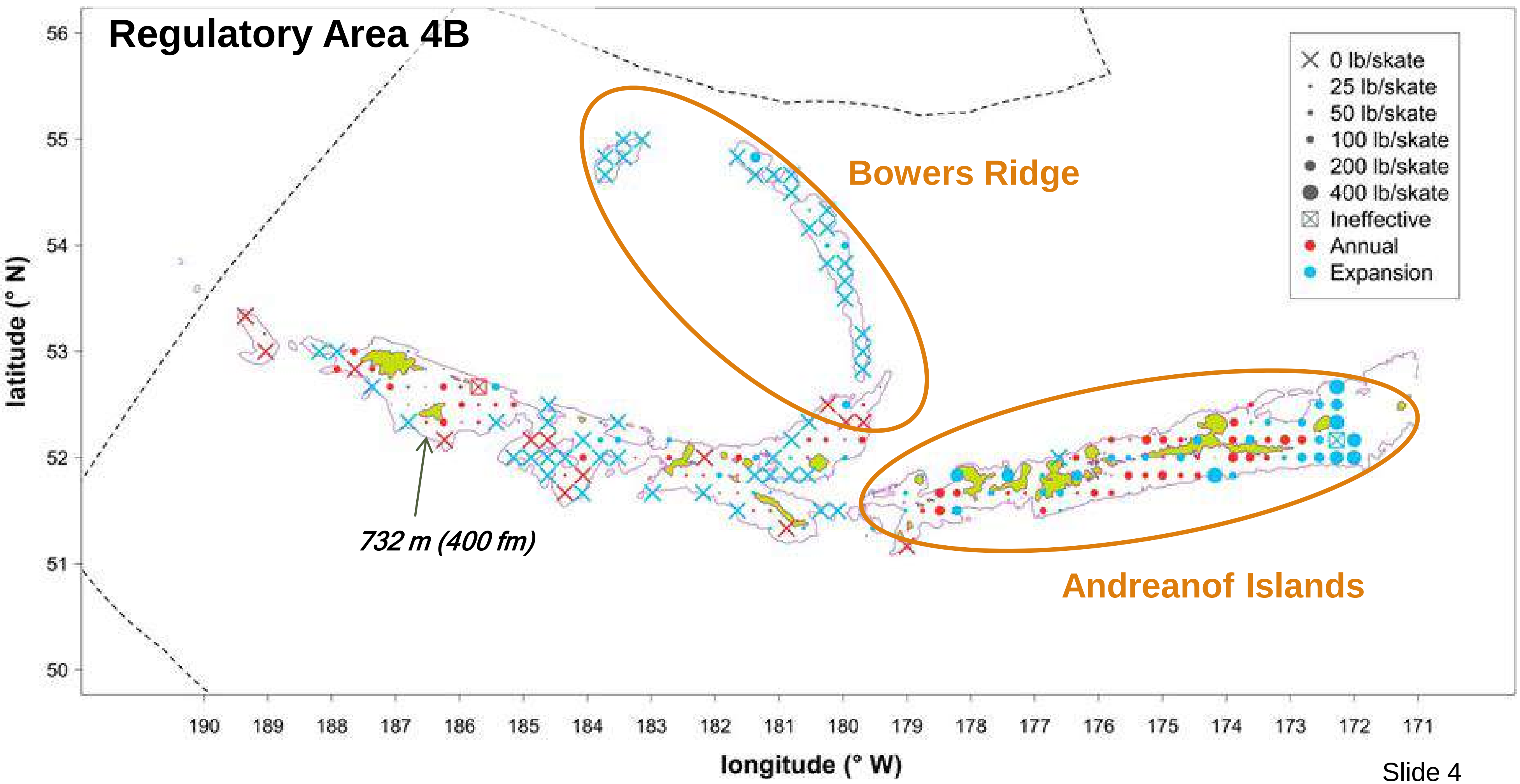
INTERNATIONAL PACIFIC HALIBUT COMMISSION

Outline

- Setline survey expansion results
  - IPHC Regulatory Areas 4B and 2A
- Output of space-time modelling
  - O32 WPUE, total WPUE and NPUE
- Evaluation of the need for future setline survey expansions
  - IPHC Regulatory Areas 2A and 4A

Setline survey expansion results

- Regulatory Area 4B
  - Addition of deep (> 503m, >275 fm) and shallow (18-37 m,10-20 fm) stations
  - Large coverage gaps surveyed for first time:
    - Bowers Ridge
    - East Andreanof Islands
    - Around Amchitka I. and between Attu and Kiska Is.
- Regulatory Area 2A
  - Expansion in CA to 37.75°N
  - Repeat of deep, shallow and Salish Sea expansions (done previously in 2011 and 2014)
  - Dense grid off the north WA coast



Regulatory Area 4B
Bowers Ridge
Andreanof Islands
732 m (400 fm)
0 lb/skate
25 lb/skate
50 lb/skate
100 lb/skate
200 lb/skate
400 lb/skate
Ineffective
Annual
Expansion
latitude (° N)
longitude (° W)
56
55
54
53
52
51
50
190
189
188
187
186
185
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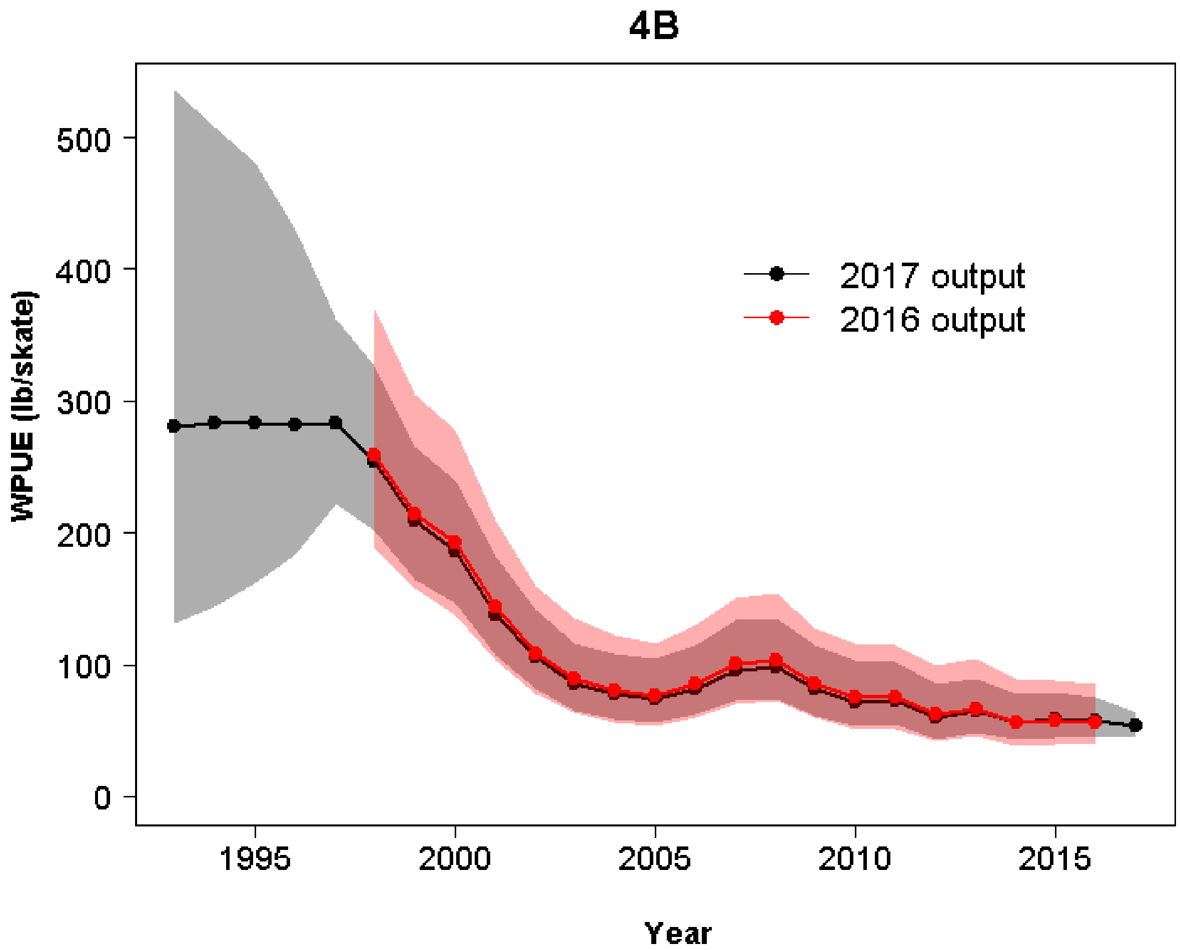
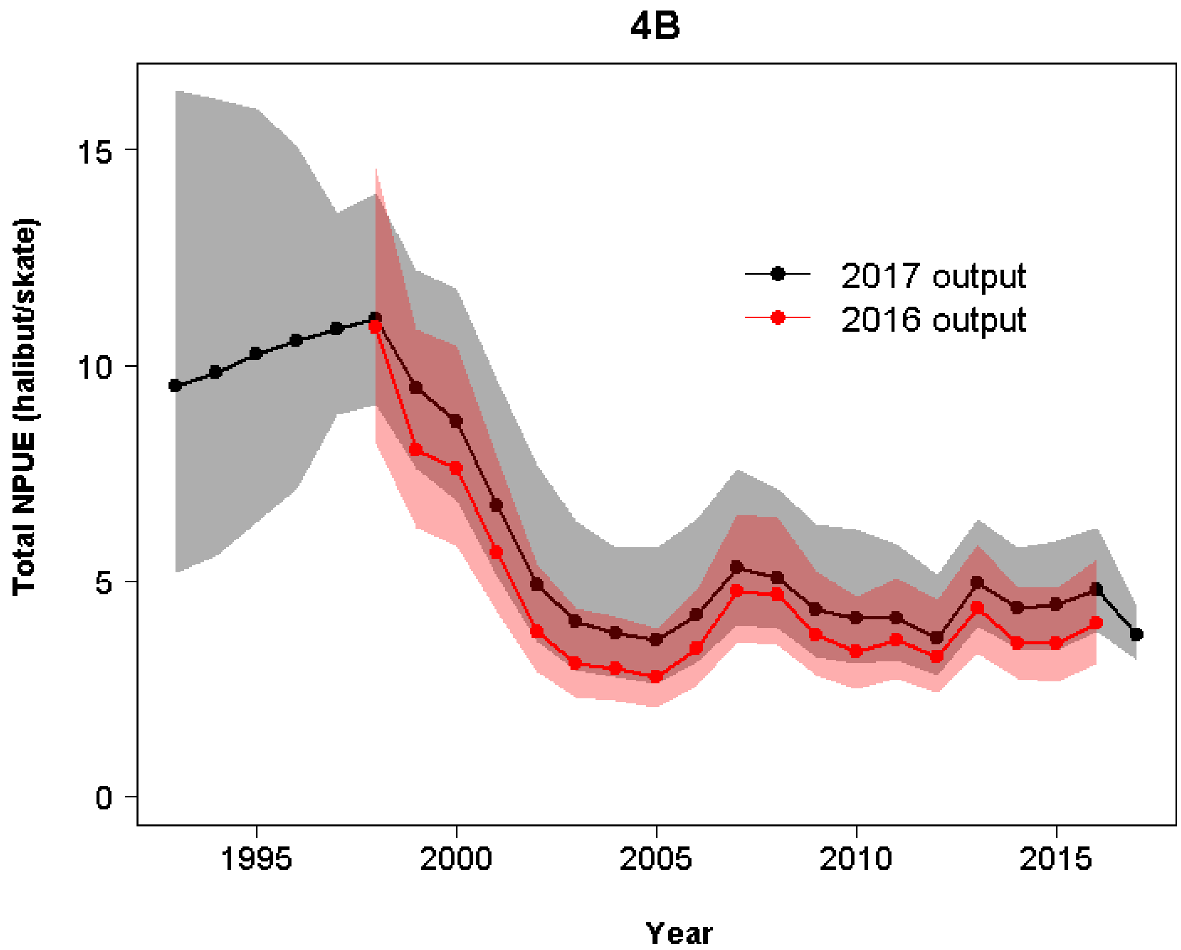
171

O32 WPUE



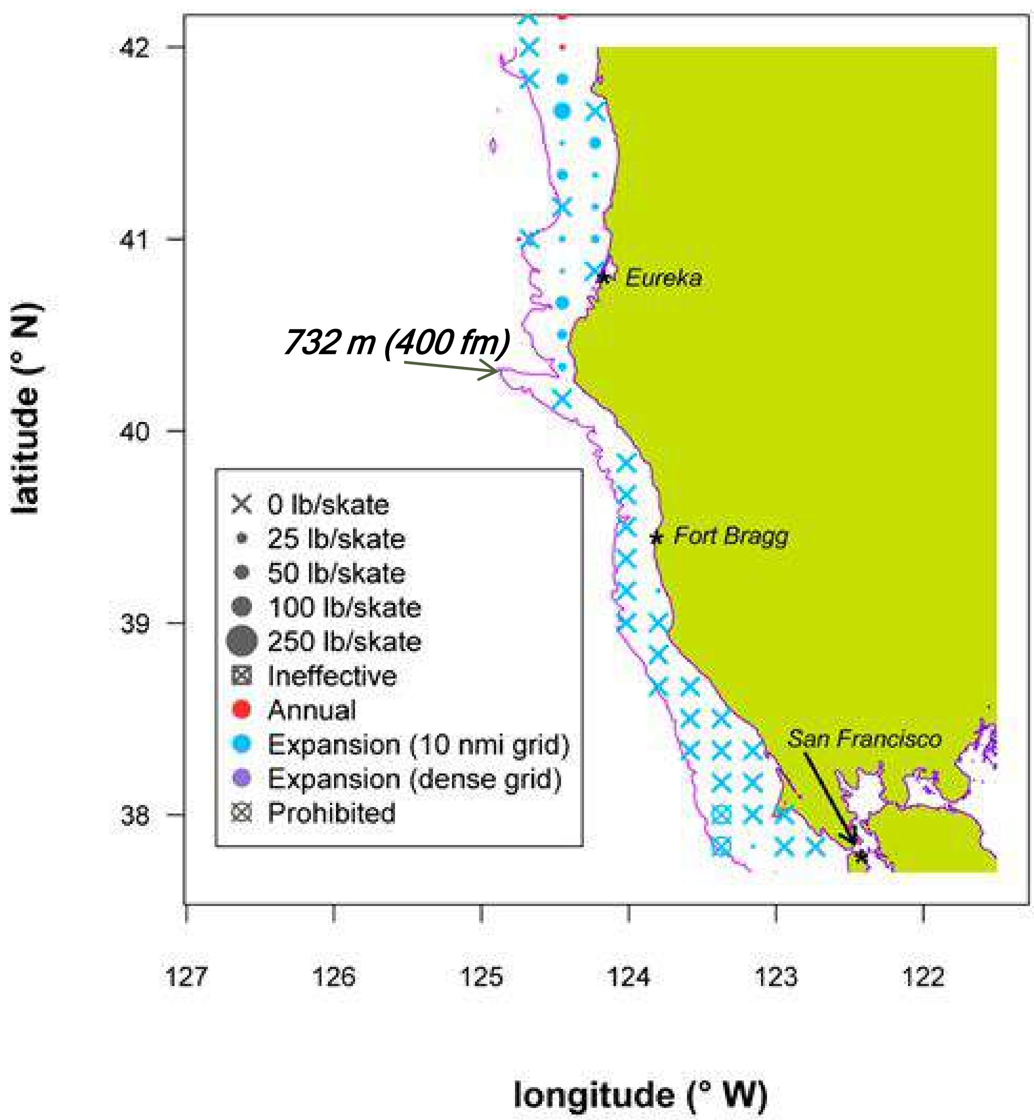
4B
2017 output
2016 output
WPUE (lb/skate)
0
100
200
300
400
500
1995
2000
2005
2010
2015
Year

Total NPUE

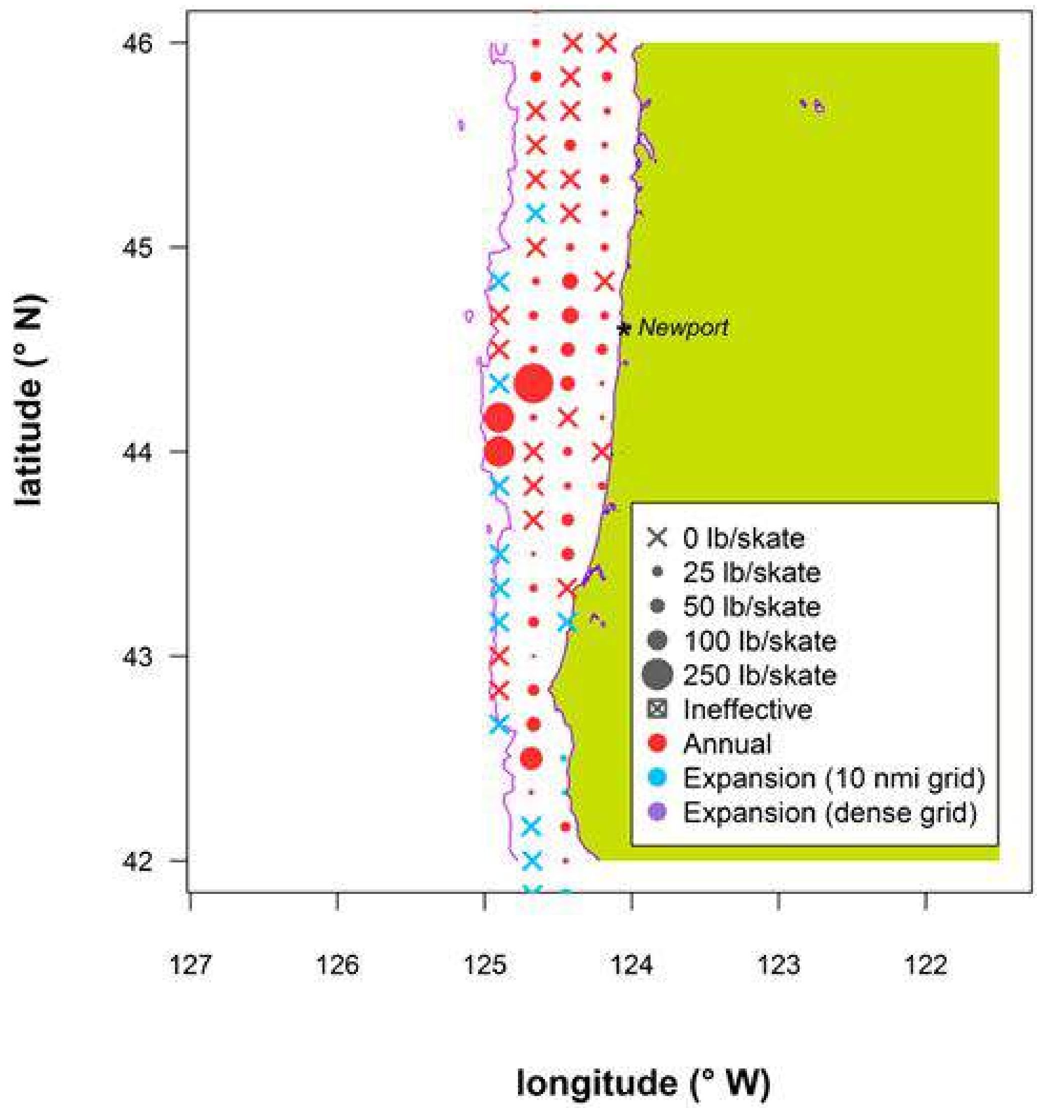


4B
15
10
5
0
Total NPUE (halibut/skate)
1995
2000
2005
2010
2015
Year
2017 output
2016 output

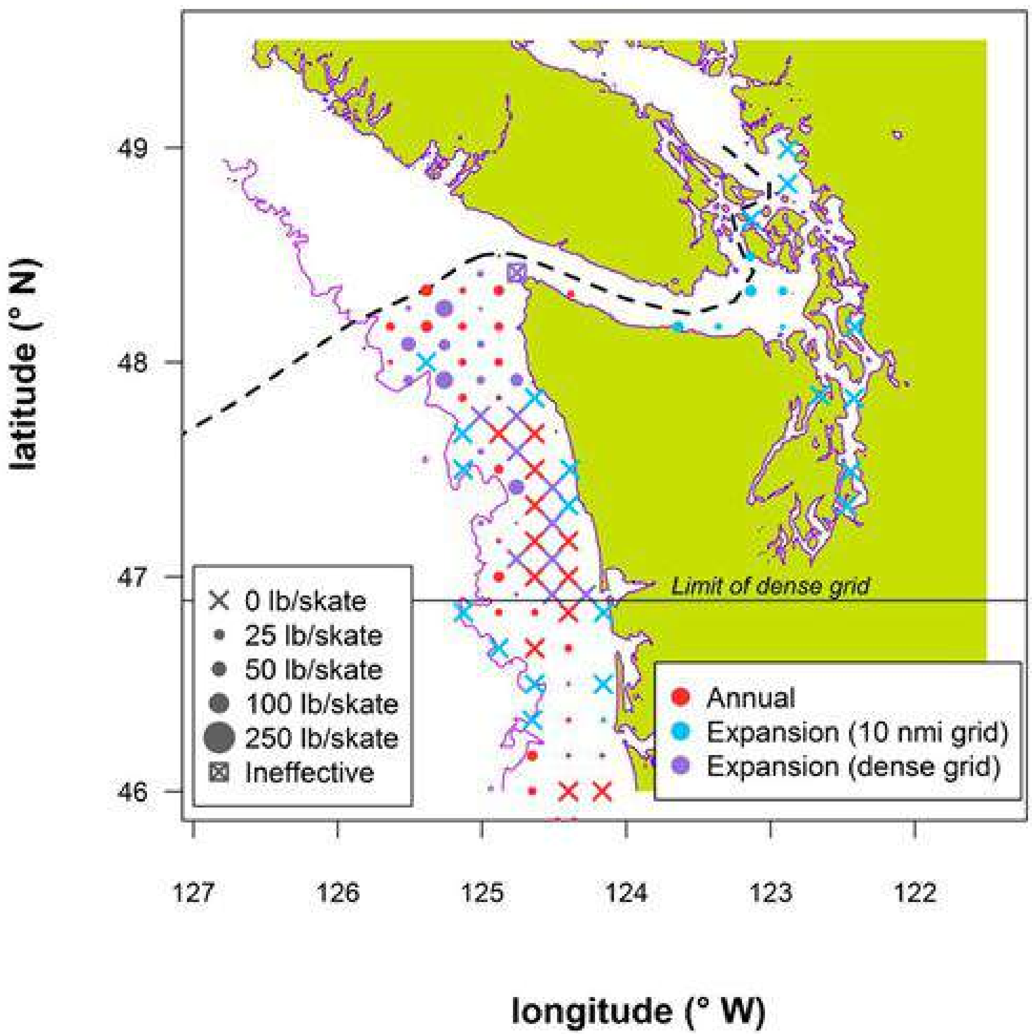
Area 2A
California



Area 2A
Oregon



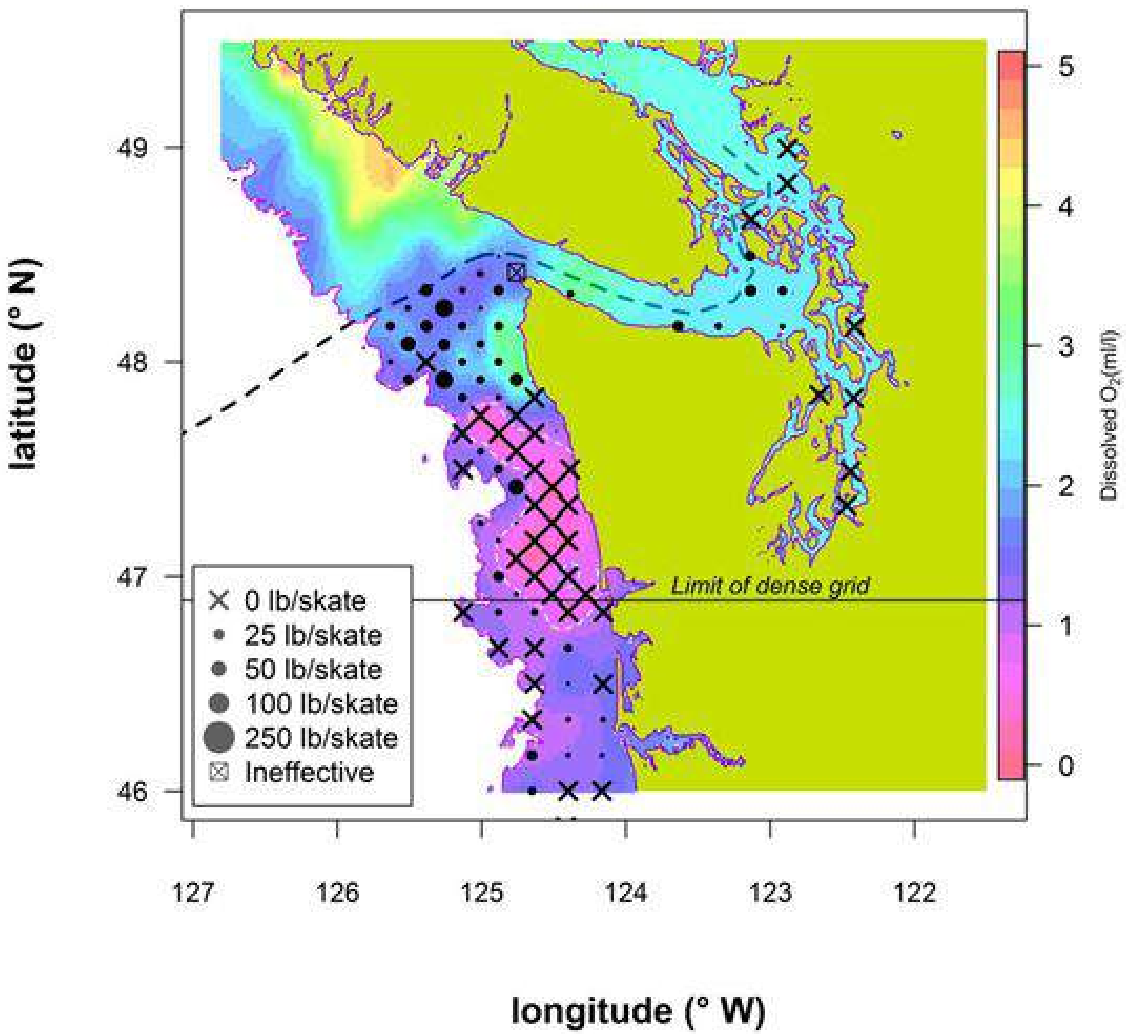
Area 2A
Washington



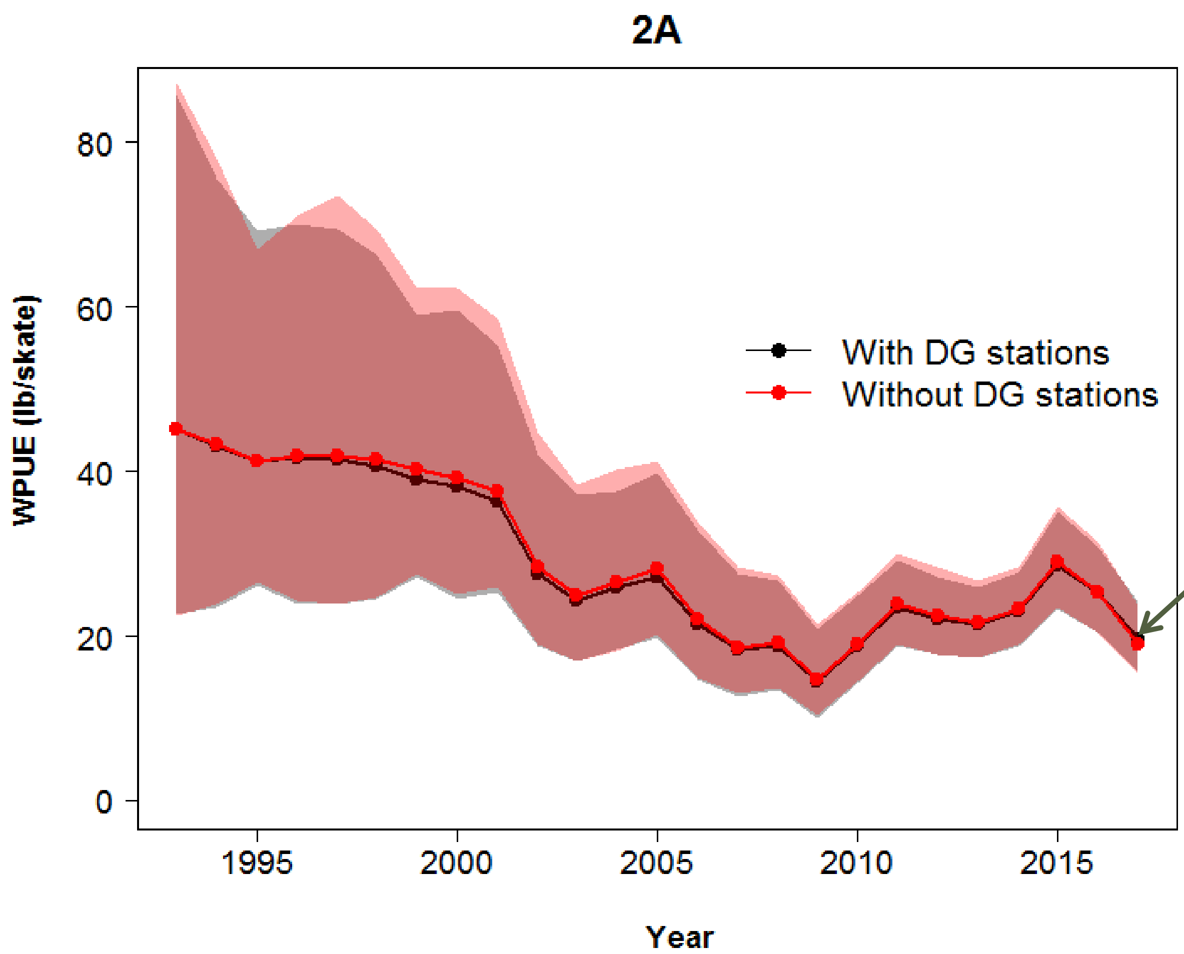
Area 2A

Washington

+ dissolved O_2



O32 WPUE



+2.8% in 2017

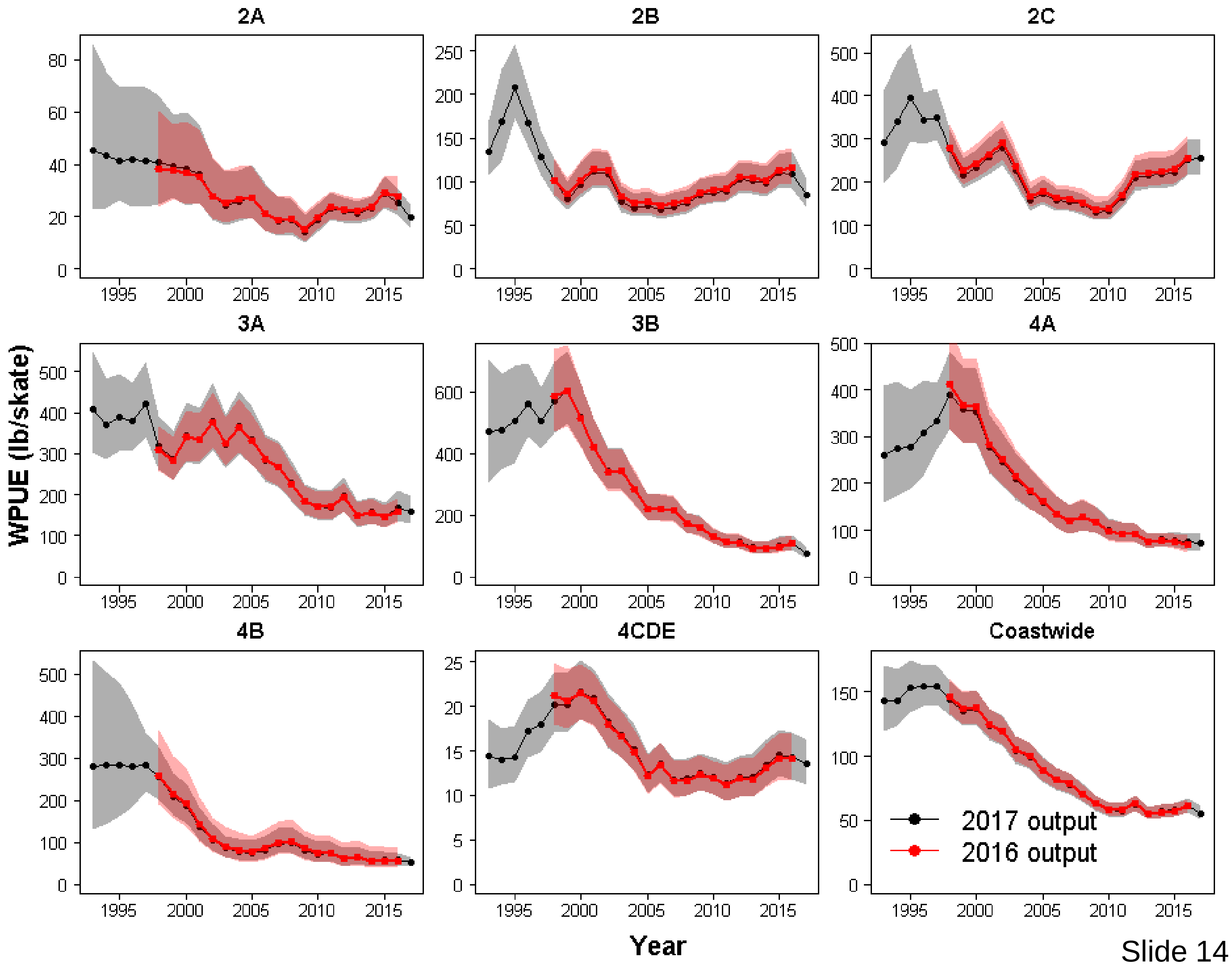
Space-time modelling

- In 2016, a space-time modelling approach was adopted to estimate WPUE and NPUE indices
  - Previously we had used an approach based on direct calculations from observed data
  - Method was approved for adoption by Scientific Review Board
- Space-time models can make use of information about the patchiness of Pacific halibut distribution to:
  - Reduce random variation in the indices
  - Improve how we deal with incomplete setline survey coverage
  - Improve estimates of uncertainty

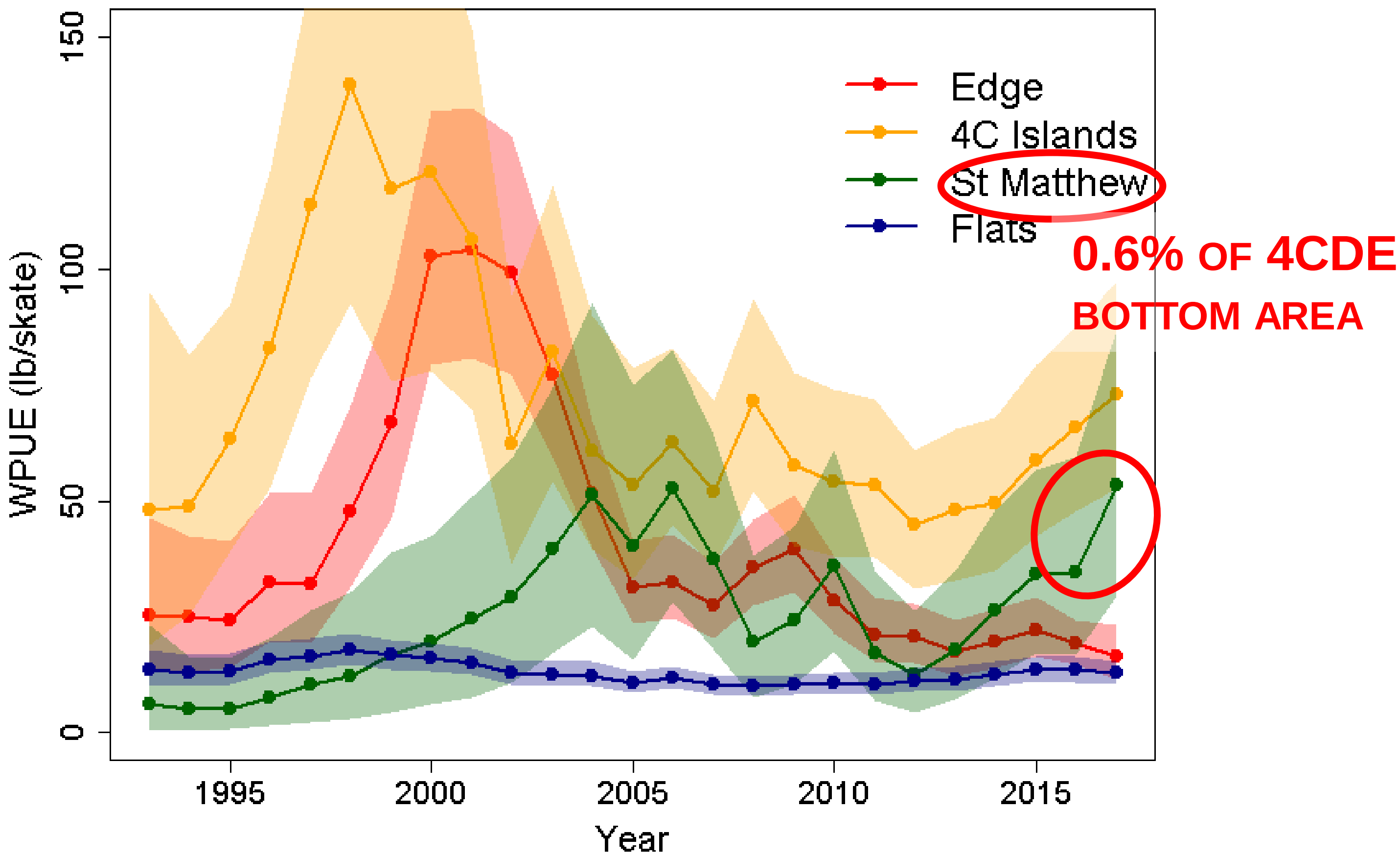
Space-time modelling updates in 2017

- Inclusion of data from 1993-1997 IPHC setline surveys
- In Area 2A, use of a covariate to indicate north and south of 40°N
  - Very low densities south of 40°N
  - Inclusion of this covariate improves prediction in this southern region in unsurveyed years
- Total WPUE modelled in 2017
  - Only O32 WPUE and total NPUE were modelled in 2016
- Bottom area estimates were updated for all IPHC Regulatory Areas

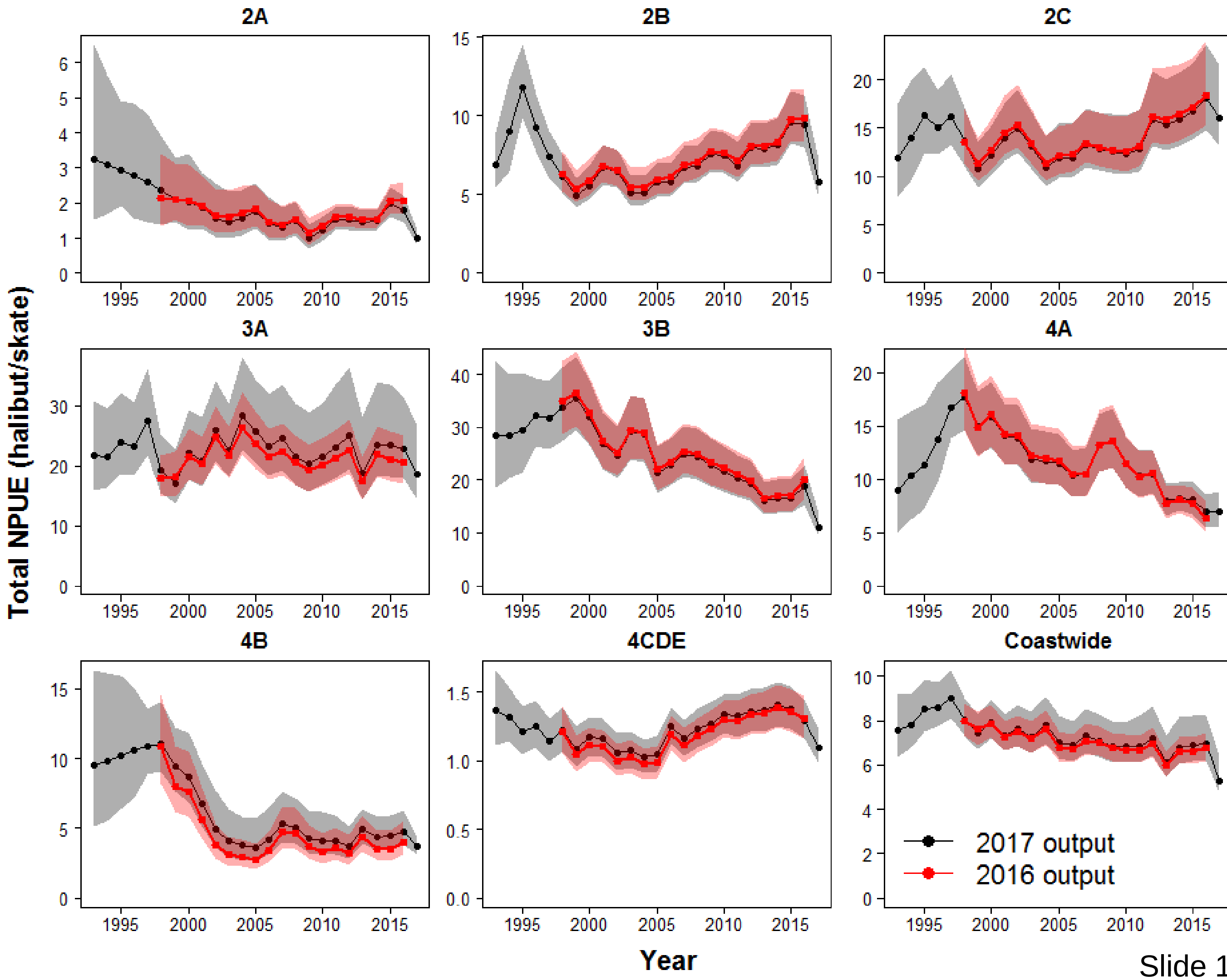
O32 WPUE 2016 and 2017 modelling



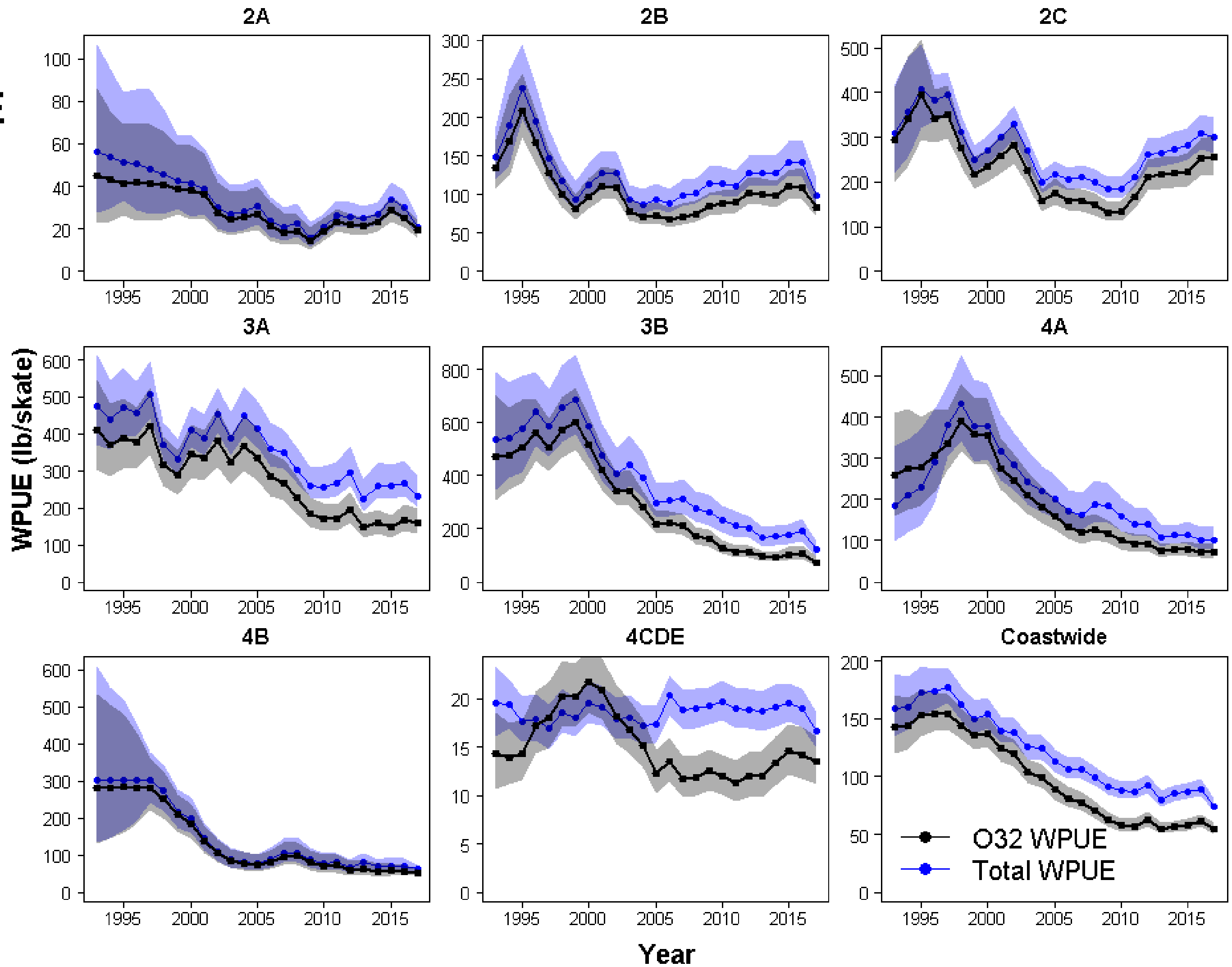
O32 WPUE
Area 4CDE split



Total NPUE 2016 and 2017 modelling



O32 & Total WPUE 2017 modelling



Evaluation of future expansion frequency

Commissioners requested we evaluate how frequently IPHC setline survey expansions should be repeated in the future:

> "*The Commission* ***RECOMMENDED*** *that the IPHC Staff develop an information paper associated with the survey expansion, which details the likely implications of periodic survey expansion on the stock assessment and apportionment, taking into consideration potential population variability of Pacific halibut in expansion areas which are infrequently surveyed.*" (IM092, para. 38)

Evaluation of future expansion frequency

- Evaluation requires expansion to have already been completed in a Regulatory Area.
- It also helps for some time to have passed since the expansion.
- Here we use the space-time modelling to evaluate the effect of expansions in survey coverage on mean WPUE estimates in IPHC Regulatory Areas 2A and 4A.

Evaluation approach

- We compare models fitted to the data excluding subsets of setline survey expansion stations with the model fitted to the full data set.
- Allows us to:
  - assess the benefits in terms of relative error and precision of having expansion data available
  - to examine how error and precision change with time since the expansion took place
  - For Regulatory Area 2A, examine whether there is an additional benefit of having the 2014 expansion data along with the original 2011 expansion data

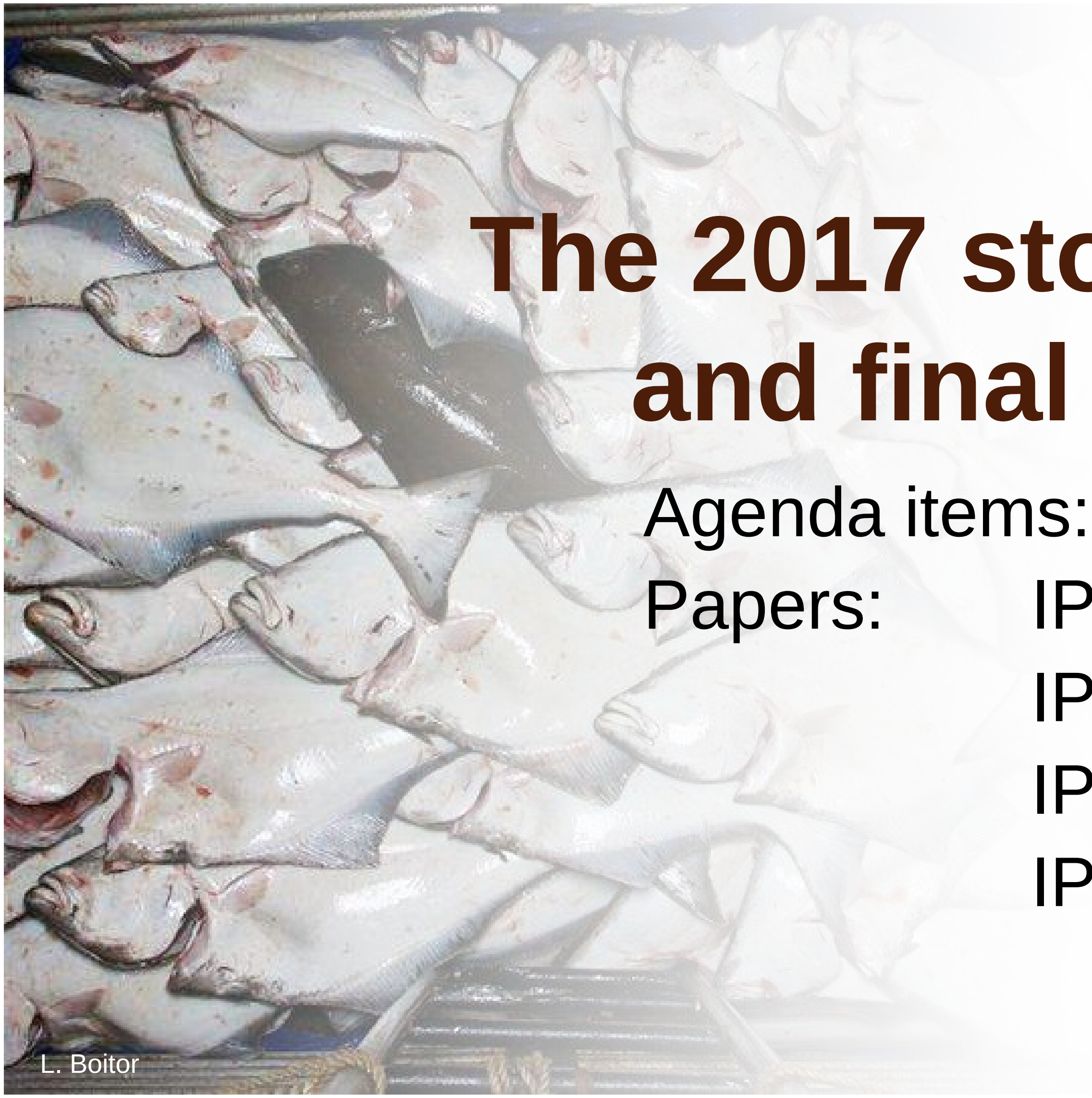
Recommendations

Reg Area	Expansion region	Density †	Variability (spatial/ temporal)	Recommend FISS frequency	Cost ‡
2A	Deep and shallow waters	Low	Low	≥ 10 years	Low
2A	Salish Sea	Low-average	High	5 years	Low
2A	N. California	Average 40-42°N; Low 39-40°N	Average 40-42°N; Low 39-40°N	3-5 years 40-42°N	Medium
4A	Aleutian Islands	High	High	3-5 years	High
4A	Shelf edge	Average	Low	≥ 10 years	Medium

† Density relative to annually surveyed parts of the Regulatory Area
‡ Cost relative to annually surveyed parts of the Regulatory Area

INTERNATIONAL PACIFIC

HALIBUT COMMISSION



The 2017 stock assessment and final catch tables

Agenda items: 6.3 & 6.4

Papers: IPHC-2018-AM094-08
IPHC-2018-AM094-09
IPHC-2018-AM094-10
IPHC-2018-AM094-11

International Pacific Halibut Commission

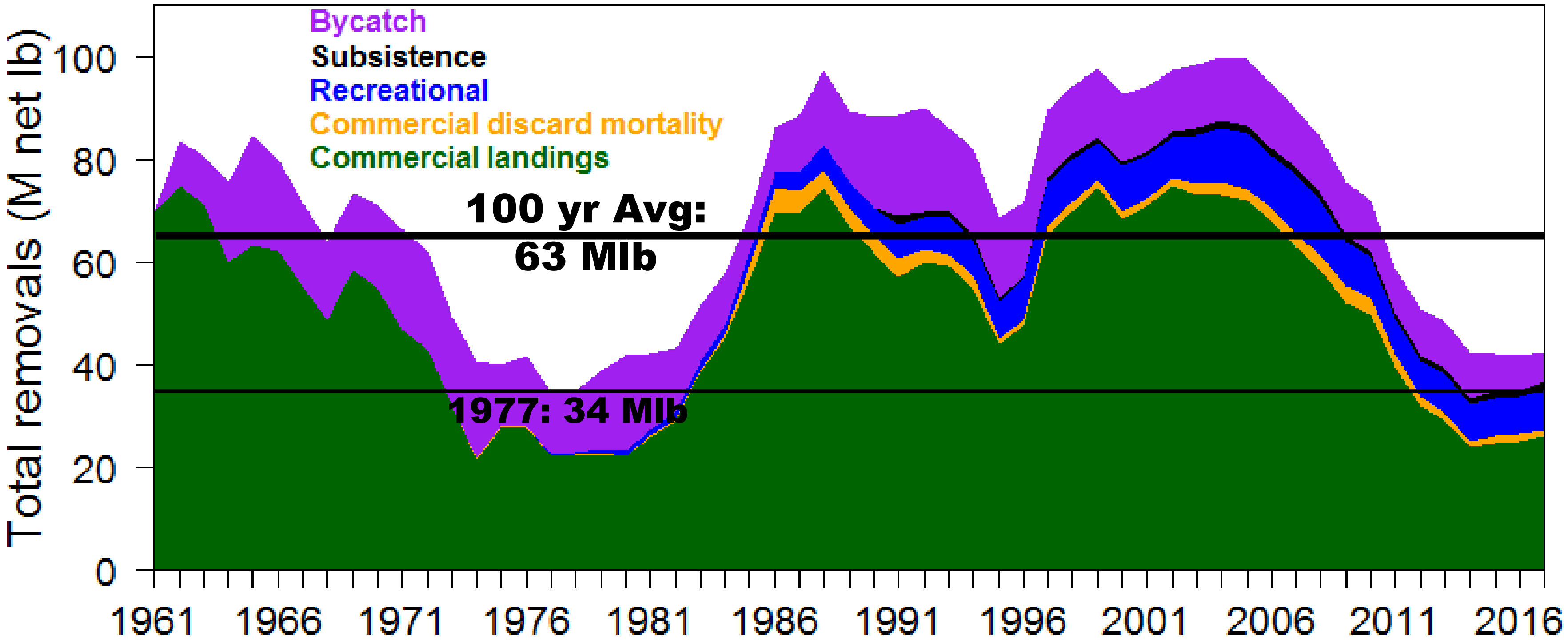
Outline

- Coastwide stock assessment
  - Data sources
  - Modelling and results
- Catch tables
  - Regulatory Area-specific projections

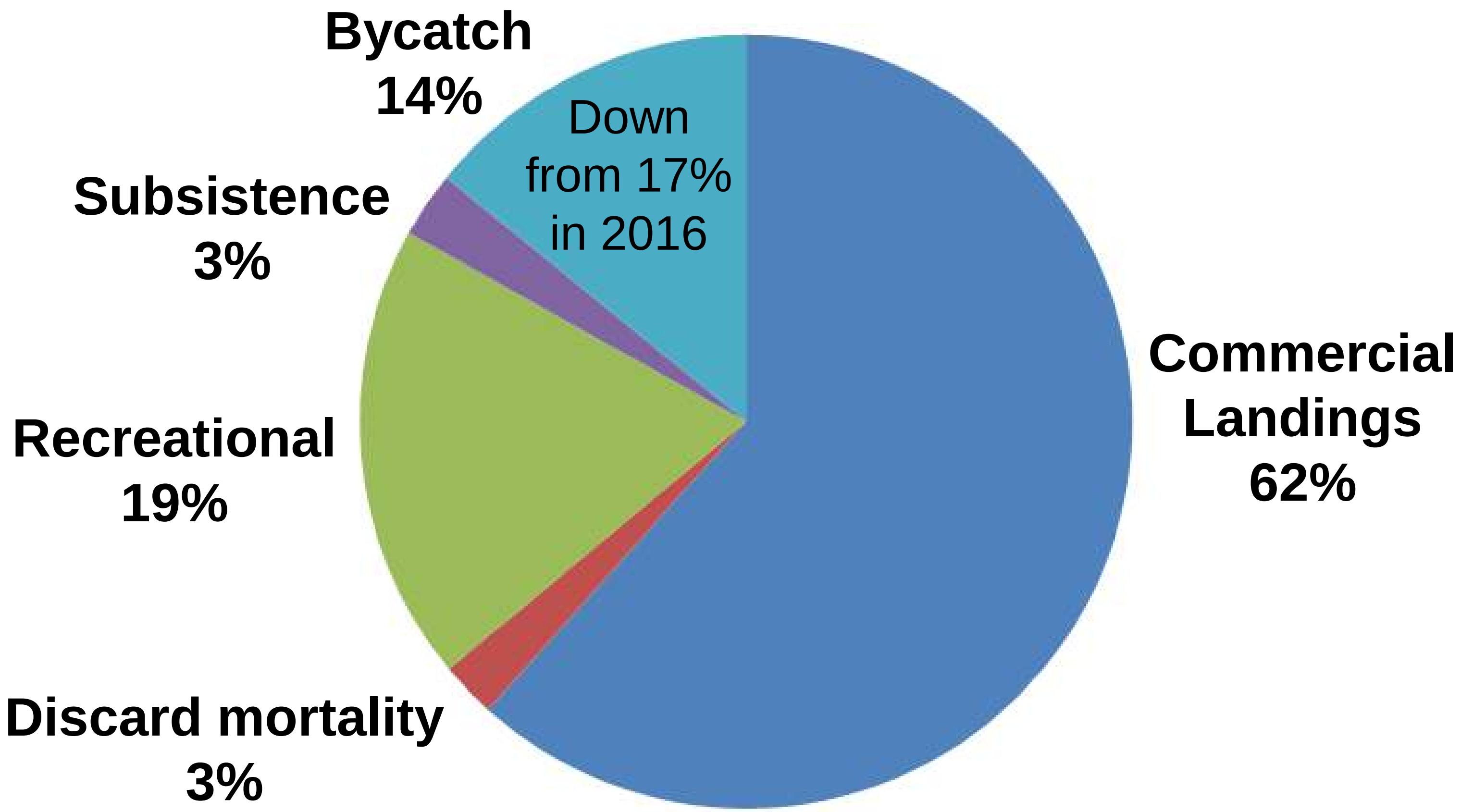
Summary

- Large drop in coastwide survey numbers (24%) and weight (10%) observed in 2017
- Fishery WPUE stable coastwide, but down in most Regulatory Areas
- 2017 spawning biomass estimates close to last assessment (down only 2%)
- Projections indicate much less yield available in the near future

Sources of mortality



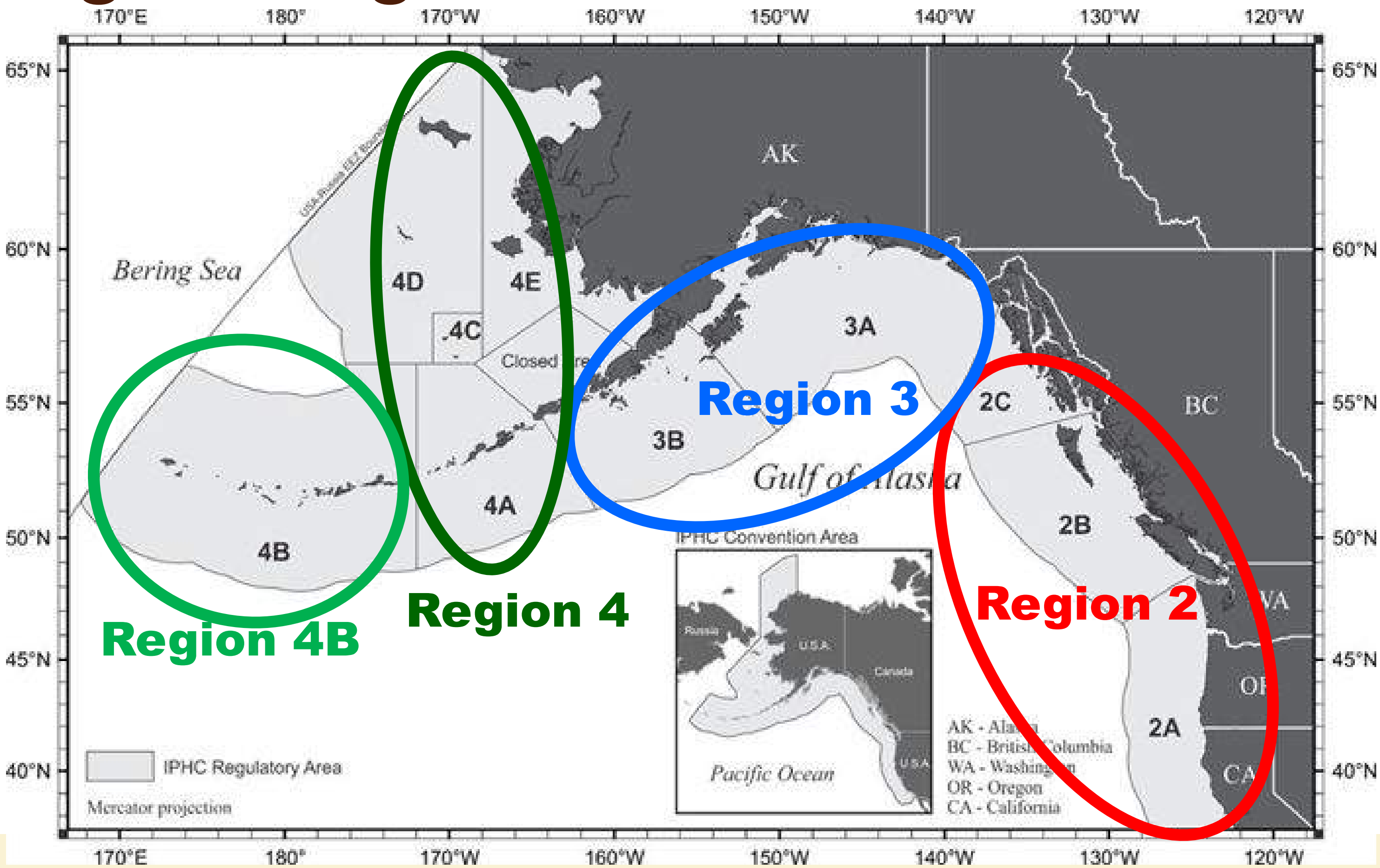
2017 Mortality (weight): 42.49 Mlb



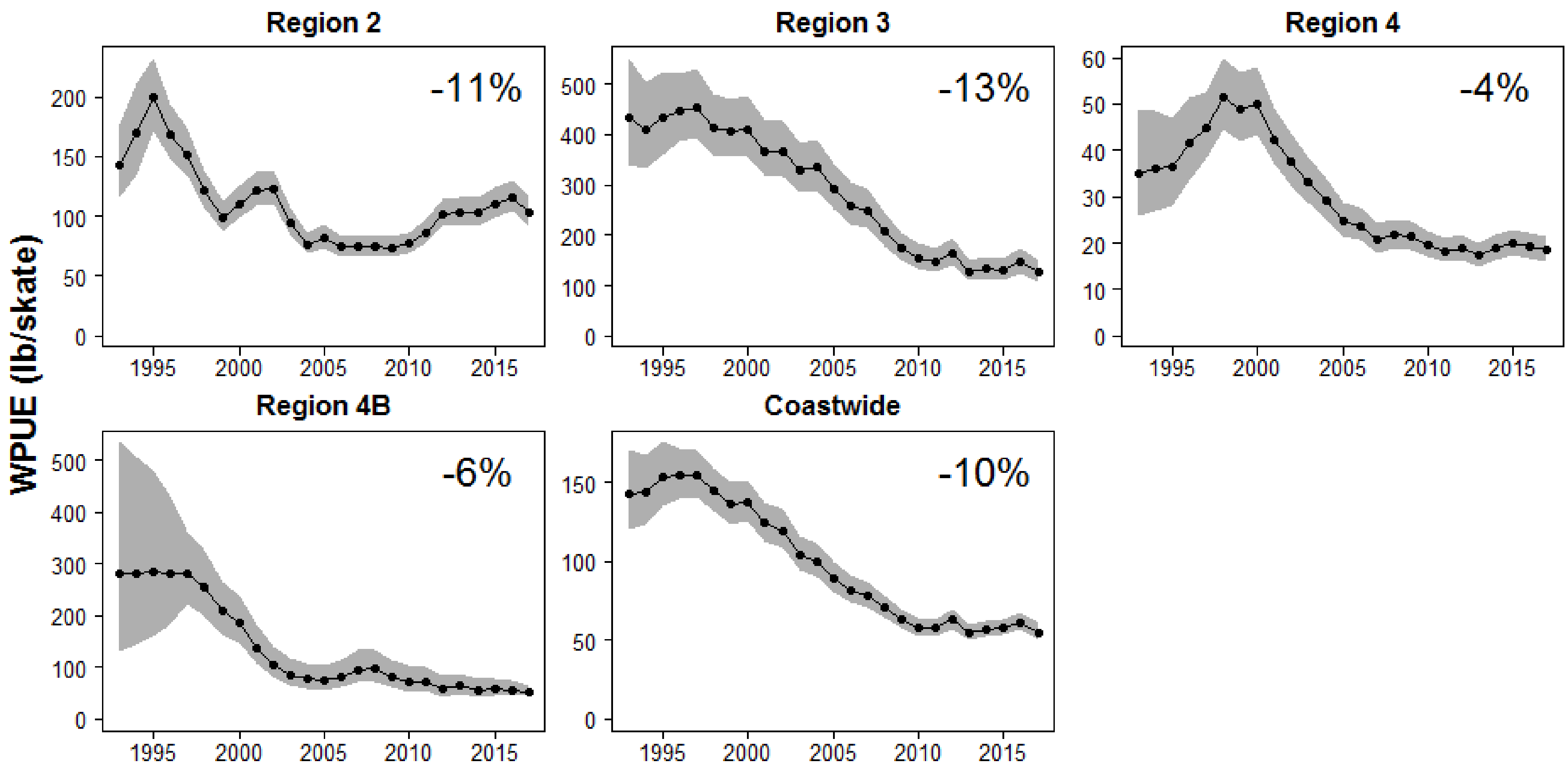
Recent mortality (M lbs net)

Year	Commercial Landings	Discard mortality	Recreational	Subsistence	Bycatch	Total
2013	29.04	1.43	7.63	1.13	8.83	48.07
2014	23.70	1.30	7.18	1.20	8.93	42.31
2015	24.67	1.29	7.46	1.20	7.47	42.10
2016	25.05	1.18	7.38	1.17	7.02	41.79
2017	26.16	0.99	8.13	1.17	~~6.00~~	~~42.44~~
				January update:	6.01	42.49

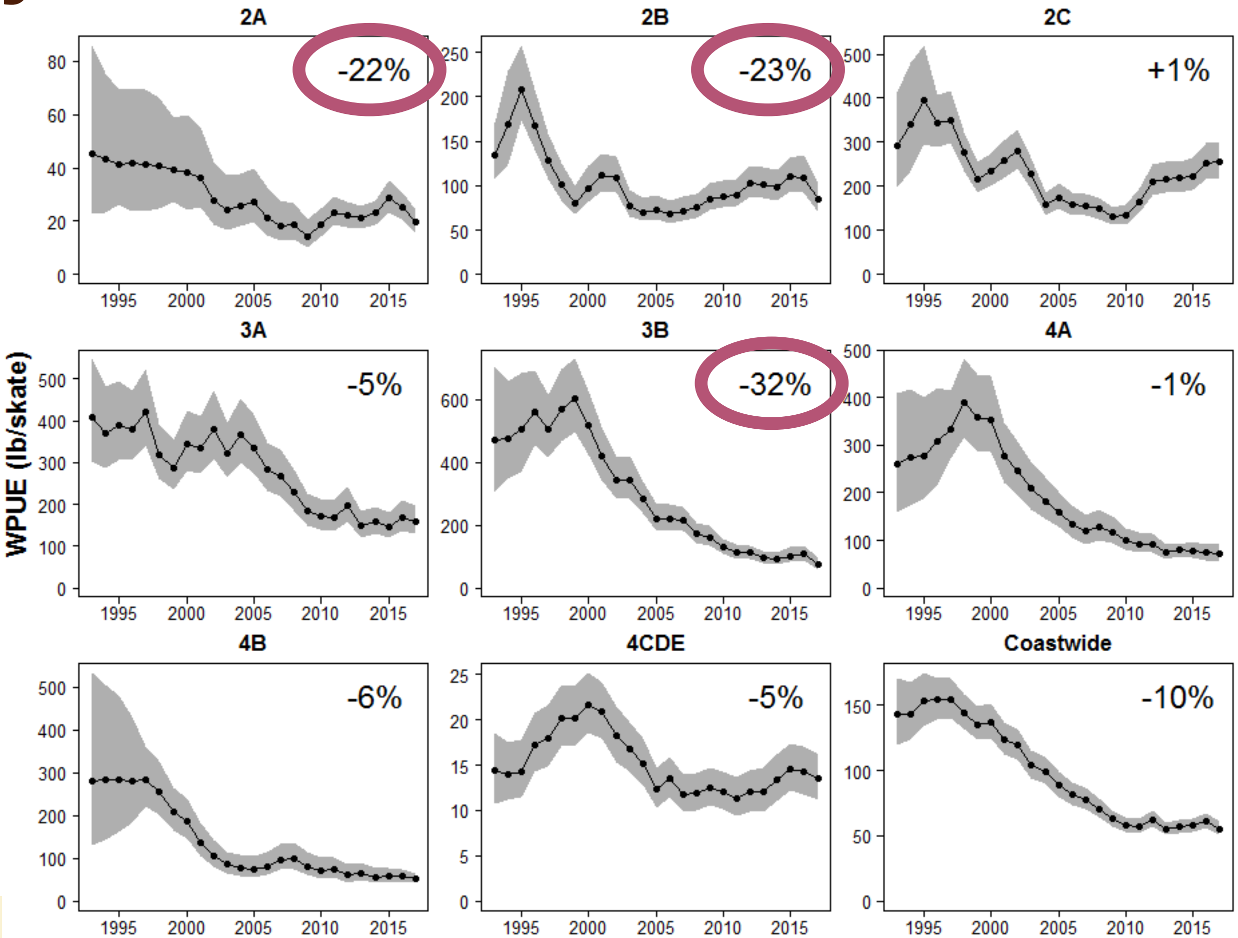
Biological regions



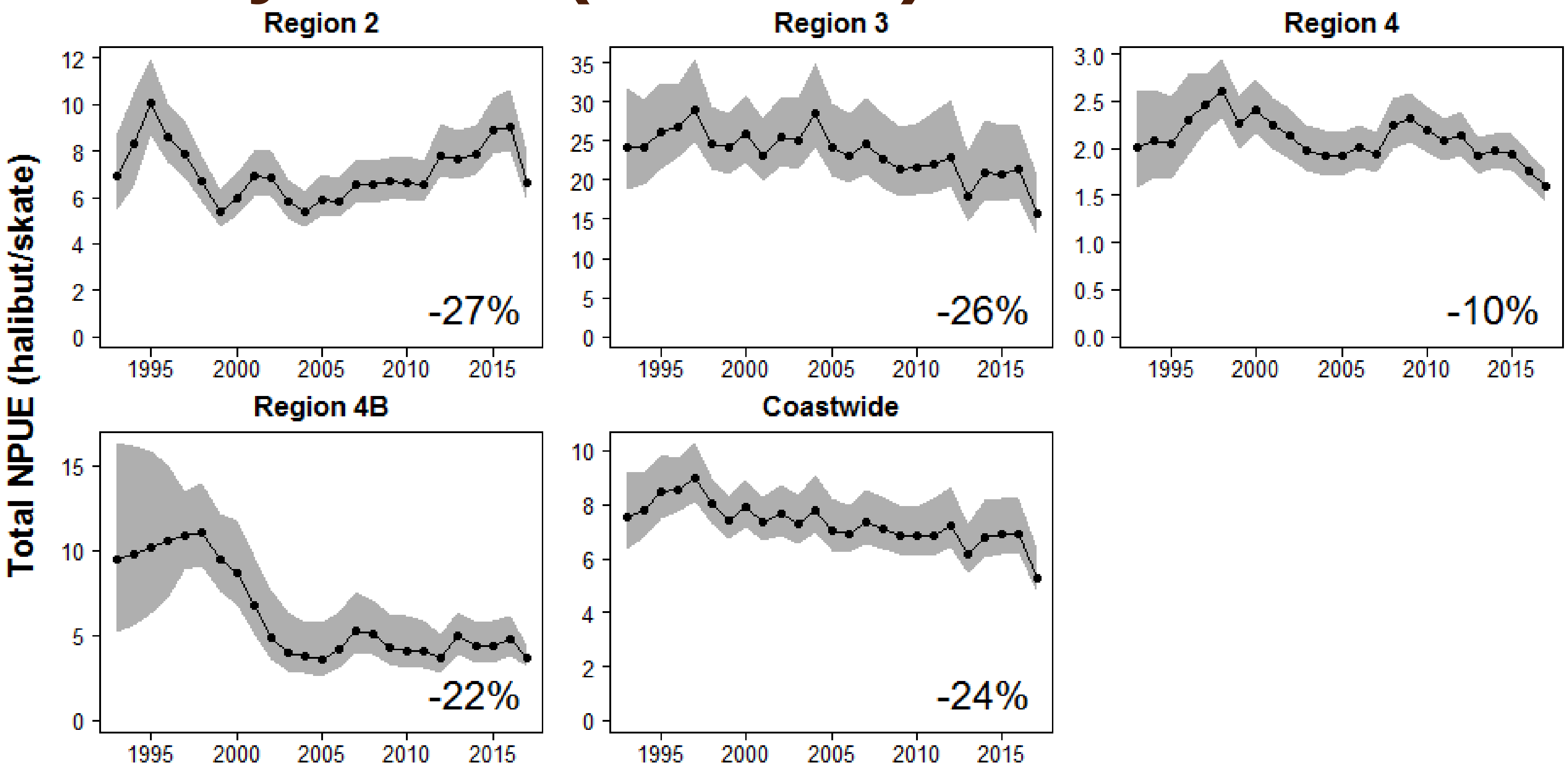
Survey O32 WPUE



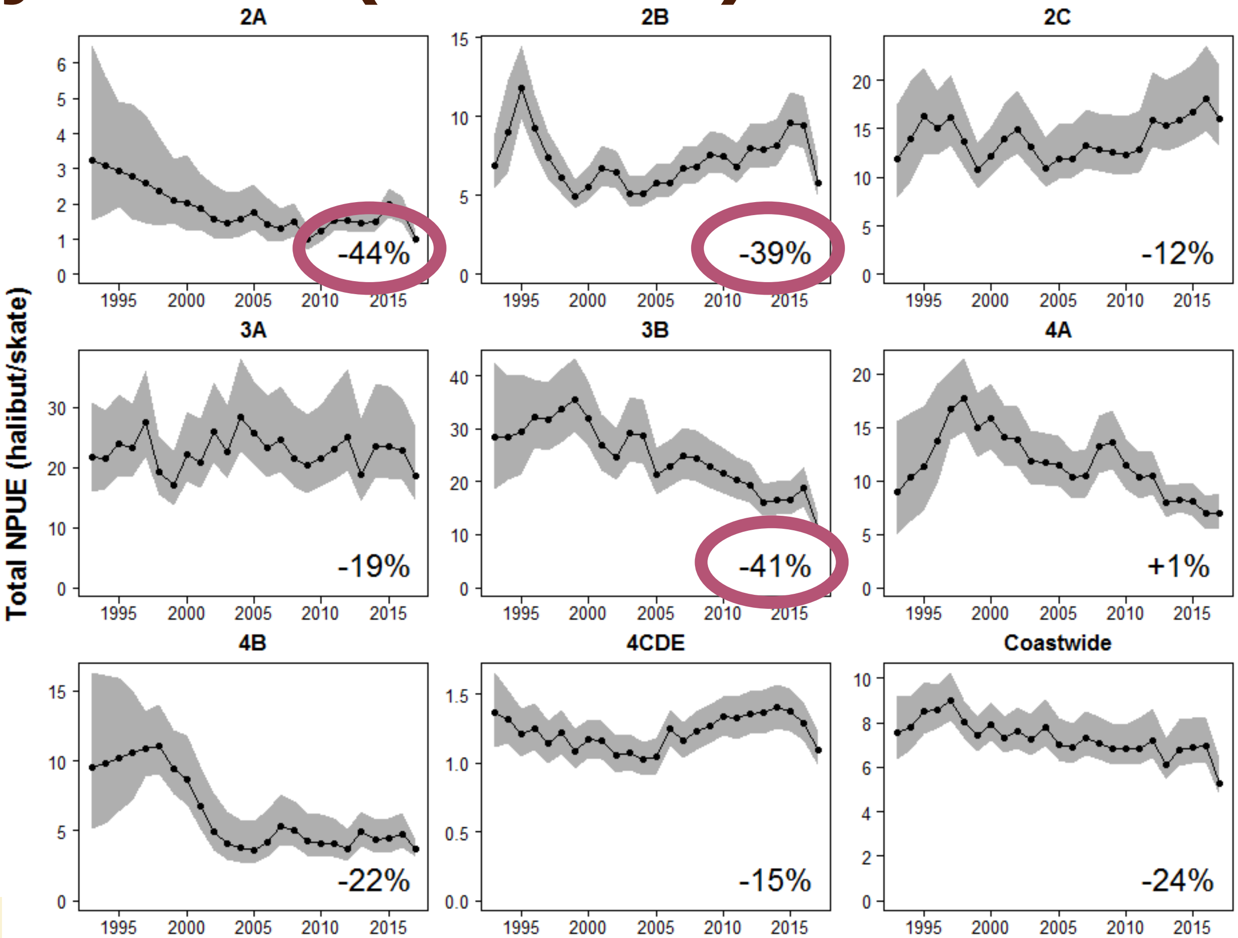
Survey O32 WPUE



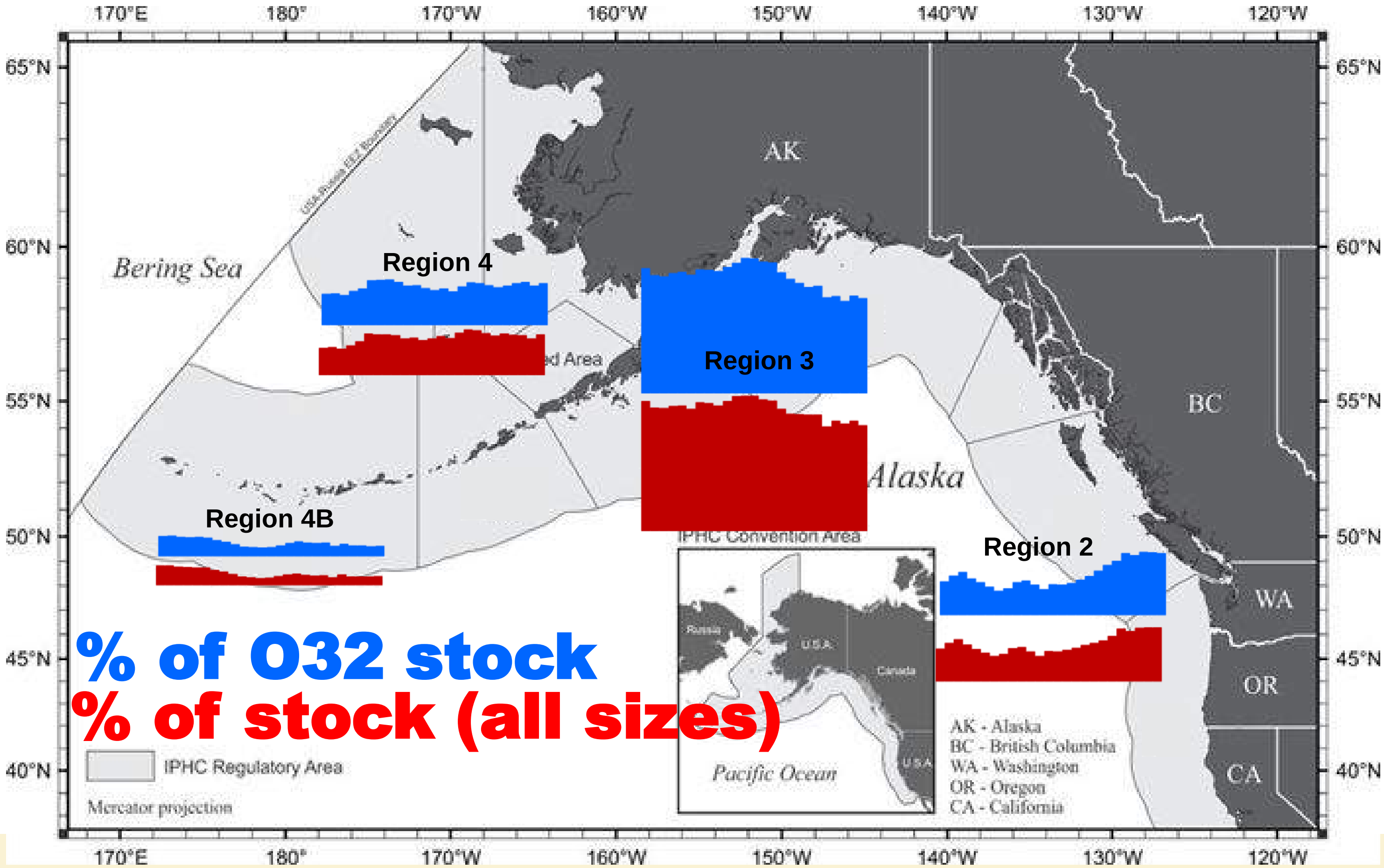
Survey NPUE (all sizes)



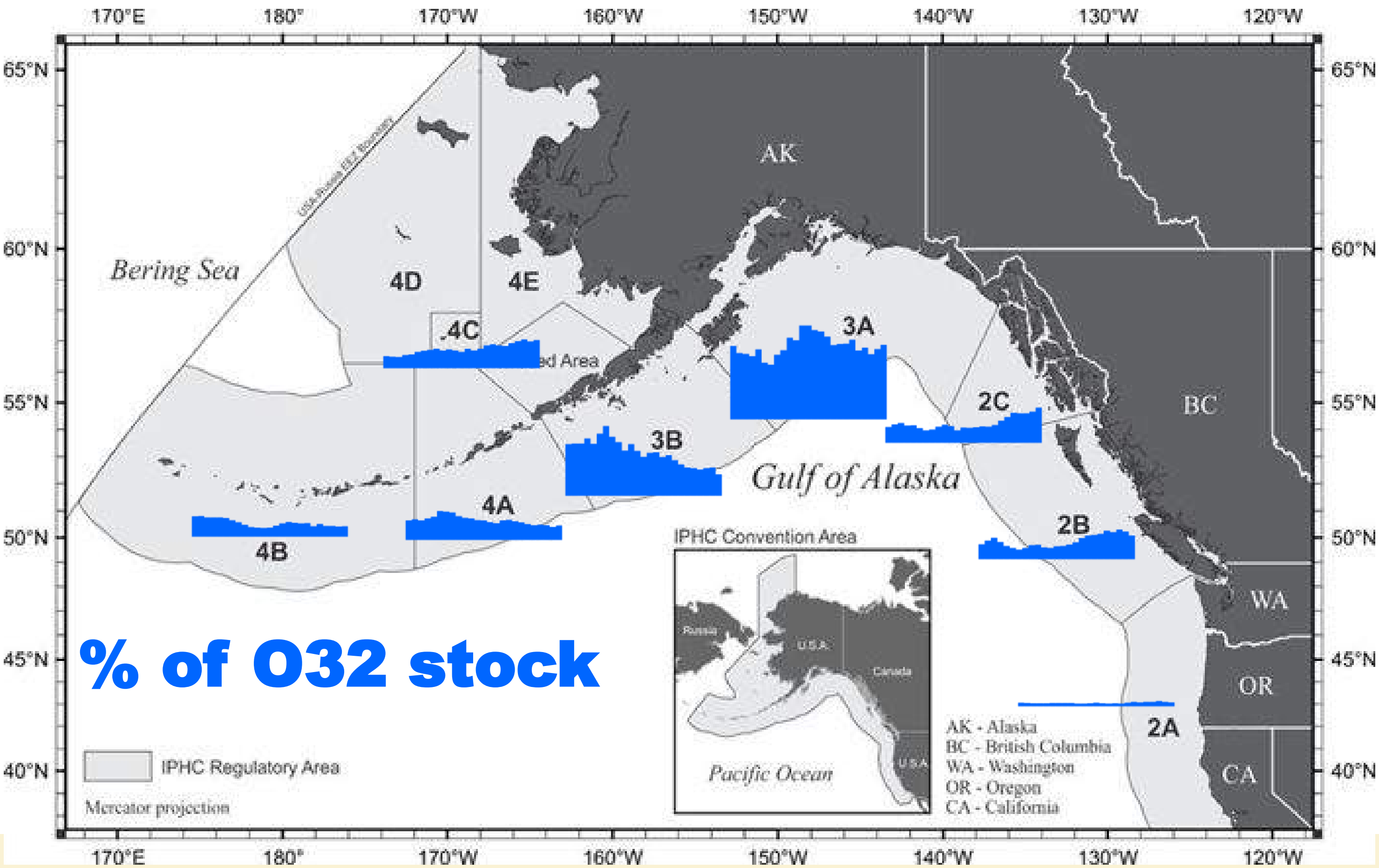
Survey NPUE (all sizes)



Stock distribution: 1993-2017

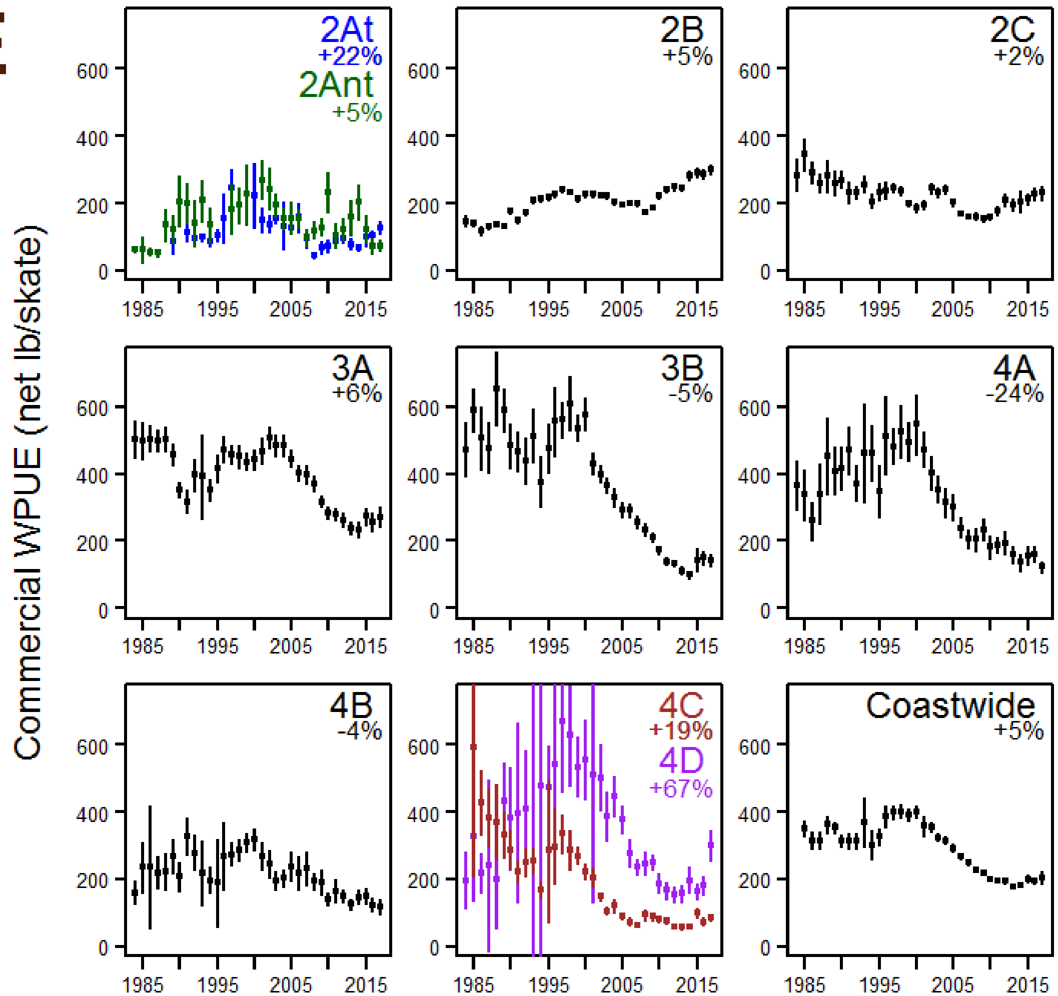


Stock distribution: 1993-2017



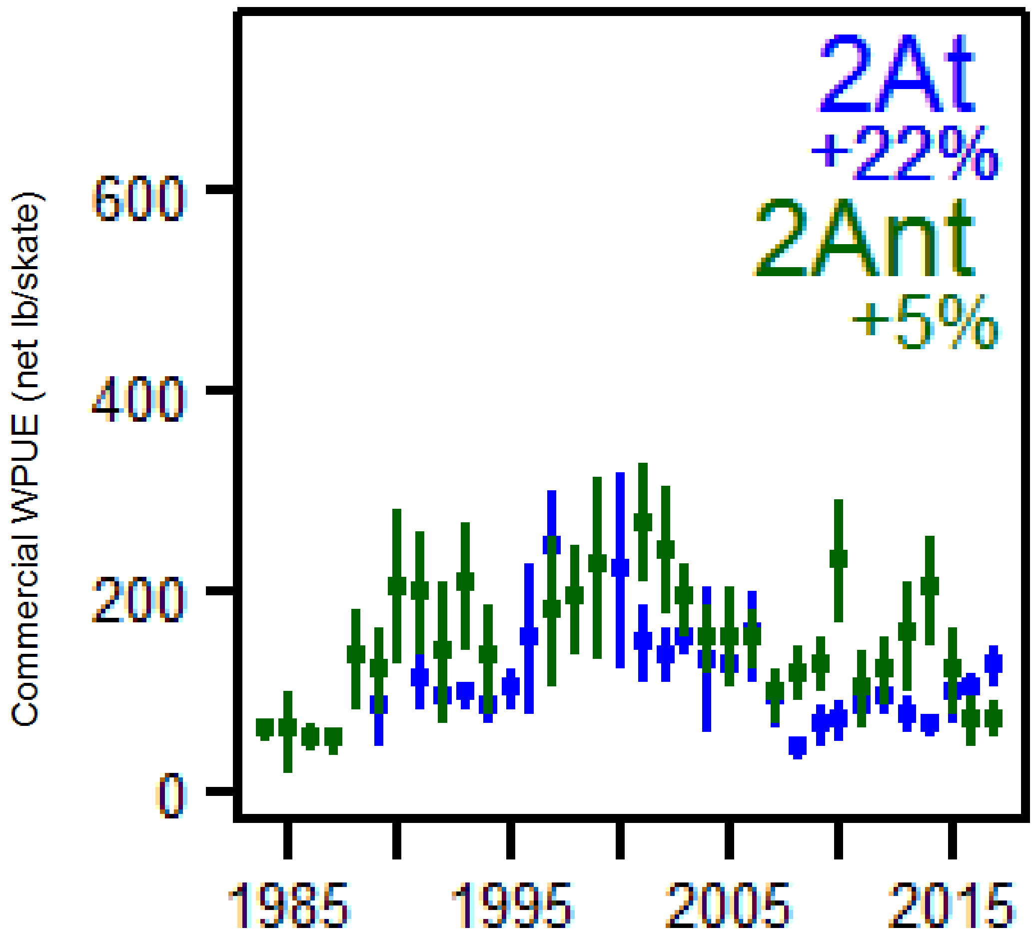
Commercial WPUE

- 2A: separating tribal and non-tribal trends
- 4D: change in spatial distribution (+25% of catch to St. Matthew)
- Bias correction for incomplete logbooks



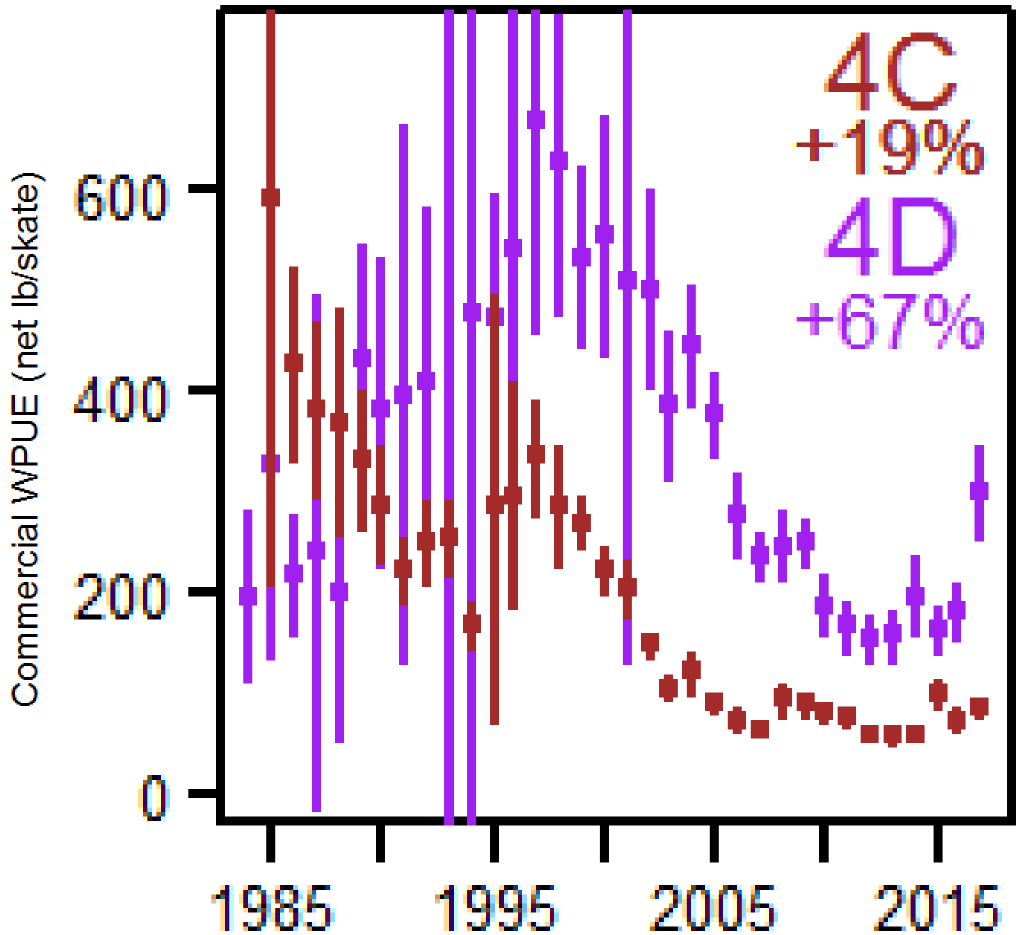
Commercial WPUE

- 2A: separating tribal and non-tribal trends



Commercial WPUE

- 4D: change in spatial distribution: 25% of catch shifted to St. Matthew



Commercial WPUE

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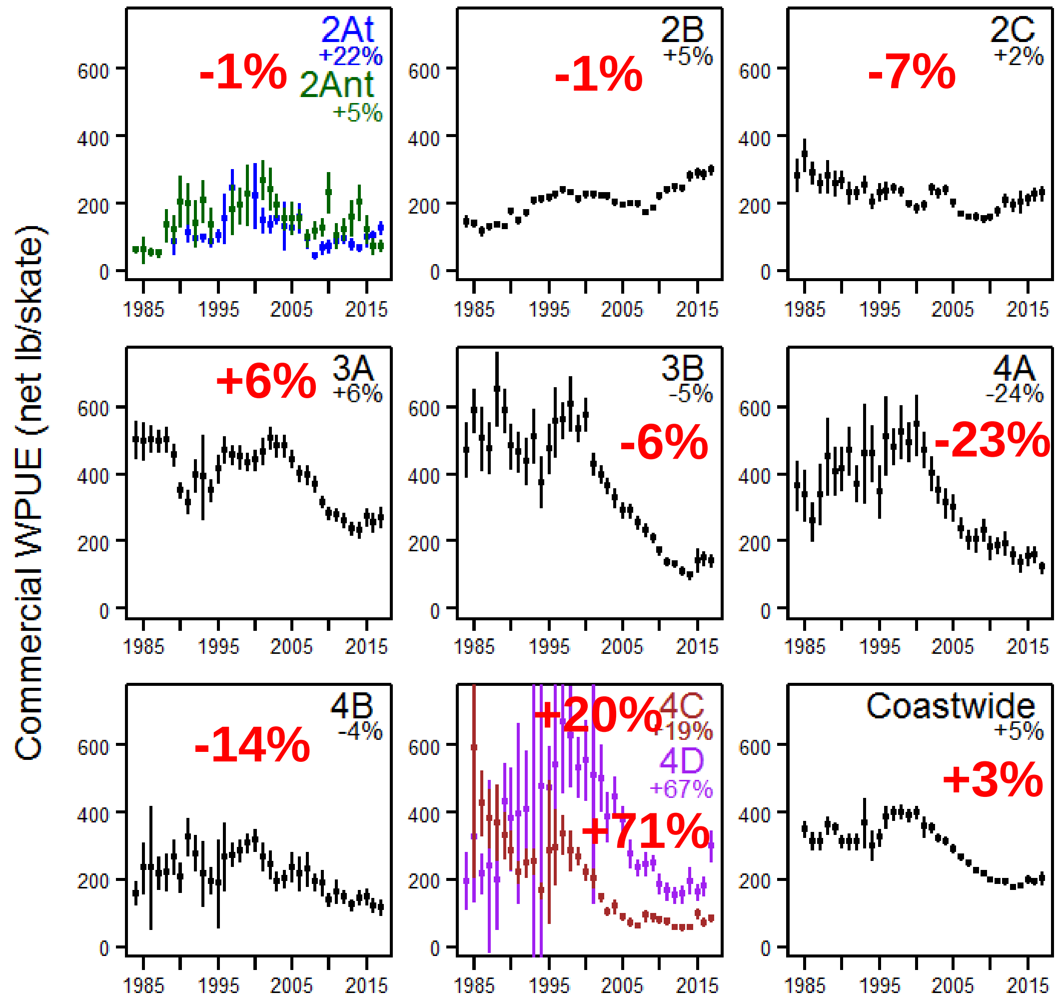
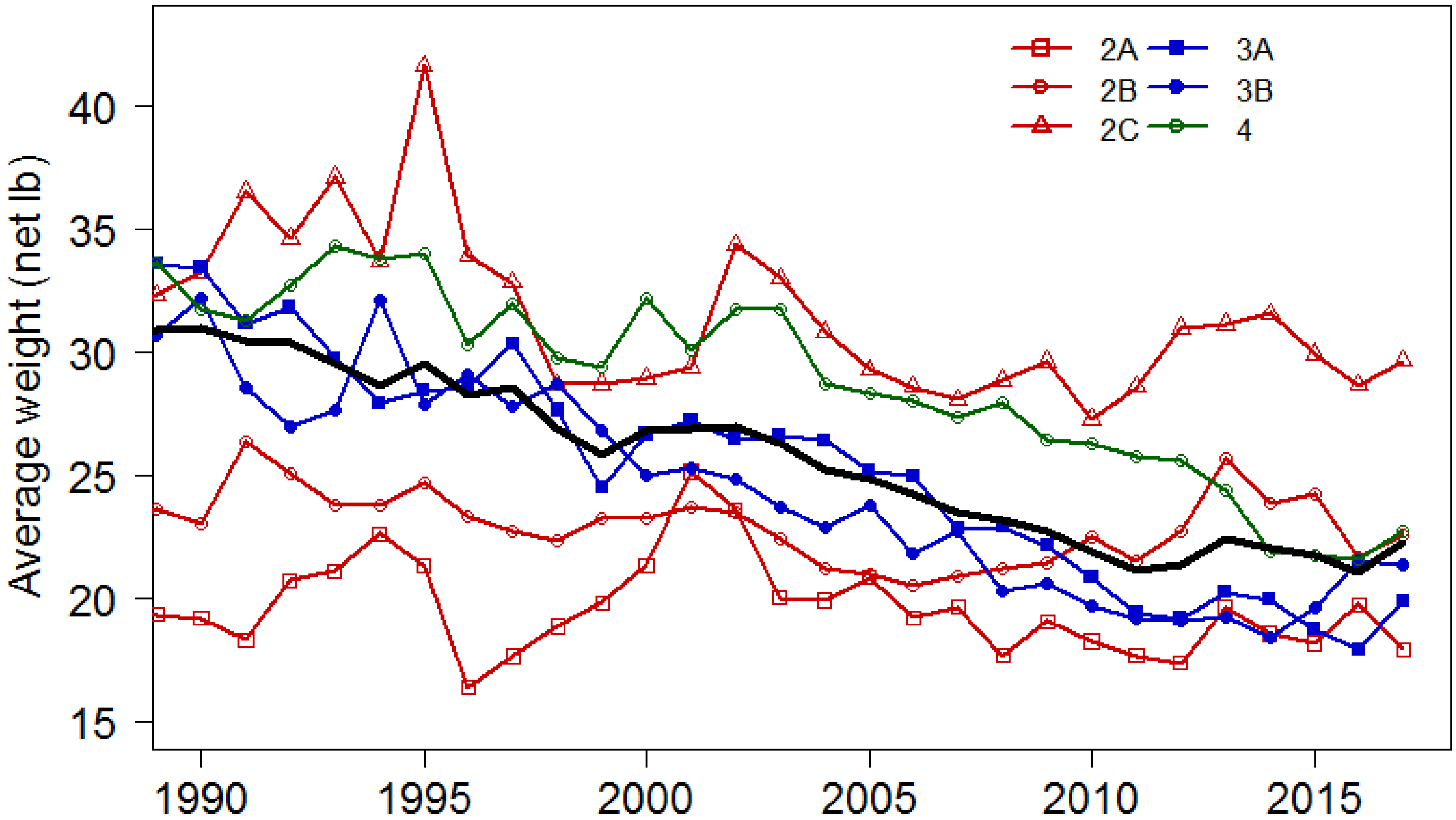
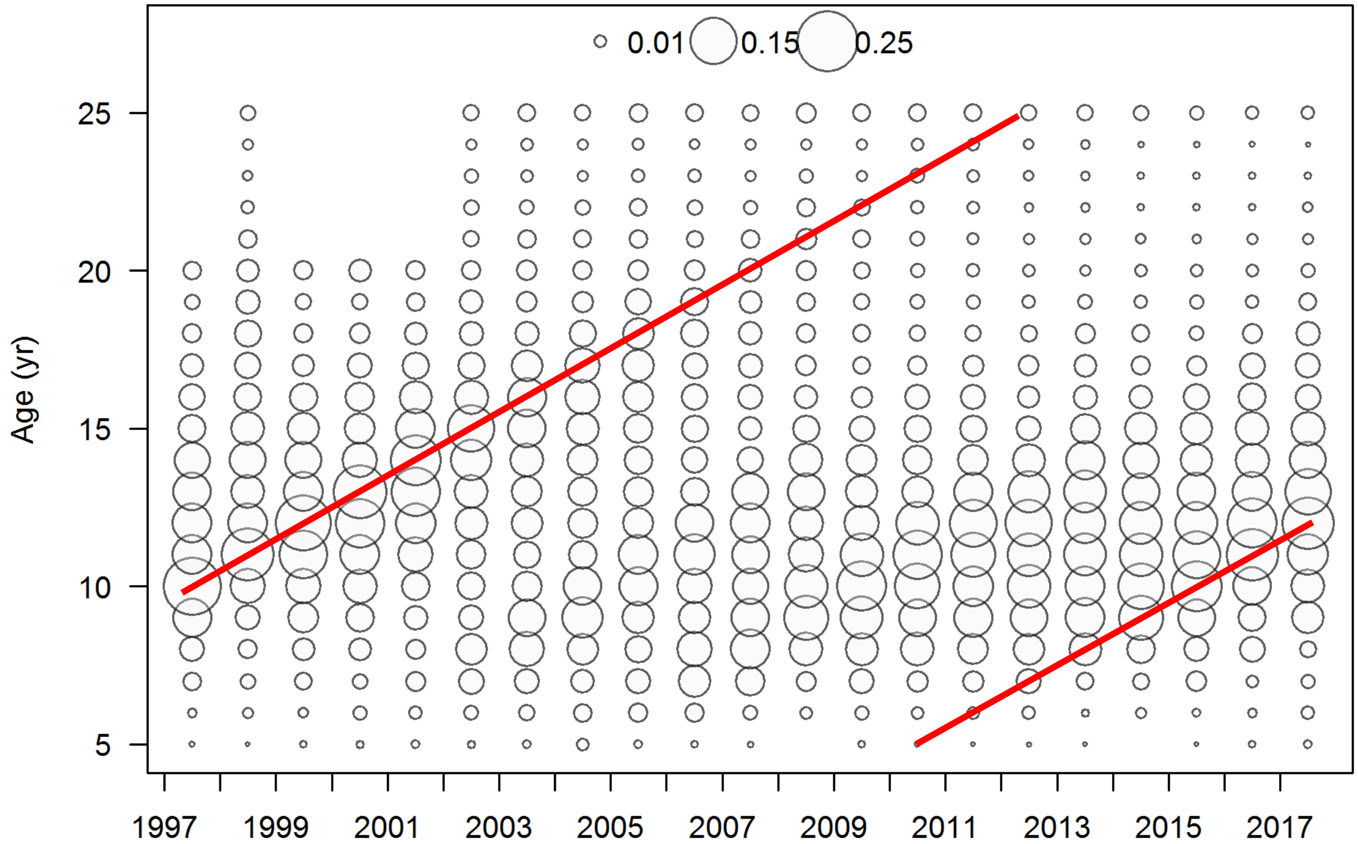


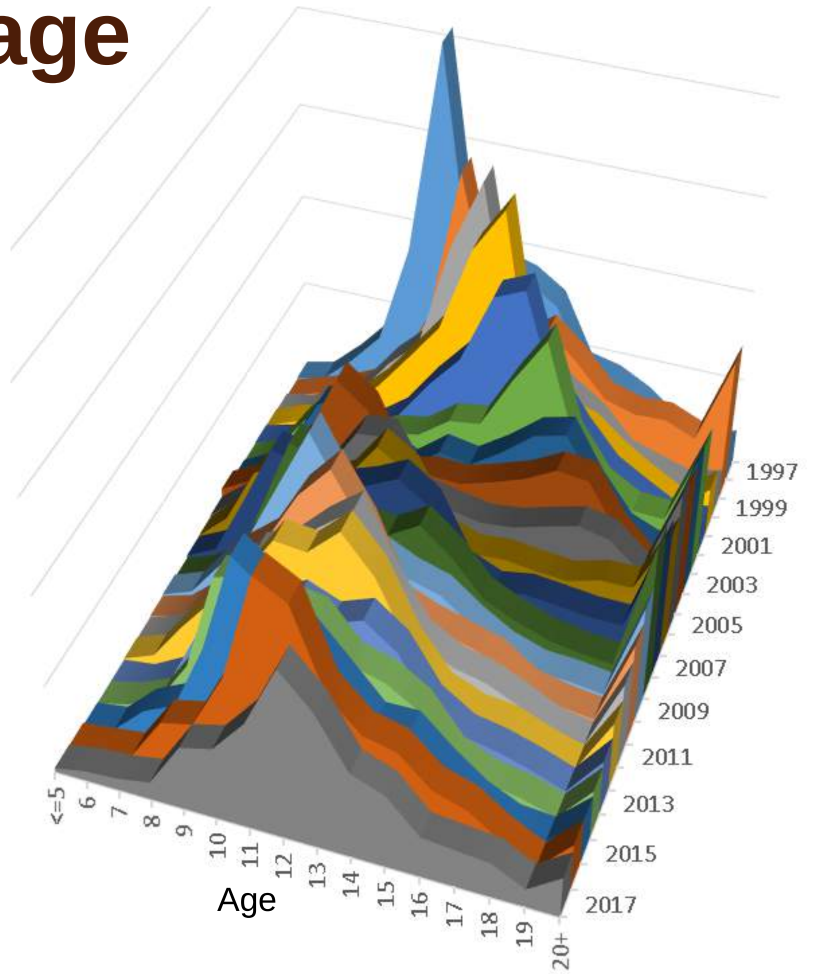
Fishery average fish weight



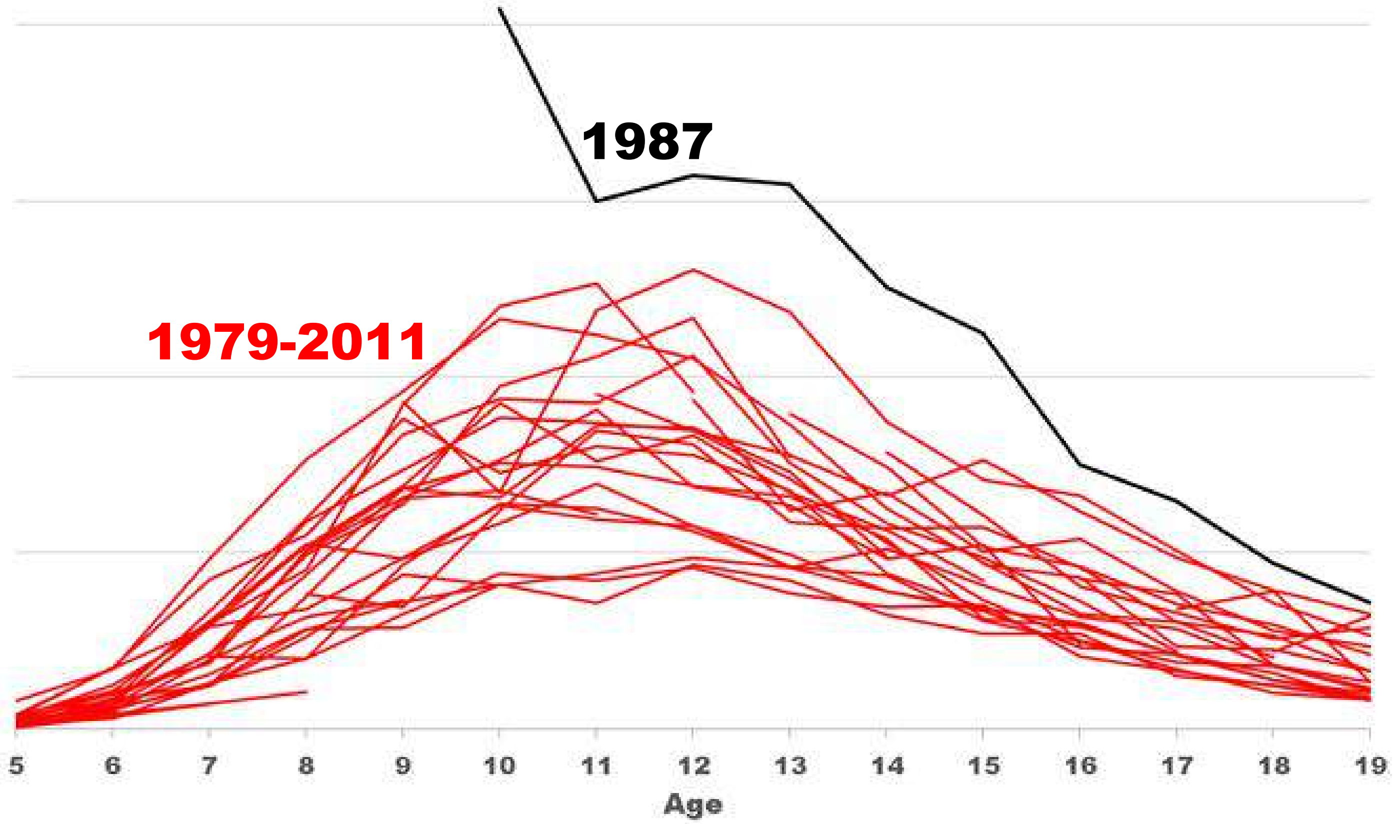
Survey proportions at age: coastwide



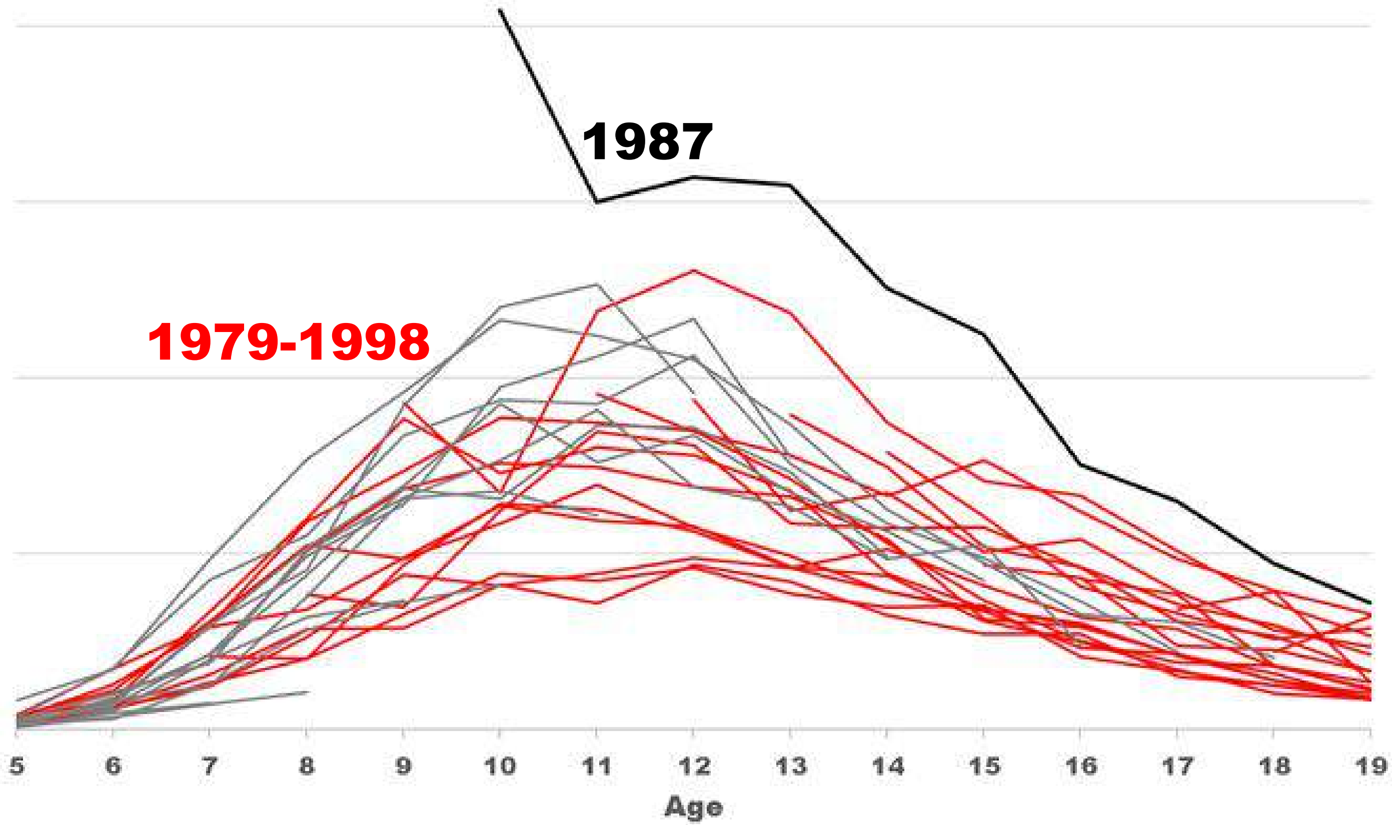
Survey NPUE at age



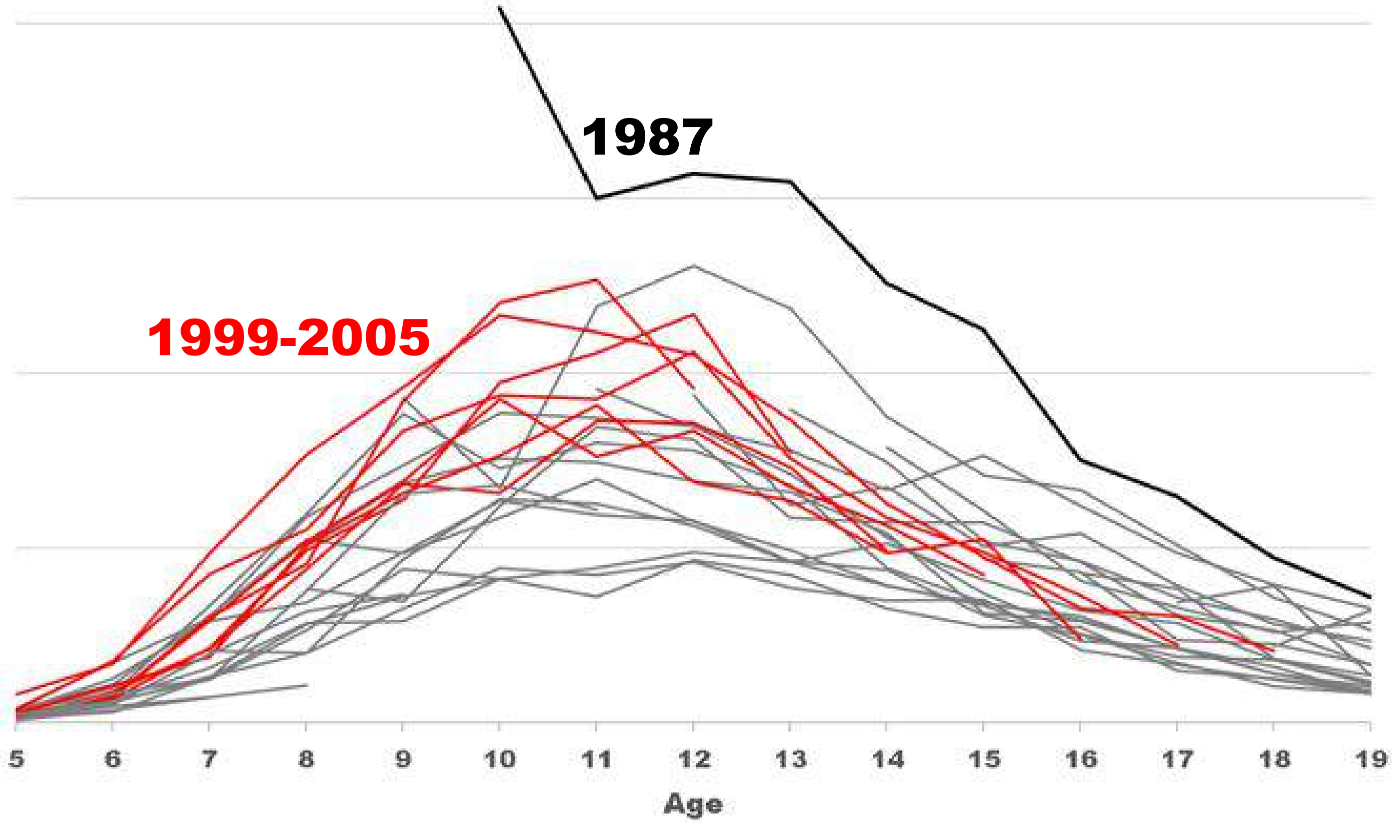
Survey NPUE at age – by cohort



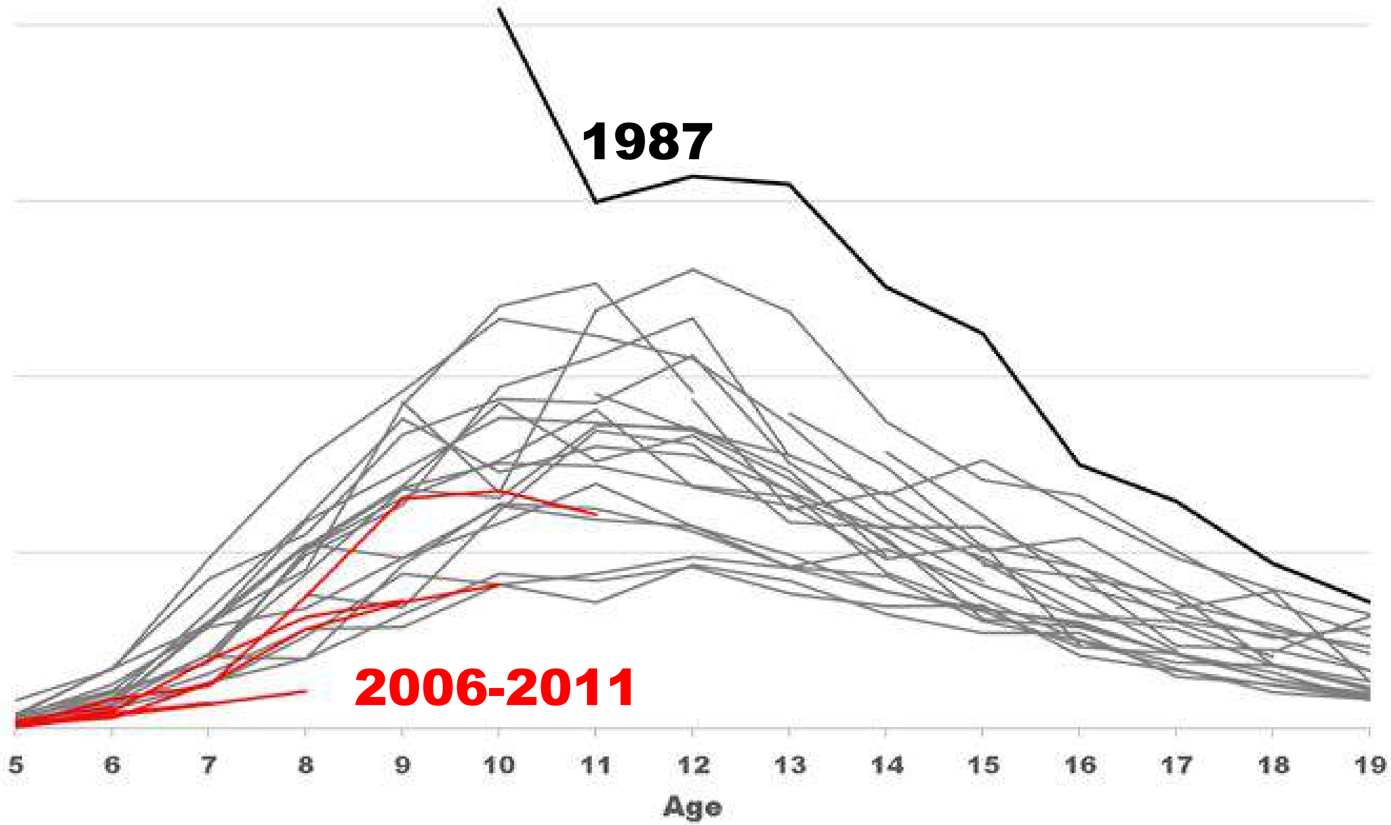
Survey NPUE at age – by cohort



Survey NPUE at age – by cohort



Survey NPUE at age – by cohort

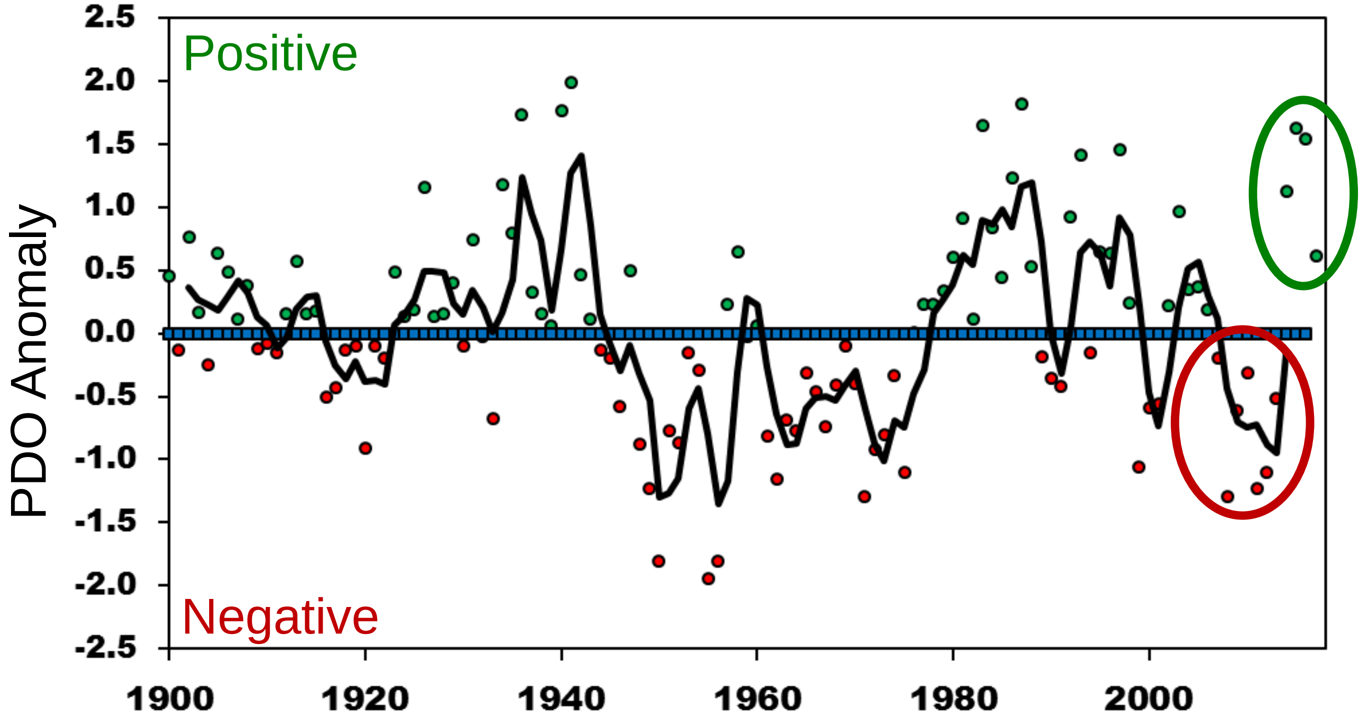


Ecosystem conditions

- Warm “blob” and other abnormal conditions 2014-2016+
  - Warm even into deeper waters of the Gulf of Alaska (GOA)
  - Pyrosomes (gelatinous zooplankton) observed in the NE Pacific
  - Seabird die-offs
  - Whale strandings
- GOA Pacific cod
  - Poor fish condition 2014 through 2017
  - Trawl survey down 58%: 2015 to 2017, 83%: 2013 -2017
- GOA arrowtooth flounder
  - Trawl survey biomass down by 36% (2015 to 2017)
- Sablefish
  - 2014 estimated to be a very large year-class (but still uncertain)

References: AFSC Ecosystem considerations reports, GOA Pacific cod stock assessment, GOA arrowtooth flounder stock assessment

Ecosystem conditions (PDO)



Annual averages through September 2017; http://research.jisao.washington.edu/pdo/

Outline

- Coastwide stock assessment
  - Data sources
  - **Modelling and results**
- Catch tables
  - Regulatory Area-specific projections

Stock assessment development

- 2012 - Stock assessment ensemble developed
- 2013 - Models improved
- 2014 - Expanded to four models
  - Two treatments of spatial data and two treatments of historical data
- 2015 – Independent scientific review

  (Reference document: http://www.iphc.int/publications/rara/2015)
- 2016, 2017 - Updated/improved data sources only

Data improvements for 2017

- Additional ages from survey expansions (2A, 4A, 4D, 4B)
- Measured fish weights (all port samples)
- Prior year's logbooks (all areas)

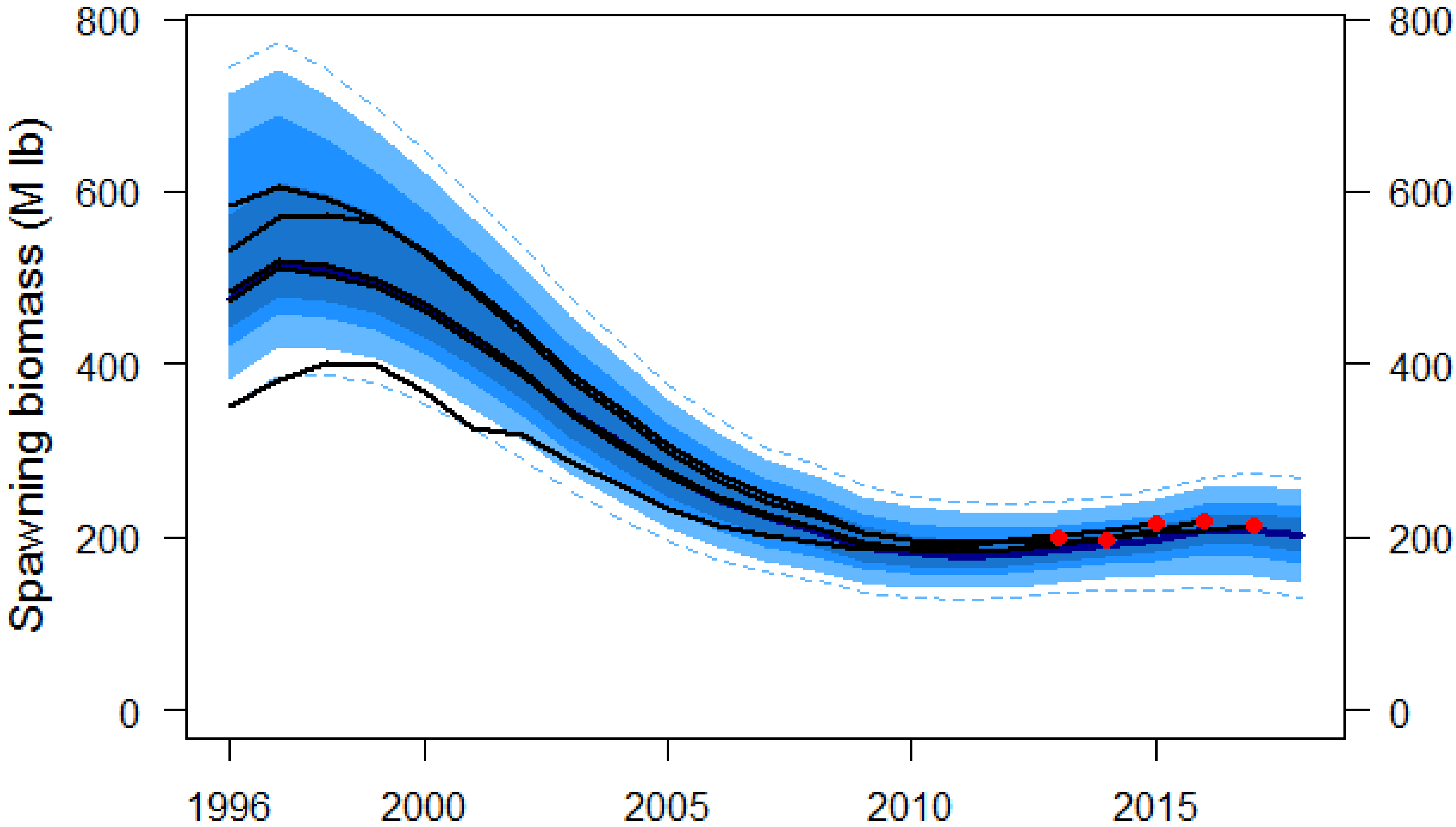
Result:

Small positive effect on stock estimates (+3.6%)

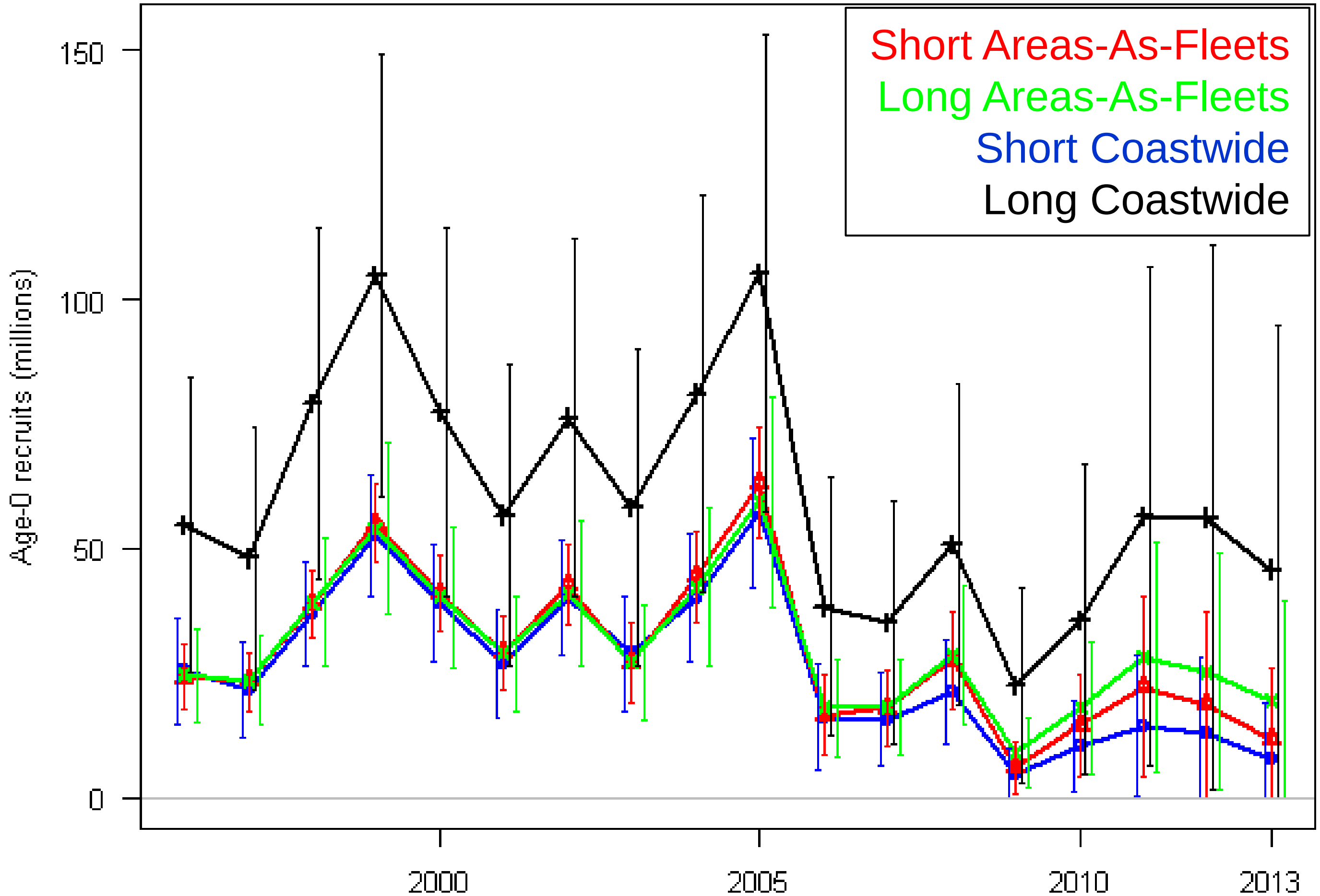
(Reference document: ***IPHC-2017-SRB11-06***)

- 1993-1997 included in survey modelling
- All available 2017 data (and 2016 updates) included

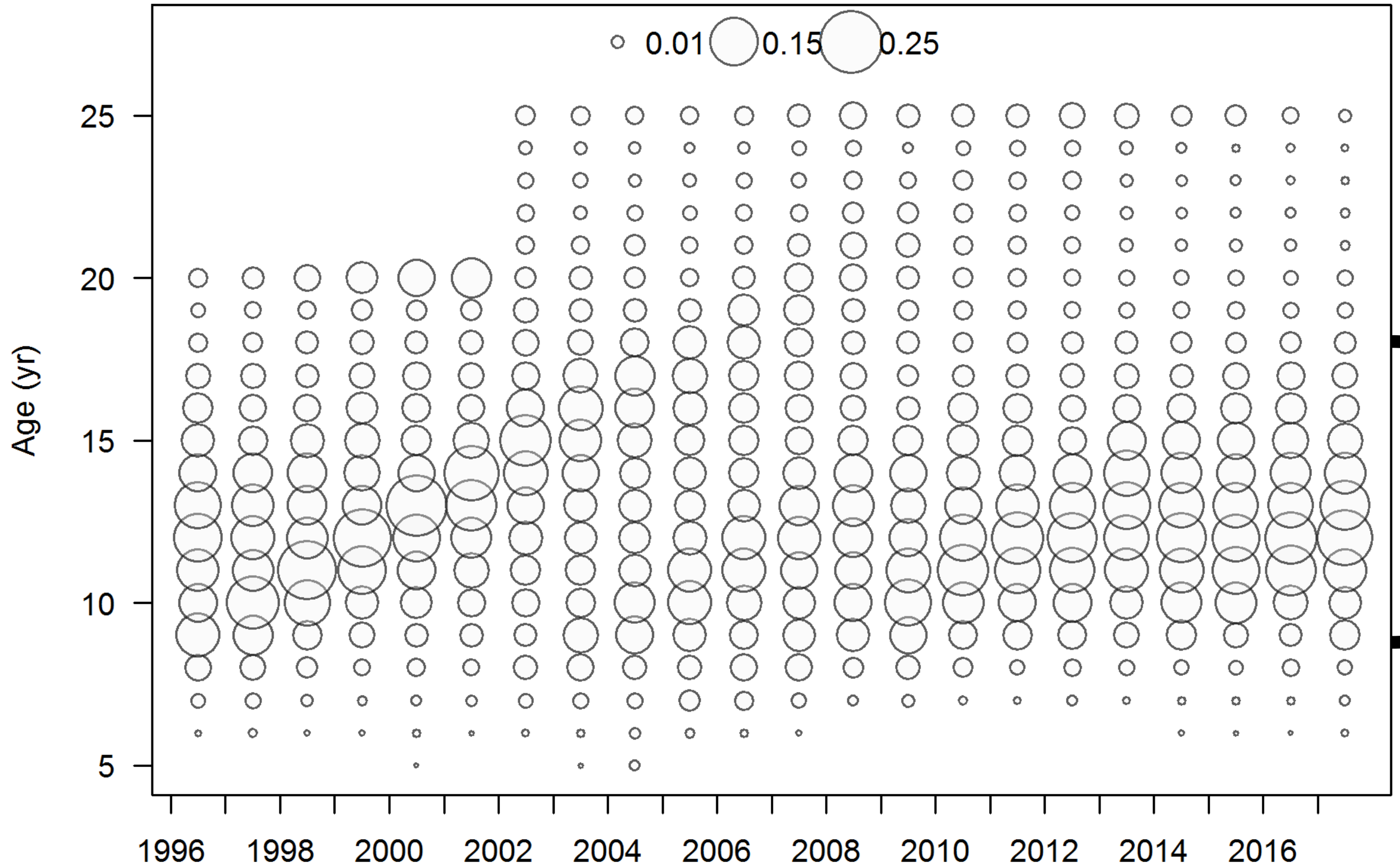
Retrospective comparison



Individual models - recruitment



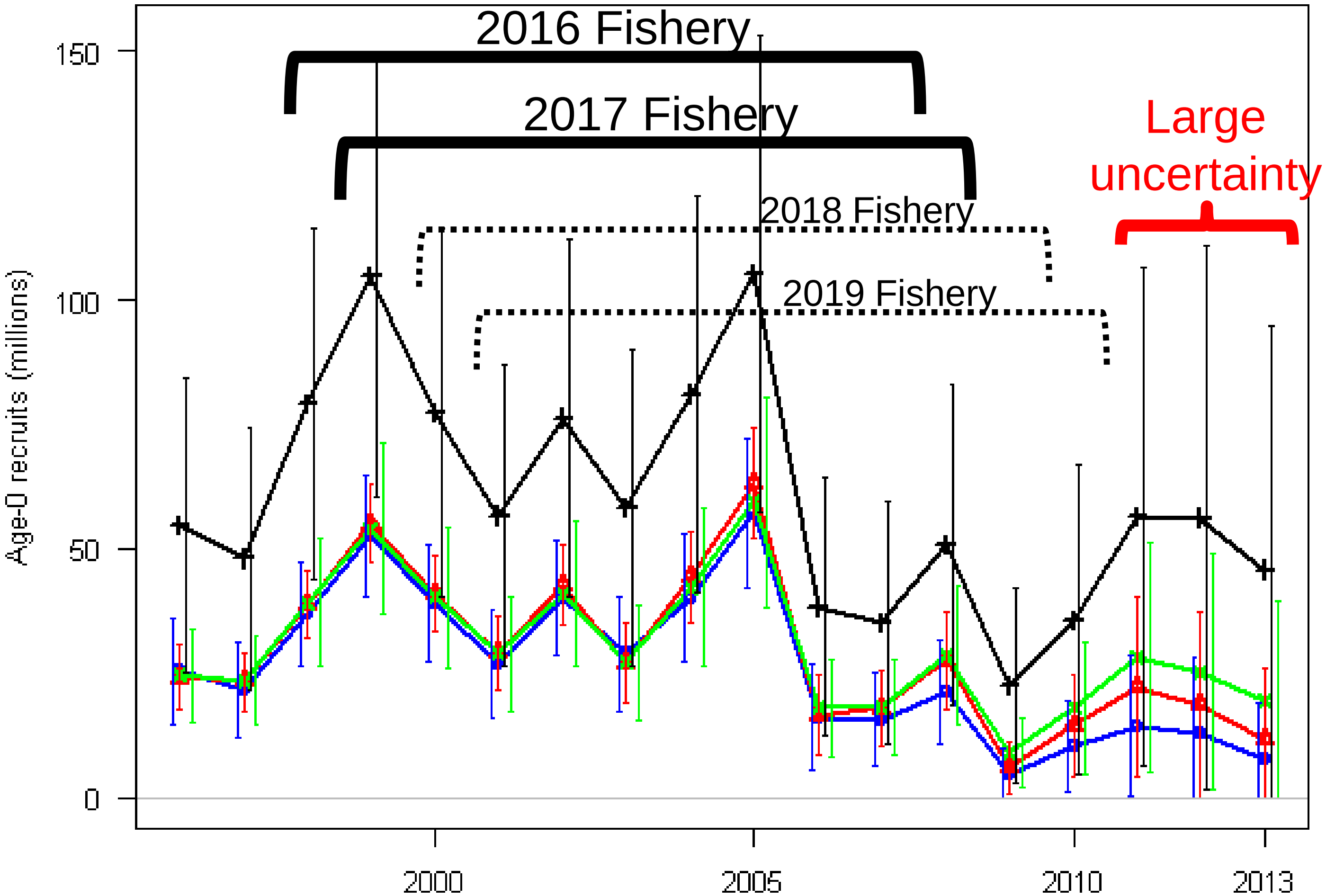
Fishery ages: coastwide



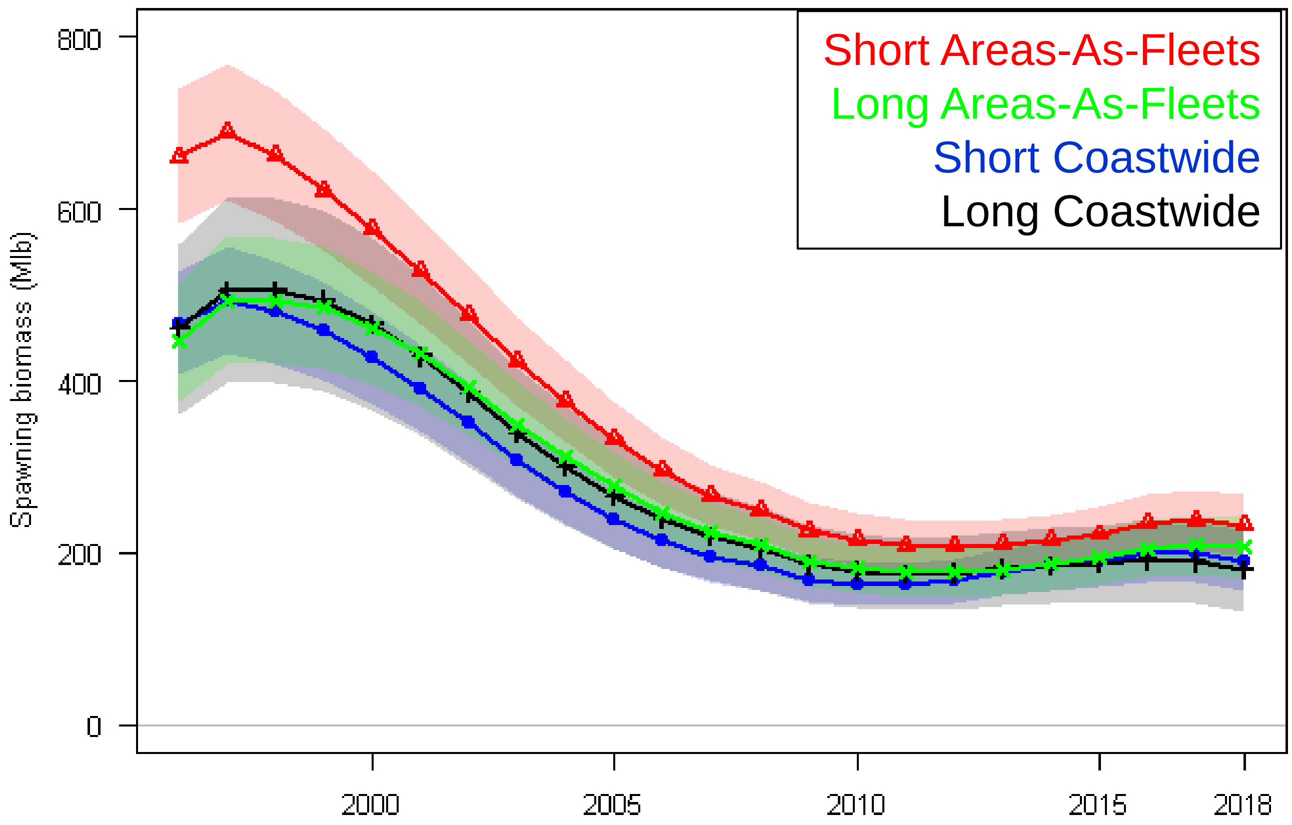
Ages 9-18

86% of landings

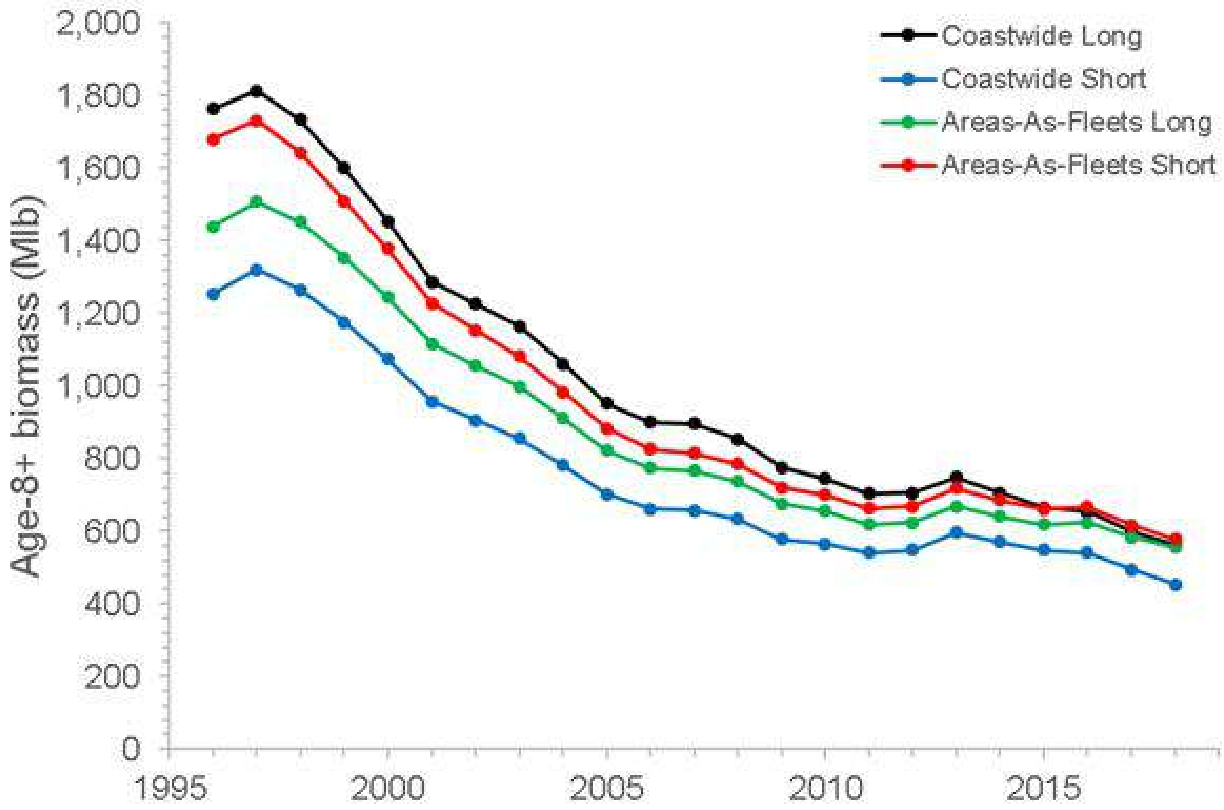
Individual models - recruitment



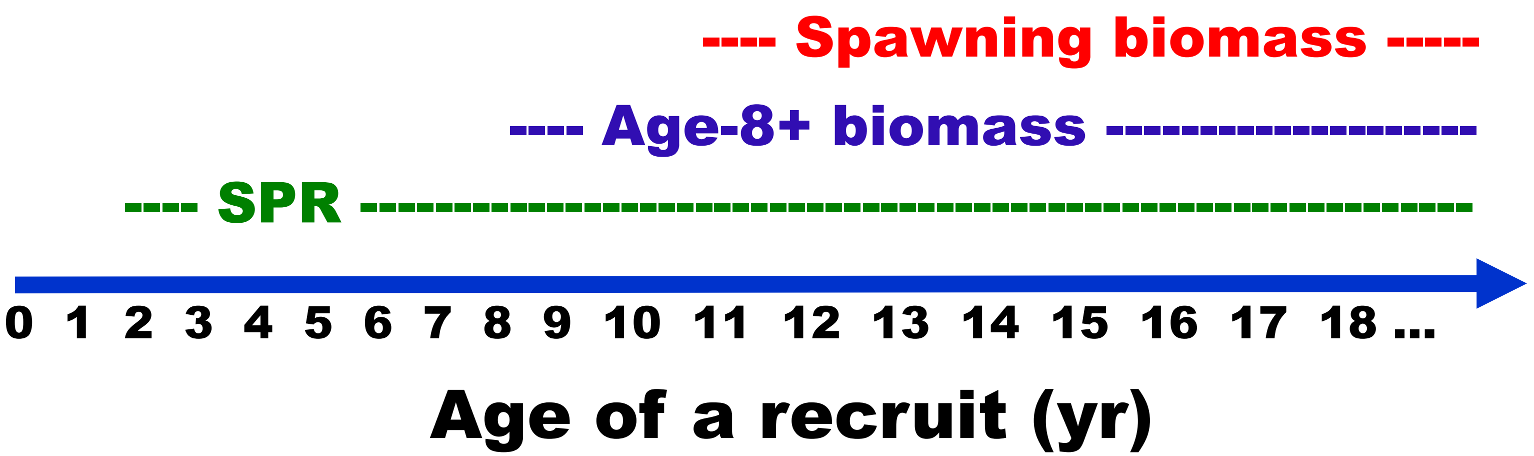
Individual models



Trend in Age-8+ biomass



Comparing trends



Assessment summary table

Indicators	Values	Trends	Status
Total removals 2017: Retained catch 2017: Average removals 2013–17:	42.44 Mlbs, 19,250 t 35.29 Mlbs, 11,864 t 43.34 Mlbs, 19,659 t	Mortality stable 2014-17	2017 mortality below 100-year average
SPR_{2017}: P(SPR<46%): P(SPR<limit):	40% (29-58%) 75% Limit not specified	Fishing intensity increased from 2016 to 2017	Fishing intensity higher than reference level
SB_{2018} (Mlb): SB_{2018}/SB_0: $P(SB_{2018}<SB_{30})$: $P(SB_{2018}<SB_{20})$:	202 Mlbs (148–256) 40% (26-60%) 6% <1%	SB decreased from 2017 to 2018	Not overfished
O32 stock distribution: All stock distribution:	See Table and Figure	Distribution stable 2013-17	Region 2 above, Region 3 below historical values

The 2017 harvest decision table

- Revised to include:
  - Easier format for risk metrics (vertical vs. horizontal)
    - Comparable to MSE results
  - Reference SPR instead of Blue Line
  - More detail: catch levels, projection years
  - TCEY for comparability with catch tables
- No other changes to projection methods

The 2017 harvest decision table

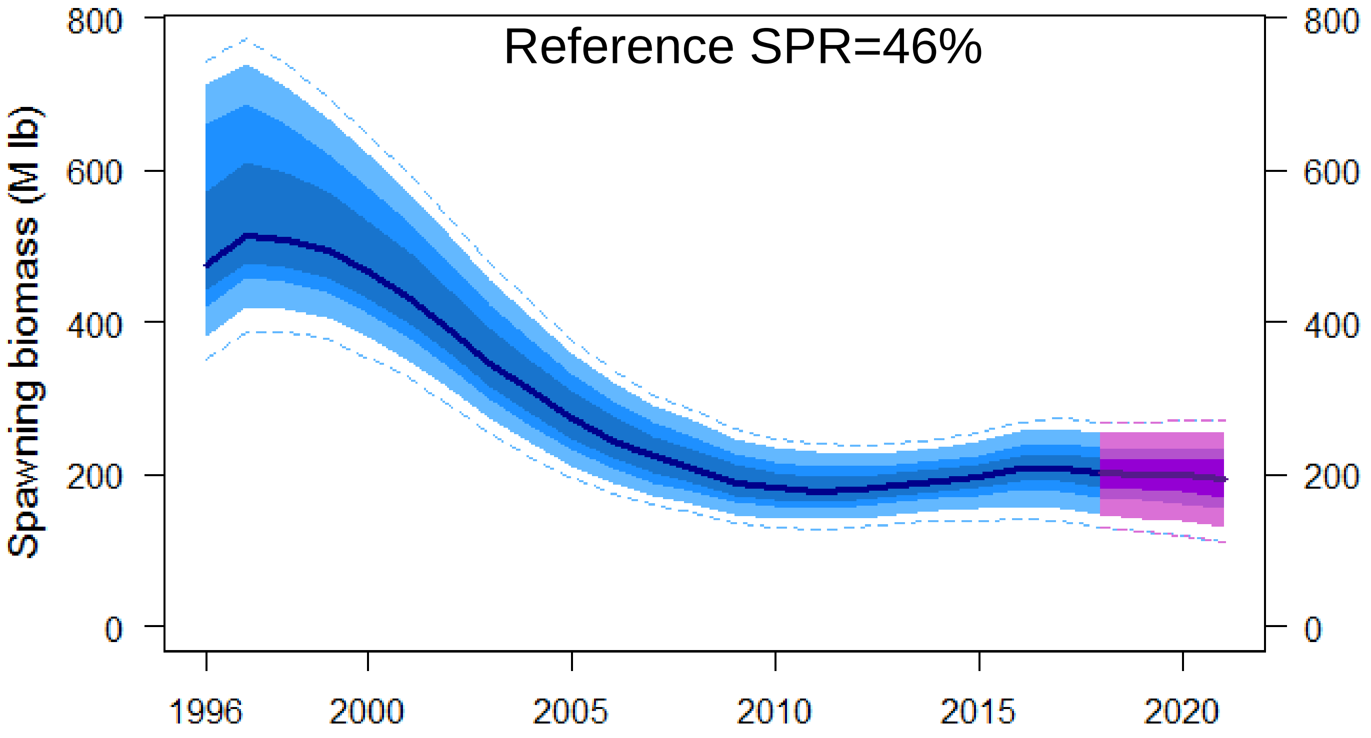
		2018 Alternative	No removals		Reference: SPR=46%	
		Total removals (M lb)	Benefits			
		TCEY (M lb)				
		Fishing intensity				
		Fishing intensity interval				
Stock Trend (spawning biomass)	in 2019	is less than 2018	Risk			a
		is 5% less than 2018				b
	in 2020	is less than 2018				c
		is 5% less than 2018				d
	in 2021	is less than 2018				e
		is 5% less than 2018				f
Stock Status (Spawning biomass)	in 2019	is less than 30%				g
		is less than 20%				h
	in 2020	is less than 30%				i
		is less than 20%				j
	in 2021	is less than 30%				k
		is less than 20%				l
Fishery Trend (TCEY)	in 2019	is less than 2018				m
		is 10% less than 2018				n
	in 2020	is less than 2018				o
		is 10% less than 2018				p
	in 2021	is less than 2018				q
		is 10% less than 2018				r
Fishery Status (Fishing intensity)	in 2018	is above $F_{46\%}$				s

The harvest decision table

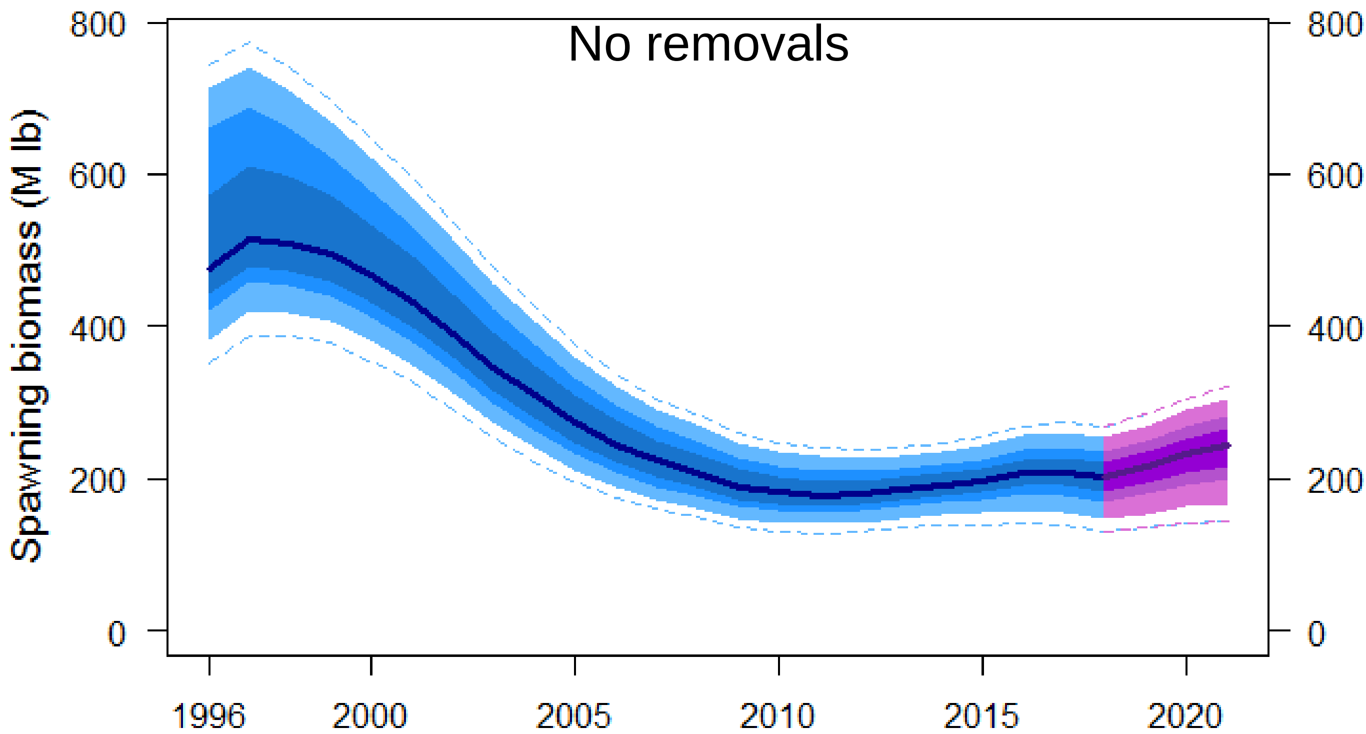
2018 Alternative	No removals							Reference: *SPR=46%*								
Total removals (M lb)	0.0	11.8	21.8	28.8	29.8	30.8	31.8	32.8	33.8	34.8	35.8	37.3	41.8	51.8	61.9	
TCEY (M lb)	0.0	10.0	20.0	27.0	28.0	29.0	30.0	31.0	32.0	33.0	34.0	35.5	40.0	50.0	60.0	
Fishing intensity	$F_{100\%}$	$F_{73\%}$	$F_{58\%}$	$F_{50\%}$	$F_{49\%}$	$F_{48\%}$	$F_{47\%}$	$F_{46\%}$	$F_{45\%}$	$F_{44\%}$	$F_{43\%}$	$F_{42\%}$	$F_{39\%}$	$F_{32\%}$	$F_{27\%}$	
Fishing intensity interval	--	61-84%	45-73%	37-67%	36-66%	36-65%	35-65%	34-64%	33-63%	32-63%	32-62%	31-61%	28-58%	23-53%	19-48%	
19 is less than 2018		3	24	59	64	69	74	78	81	85	87	91	98	>99	>99	a
is 5% less than 2018		<1	<1	2	2	3	4	5	7	9	11	14	29	69	96	b
20 is less than 2018		1	14	46	52	57	62	67	71	76	80	85	95	>99	>99	c
is 5% less than 2018		<1	1	9	11	14	18	21	25	29	34	41	61	94	>99	d
21 is less than 2018		2	23	59	63	68	72	76	79	83	86	90	97	>99	>99	e
is 5% less than 2018		<1	5	27	32	36	41	46	50	55	59	66	83	99	>99	f
19 is less than 30%		4	5	6	6	7	7	7	7	7	7	8	9	11	15	g
is less than 20%		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1	h
20 is less than 30%	2	2	4	6	6	6	7	7	8	8	9	9	12	21	32	i
is less than 20%	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1	1	j

Reference line down the center of the table

The harvest decision table

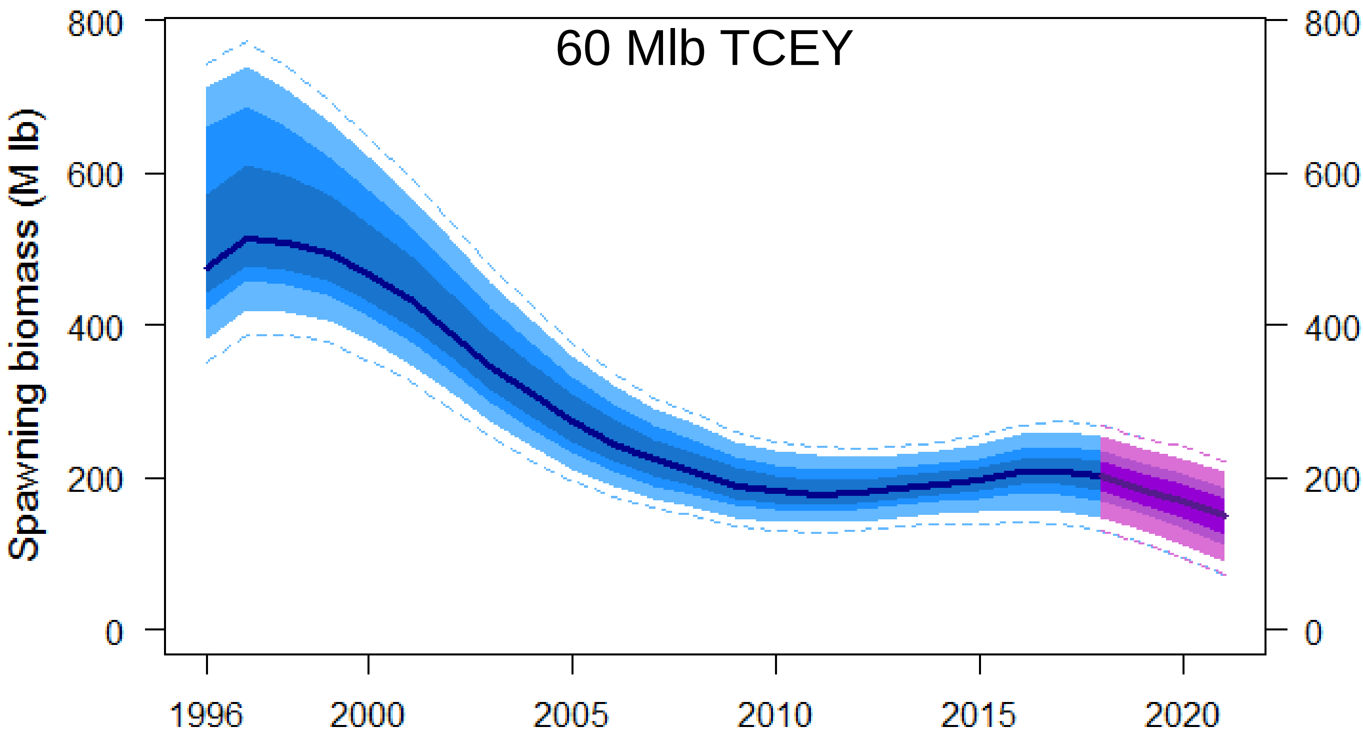


The harvest decision table



							Reference SPR=46%
					0.8	31.8	32.8
					9.0	30.0	31.0
					$F_{48\%}$	$F_{47\%}$	$F_{46\%}$
					6-65%	35-65%	34-64%
					69	74	78
					3	4	5
					57	62	67
					14	18	21
					68	72	76
					36	41	46
in 2019	is less than 30%	4	5	6	7	7	7
	is less than 20%	<1	<1	<1	<1	<1	<1
Stock Status in 2020	is less than 30%	2	4	6	6	7	7

The harvest decision table



No removals		Reference: SPR=46%	
0.0	11.8	31.8	32.8
0.0	10.0	30.0	31.0
$F_{100\%}$	$F_{73\%}$	$F_{47\%}$	$F_{46\%}$
--	61-84%	35-65%	34-64%
	3	74	78
	<1	4	5
	1	62	67
	<1	18	21
	2	72	76
	<1	41	46

4 5 6 7 7 7 is less than 30% 7 7 9 11 15 6 7 7 7

in 2019

<1 <1 <1 <1 <1 <1 is less than 20% <1 <1 <1 <1 <1 <1 <1 <1 <1

2 2 4 6 6 7 7 8 8 9 12 21 32 6 6 7 7

Stock Status

in 2020

The harvest decision table

2018 Alternative		2018 Alternative							Reference: SPR=46%					
Total removals (M lb)		Total removals (M lb)	0.0	11.8	21.8	28.8	29.8	30.8	31.8	32.8	33.8	34.8	35.8	37.3	41.8
TCEY (M lb)		0.0 TCEY (M lb)	10.0		20.0	27 10.0 28.0	20 29.0	28 30.0	29.0	31 31.0	32 21.0	33.0 32.0	34.0 33.0	35.0 34.0	40.0 40
Fishing intensity		Fishing intensity	$F_{100\%}$	$F_{73\%}$	$F_{58\%}$	$F_{50\%}$	$F_{49\%}$	$F_{48\%}$	$F_{47\%}$	$F_{46\%}$	$F_{45\%}$	$F_{44\%}$	$F_{43\%}$	$F_{42\%}$	$F_{39\%}$
Fishing intensity interval		Fishing intensity interval		61-84%	45-73%	37-67%	36-66%	36-65%	35-65%	34-65%	33-64%	32-63%	32-62%	31-61%	28-58%
Stock Trend (spawning biomass)	in 2019	is less than 2018	3		24	593	64	24 69	64 74	69 78 84	81 78	85 81	87 85	91 87	89
		is 5% less than 2018	<1		<1 1	2 <1	2	<1 3	2 4	3 5 4	7 5	9 7	11 9	14 11	29 2
	in 2020	is less than 2018	1		14 1	46 1	52	14 57	52 62	57 66 72	76 67	76 71	80 76	85 80	95 9
		is 5% less than 2018	<1		1 1	9 <1	11	1 14	11 18	14 21 18	25 21	29 25	34 29	41 34	61 6
	in 2021	is less than 2018	2		23 1	59 2	63	23 68	63 72	68 76 72	79 76	83 79	86 83	90 86	97 9
		is 5% less than 2018	<1		5 1	27 <1	32	5 36	32 41	36 46 41	50 46	55 50	59 55	66 59	83 8
Stock Status (spawning biomass)	in 2019	is less than 30%	4		5	6 4	6	5 7	6 7	7 7 7	7 7	7 7	7 7	8 7	9 9
		is less than 20%	<1		<1 1	<1 <1	<1	<1 <1	<1 <1	<1 <1 <1	<1 <1	<1 <1	<1 <1	<1 <1	<1 <
	in 2020	is less than 30%	2		4	6 2	6	4 6	6 7	6 7 7	8 7	8 8	9 8	9 9	12 1

The harvest decision table

2018 Alternative	Total removals (M lb)	21.8, 28.8, 29.8, 30.8, 31.8, 32.8, 33.8, 34.8, 35.8, 37.3, 41.8
	TCEY (M lb)	[illegible]
	Fishing intensity	[illegible]
	Fishing intensity interval	[illegible]
Stock Trend (spawning biomass)	in 2019 is less than 2018	[illegible]
	is 5% less than 2018	[illegible]
	in 2020 is less than 2018	[illegible]
	is 5% less than 2018	[illegible]
	in 2021 is less than 2018	[illegible]
	is 5% less than 2018	[illegible]
Stock Status (spawning biomass)	in 2019 is less than 30%	[illegible]
	is less than 20%	[illegible]
	in 2020 is less than 30%	[illegible]
	is less than 20%	[illegible]
	in 2021 is less than 30%	[illegible]
	is less than 20%	[illegible]
Fishery Trend	in 2019 is less than 2018	[illegible]
	is 10% less than 2018	[illegible]
	in 2020 is less than 2018	[illegible]

Reference: SPR=46%

The harvest decision table

Stock Status (Spawning biomass)

Stock Trend (Spawning biomass)

Fishery Trend (TCEY)

Fishery Status (Fishing intensity)

2018 Alternative

No removals

Reference: SPR=46%

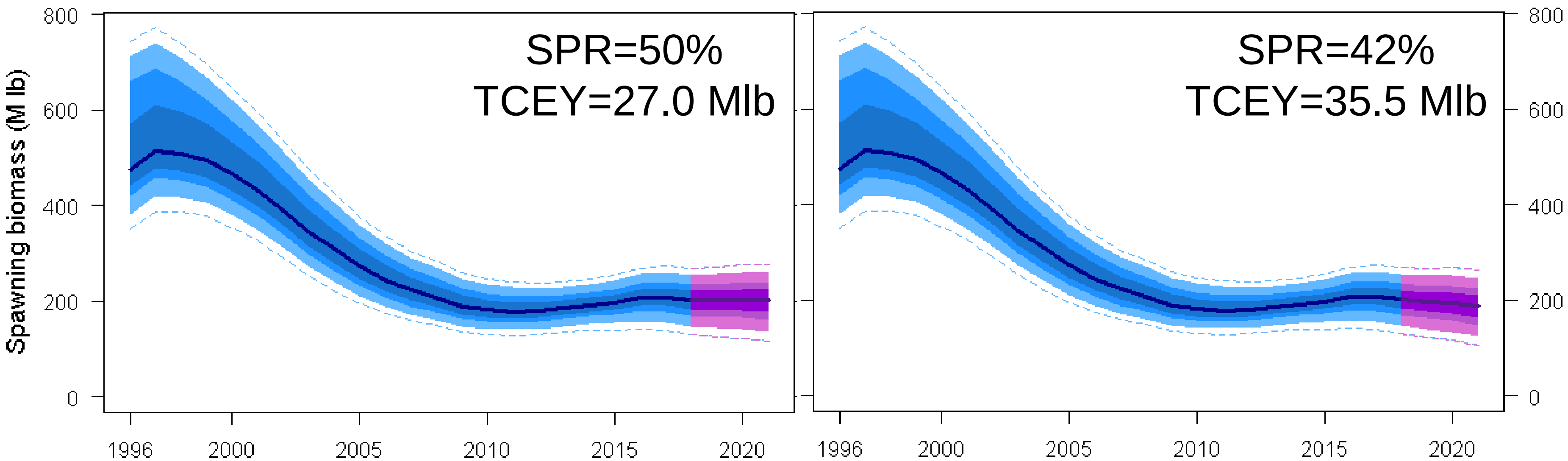
Total mortality (M lb)

TCEY (M lb)

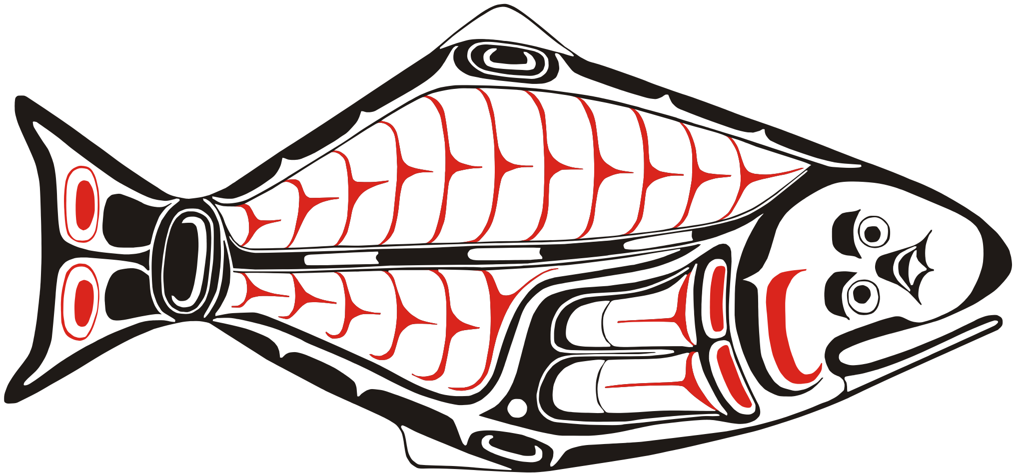
Fishing intensity

Fishing intensity interval

Alternative SPRs



Break



Outline

- Coastwide stock assessment
  - Data sources
  - Modelling and results
- Catch tables
  - **Regulatory Area-specific projections**

Catch tables

- TCEY-based catch-limits

“AM093–**30.** *NOTING that the Commission has indicated its interest in clearer accounting for all mortality, and that Canada has put forward catch limit allocation principles proposing that catch limits include all sources of mortality for each regulatory area, the Commission RECOMMENDED that the presentation of harvest advice be changed to be based on the TCEY, which includes all O26 commercial, sport, personal use/subsistence, bycatch and wastage removals, for the 2018 Annual Meeting cycle, as a step towards more comprehensive and responsible management of the resource that will result in the negotiation of Regulatory Area-specific catch limits based on TCEYs.”*

Catch tables based on TCEY

- Projections remain the same (2017 adopted table)

	2A	2B	2C	3A	3B	4A	4B	4CDE	Total
O26 Non-FCEY									
Commercial disc. mort.	**0.05**	**0.23**	**NA**	**NA**	**0.23**	**0.05**	**0.06**	**0.08**	**0.69**
Bycatch	**0.10**	**0.24**	**0.03**	**1.17**	**0.58**	**0.34**	**0.14**	**1.98**	**4.57**
Non CSP Recreational	**NA**	**NA**	**1.33**	**1.56**	**0.01**	**0.01**	**0.00**	**0.00**	**2.91**
Subsistence	**NA**	**0.41**	**0.43**	**0.23**	**0.02**	**0.01**	**0.00**	**0.08**	**1.17**
Total O26 non-FCEY	**0.14**	**0.87**	**1.79**	**2.96**	**0.84**	**0.41**	**0.20**	**2.14**	**9.34**
O26 FCEY									
Commercial disc. mort.	**NA**	**NA**	**0.12**	**0.37**	**NA**	**NA**	**NA**	**NA**	**0.49**
CSP Recreational	**0.53**	**1.15**	**0.92**	**1.89**	**NA**	**NA**	**NA**	**NA**	**4.49**
Subsistence	**0.03**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**0.03**
Commercial landings	**0.77**	**6.30**	**4.21**	**7.74**	**3.14**	**1.39**	**1.14**	**1.70**	**26.39**
Total FCEY	**1.33**	**7.45**	**5.25**	**10.00**	**3.14**	**1.39**	**1.14**	**1.70**	**31.40**
TCEY (Total O26)	**1.47**	**8.32**	**7.04**	**12.96**	**3.98**	**1.80**	**1.34**	**3.84**	**40.74**
U26									
Commercial disc. Mort.	**0.00**	**0.00**	**0.00**	**0.01**	**0.03**	**0.01**	**0.00**	**0.00**	**0.07**
Bycatch	**0.00**	**0.02**	**0.00**	**0.62**	**0.29**	**0.23**	**0.01**	**1.27**	**2.44**
Total U26	**0.00**	**0.02**	**0.00**	**0.63**	**0.33**	**0.24**	**0.01**	**1.27**	**2.51**
Total mortality	**1.48**	**8.35**	**7.04**	**13.60**	**4.30**	**2.04**	**1.35**	**5.11**	**43.25**

(FCEYs still used for catch allocation agreements within IPHC Regulatory Areas)

Catch table projections

- **Scale** from:
  - Reference SPR = 46%
  - *Or other coastwide level*
- **Distribution** from:
  - Stock distribution (O32 survey)
  - Relative harvest rates (1.0 in 2A-3A, 0.75 in 3B-4CDE)
    - These are exactly analogous to the historical 21.5% and 16.125%
  - *Or other TCEY distributions*

Recent TCEYs

	2A	2B	2C	3A	3B	4A	4B	4CDE	Total
2017 Reference	**0.96**	**6.08**	**6.47**	**13.84**	**4.39**	**1.84**	**1.46**	**4.06**	**39.10**
2017 Adopted	**1.47**	**8.32**	**7.04**	**12.96**	**3.98**	**1.80**	**1.34**	**3.84**	**40.74**
2018 Reference	**0.59**	**3.84**	**5.65**	**12.07**	**2.56**	**1.69**	**1.21**	**3.39**	**31.00**

Reflects changes in both scale and distribution

Example:

2B O32 stock distribution:
2016: 14.1%
2017: 11.3%

Region 2 O32 stock distribution:
2016: 31.4%
2017: 29.7%

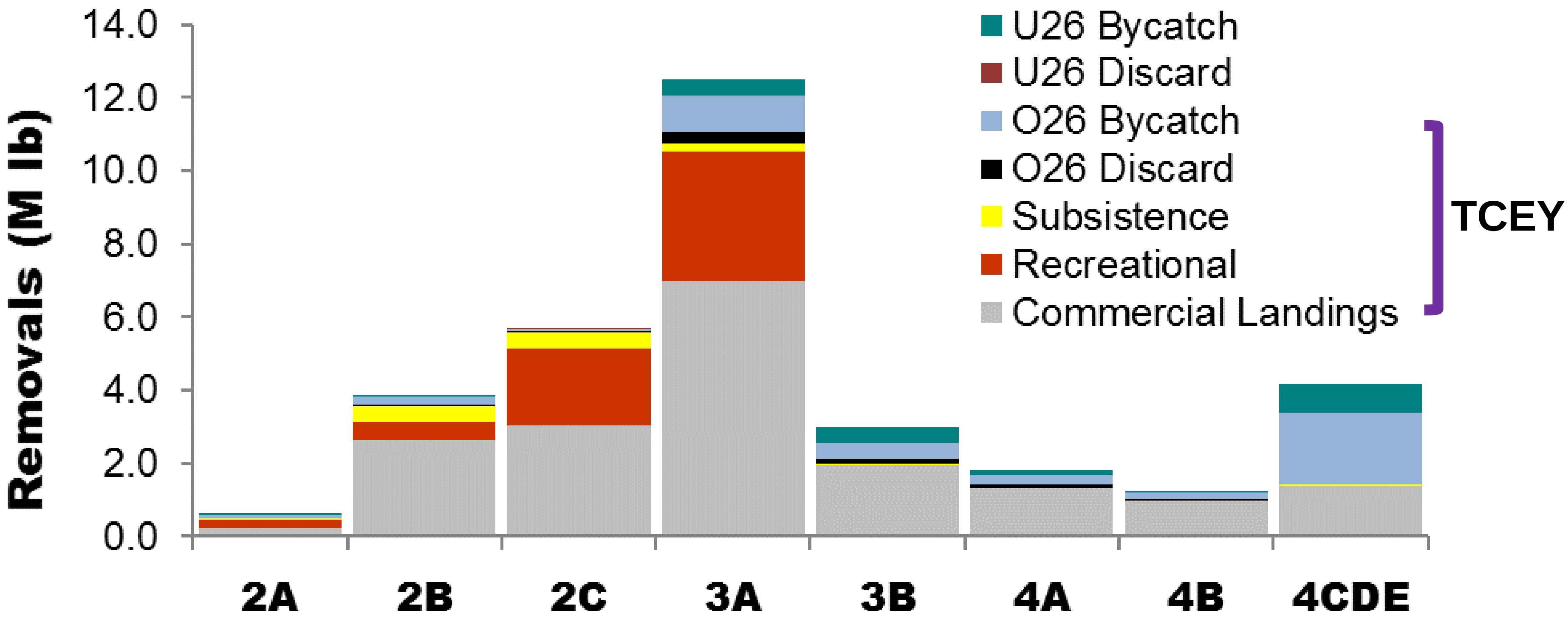
2018 Reference (SPR=46%) full catch table

	2A	2B	2C	3A	3B	4A	4B	4CDE	Total
O26 Non-FCEY									
Commercial discard mort.	0.01	0.07	NA	NA	0.13	0.06	0.03	0.02	0.32
Bycatch	0.11	0.23	0.02	1.01	0.45	0.29	0.20	1.96	4.26
Recreational (+discard mort.)	NA	NA	1.43	1.86	0.01	0.02	0.00	0.00	3.31
Subsistence	NA	0.41	0.44	0.22	0.01	0.01	0.00	0.05	1.14
Total Non-FCEY	0.12	0.71	1.89	3.09	0.61	0.37	0.22	2.04	9.04
O26 FCEY									
Commercial discard mort.	NA	NA	0.06	0.30	NA	NA	NA	NA	0.36
Recreational (+discard mort.)	0.21	0.48	0.69	1.70	NA	NA	NA	NA	3.08
Subsistence	0.03	NA	NA	NA	NA	NA	NA	NA	0.03
Commercial landings	0.23	2.65	3.01	6.99	1.95	1.32	0.99	1.36	18.49
Total FCEY	0.47	3.14	3.76	8.98	1.95	1.32	0.99	1.36	21.96
TCEY	**0.59**	**3.84**	**5.65**	**12.07**	**2.56**	**1.69**	**1.21**	**3.39**	**31.00**
U26									
Commercial discard mort.	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.04
Bycatch	0.00	0.02	0.00	0.42	0.44	0.11	0.01	0.79	1.79
Total U26	0.00	0.02	0.00	0.43	0.45	0.12	0.01	0.79	1.82
Total Mortality	**0.59**	**3.87**	**5.65**	**12.50**	**3.01**	**1.81**	**1.22**	**4.18**	**32.82**

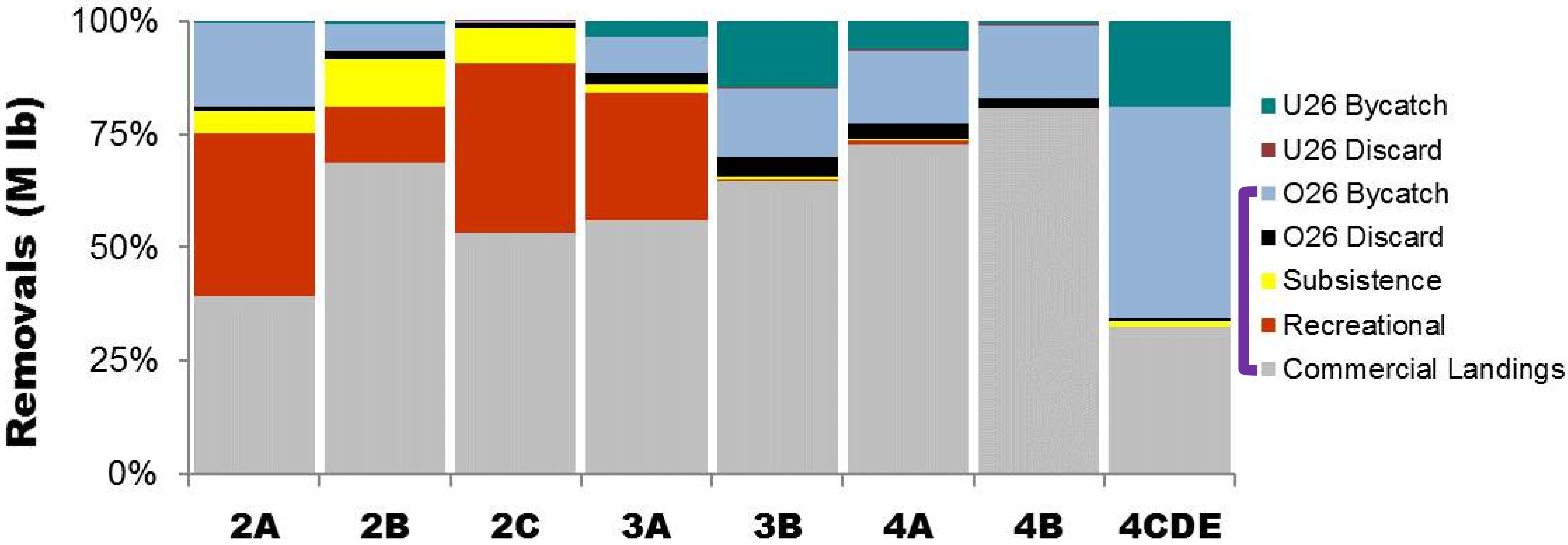
2018 Reference (SPR=46%) summary

		2A	2B	2C	3A	3B	4A	4B	4CDE	Total
	O26									
	Commercial	0.24	2.73	3.07	7.29	2.08	1.38	1.01	1.38	19.18
	Recreational	0.21	0.48	2.12	3.55	0.01	0.02	0.00	0.00	6.39
	Subsistence	0.03	0.41	0.44	0.22	0.01	0.01	0.00	0.05	1.17
	Bycatch	0.11	0.23	0.02	1.01	0.45	0.29	0.20	1.96	4.26
TCEY →	**Total O26**	0.59	3.84	5.65	12.07	2.56	1.69	1.21	3.39	31.00
	U26									
Include in TCEY? →	**Commercial**	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.04
	Bycatch	0.00	0.02	0.00	0.42	0.44	0.11	0.01	0.79	1.79
	Total U26	0.00	0.02	0.00	0.42	0.45	0.12	0.01	0.79	1.81
	Total	0.59	3.87	5.65	12.50	3.01	1.81	1.22	4.18	32.82

2018 Reference (SPR=46%) summary



2018 Reference (SPR=46%) summary



Additional 2018 Catch tables

- Detailed results (full tables) can be created for all alternatives under consideration during AM

Alternative: SPR=46%, Full regulatory bycatch in all Areas

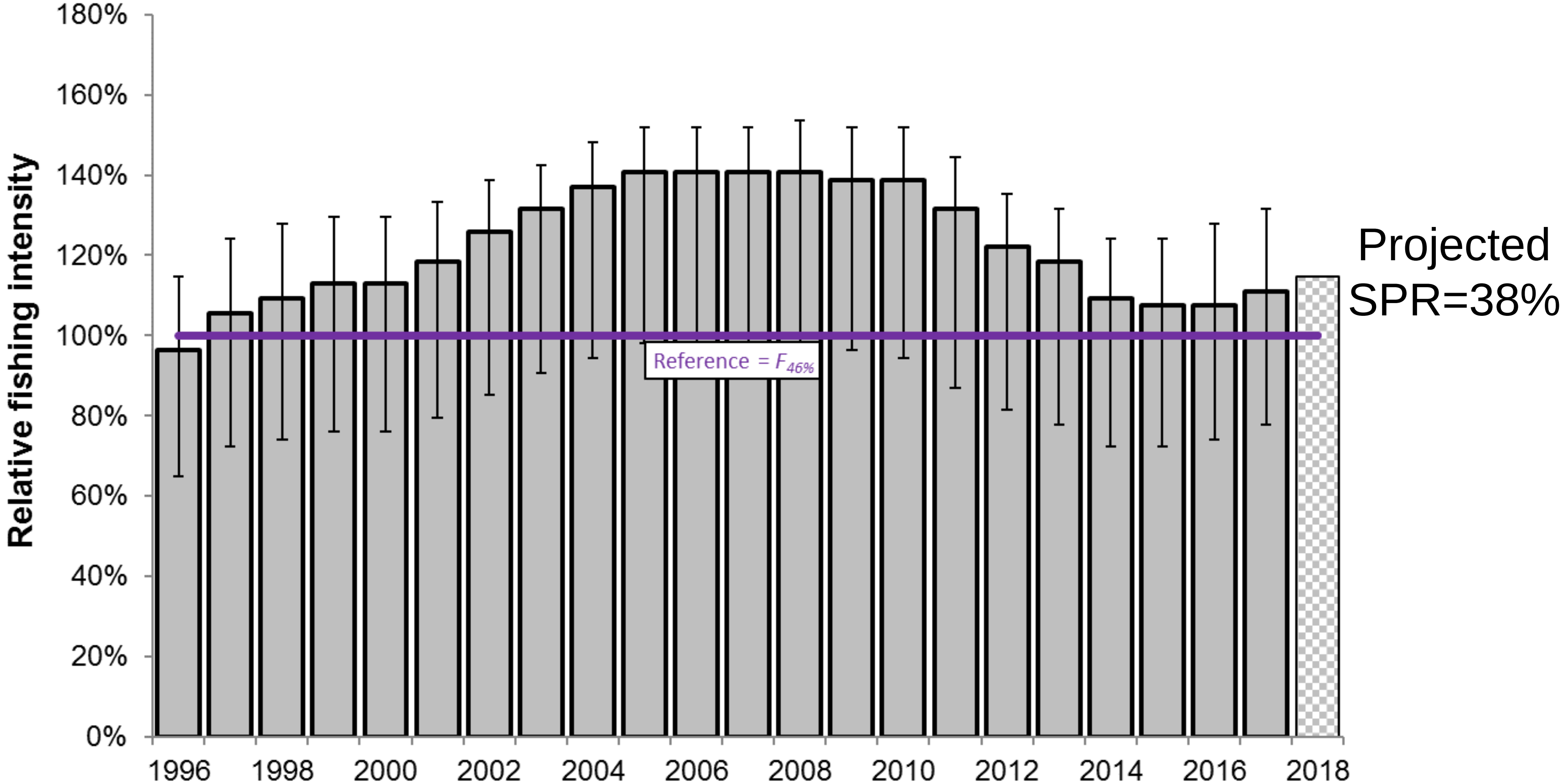
	2A[1]	2B	2C	3A	3B	4A	4B	4CDE	Total
O26 Non-FCEY									
Commercial discard mort.	0.00	0.05	NA	NA	0.11	0.05	0.02	0.00	0.24
Bycatch	0.22	0.91	0.02	1.40	0.64	0.50	0.32	3.41	7.43
Recreational (+discard mort.)	NA	NA	1.43	1.86	0.01	0.02	0.00	0.00	3.31
Subsistence	NA	0.41	0.44	0.22	0.01	0.01	0.00	0.05	1.14
Total Non-FCEY	0.22	1.37	1.89	3.48	0.77	0.57	0.35	3.46	12.11
O26 FCEY									
Commercial discard mort.	NA	NA	0.05	0.26	NA	NA	NA	NA	0.32
Recreational (+discard mort.)	0.15	0.34	0.63	1.49	NA	NA	NA	NA	2.60
Subsistence	0.03	NA	NA	NA	NA	NA	NA	NA	0.03
Commercial landings	0.15	1.90	2.74	6.12	1.63	1.02	0.79	0.00	14.34
Total FCEY	0.33	2.24	3.42	7.87	1.63	1.02	0.79	0.00	17.29
TCEY	**0.55**	**3.61**	**5.31**	**11.34**	**2.40**	**1.58**	**1.14**	**3.46**	**29.40**
U26									
Commercial discard mort.	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.03
Bycatch	0.00	0.09	0.00	0.58	0.62	0.20	0.02	1.37	2.87
Total U26	0.00	0.09	0.00	0.59	0.63	0.20	0.02	1.37	2.90
Total Mortality	**0.56**	**3.70**	**5.31**	**11.93**	**3.03**	**1.79**	**1.16**	**4.83**	**32.30**

[1] 2x bycatch

Alternative: Last year's (2017) catch limits

	2A	2B	2C	3A	3B	4A	4B	4CDE	Total
O26 Non-FCEY									
Commercial discard mort.	0.02	0.17	NA	NA	0.23	0.07	0.03	0.03	0.54
Bycatch	0.11	0.23	0.02	1.01	0.45	0.29	0.20	1.96	4.26
Recreational (+discard mort.)	NA	NA	1.43	1.86	0.01	0.02	0.00	0.00	3.31
Subsistence	NA	0.41	0.44	0.22	0.01	0.01	0.00	0.05	1.14
Total Non-FCEY	0.13	0.81	1.89	3.09	0.70	0.38	0.23	2.04	9.26
O26 FCEY									
Commercial discard mort.	NA	NA	0.08	0.33	NA	NA	NA	NA	0.41
Recreational (+discard mort.)	0.54	1.15	0.92	1.87	NA	NA	NA	NA	4.47
Subsistence	0.03	NA	NA	NA	NA	NA	NA	NA	0.03
Commercial landings	0.78	6.36	4.15	7.68	3.28	1.42	1.11	1.79	26.57
Total FCEY	1.34	7.52	5.15	9.88	3.28	1.42	1.11	1.79	31.48
TCEY	**1.47**	**8.32**	**7.04**	**12.96**	**3.98**	**1.80**	**1.34**	**3.84**	**40.74**
U26									
Commercial discard mort.	0.00	0.00	0.00	0.01	0.02	0.01	0.00	0.00	0.05
Bycatch	0.00	0.02	0.00	0.42	0.44	0.11	0.01	0.79	1.79
Total U26	0.00	0.03	0.00	0.43	0.46	0.12	0.01	0.79	1.84
Total Mortality	**1.47**	**8.35**	**7.04**	**13.39**	**4.44**	**1.92**	**1.35**	**4.62**	**42.58**

Alternative: Last year's (2017) catch limits



Recommendations

- **NOTE** papers IPHC-2018-AM094-8, 9, 10, 11 which provide the data, stock assessment, harvest decision table, and catch tables.
- **REQUEST** any further analyses required for decision making during AM094.
- **REQUEST** any changes to the presentation of these analyses to be considered by the Secretariat during 2018.

INTERNATIONAL PACIFIC

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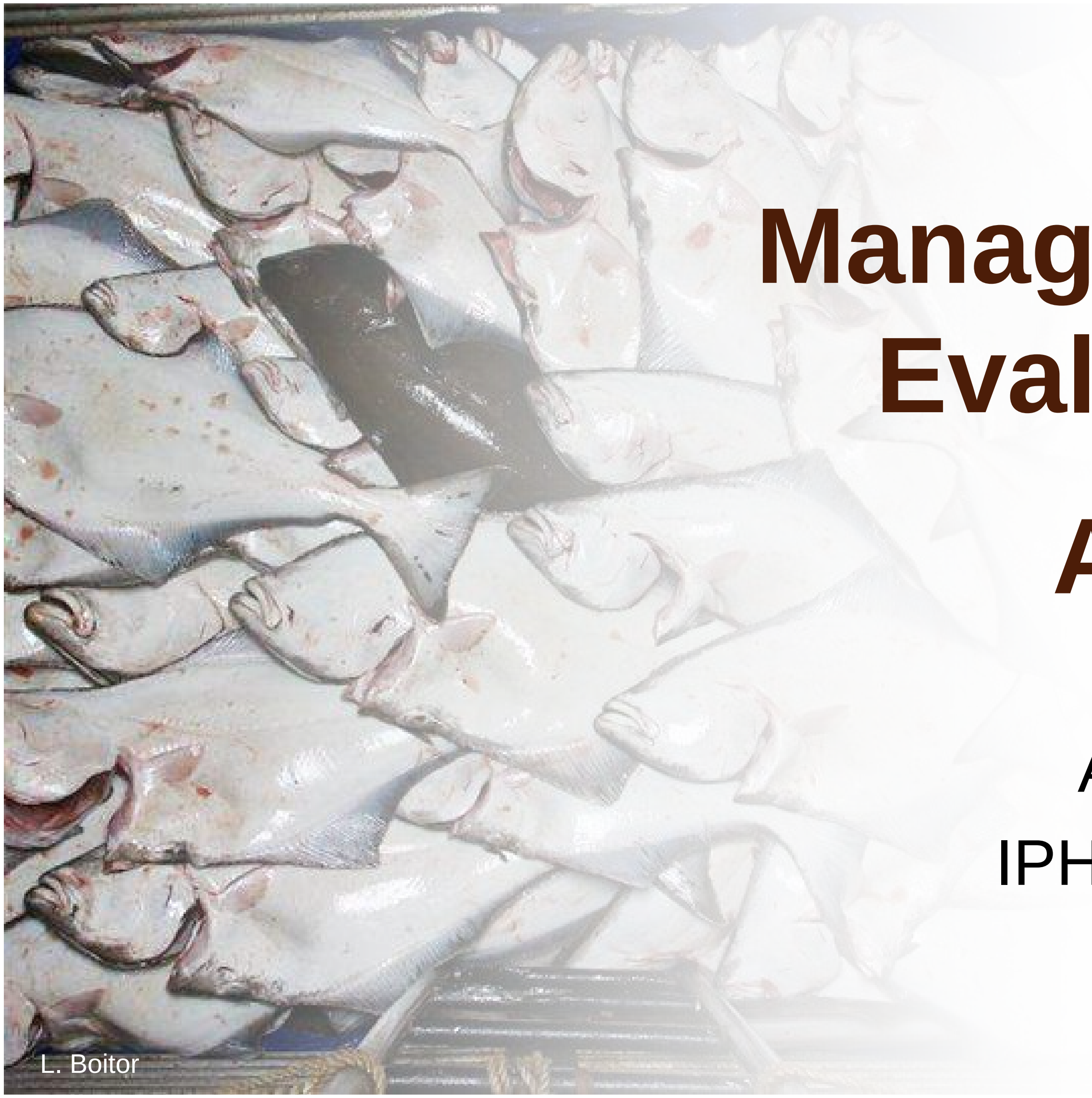


IPHC Management Strategy Evaluation (MSE)

An update

Agenda Item 7.1

IPHC-2018-AM094-12

INTERNATIONAL PACIFIC HALIBUT COMMISSION

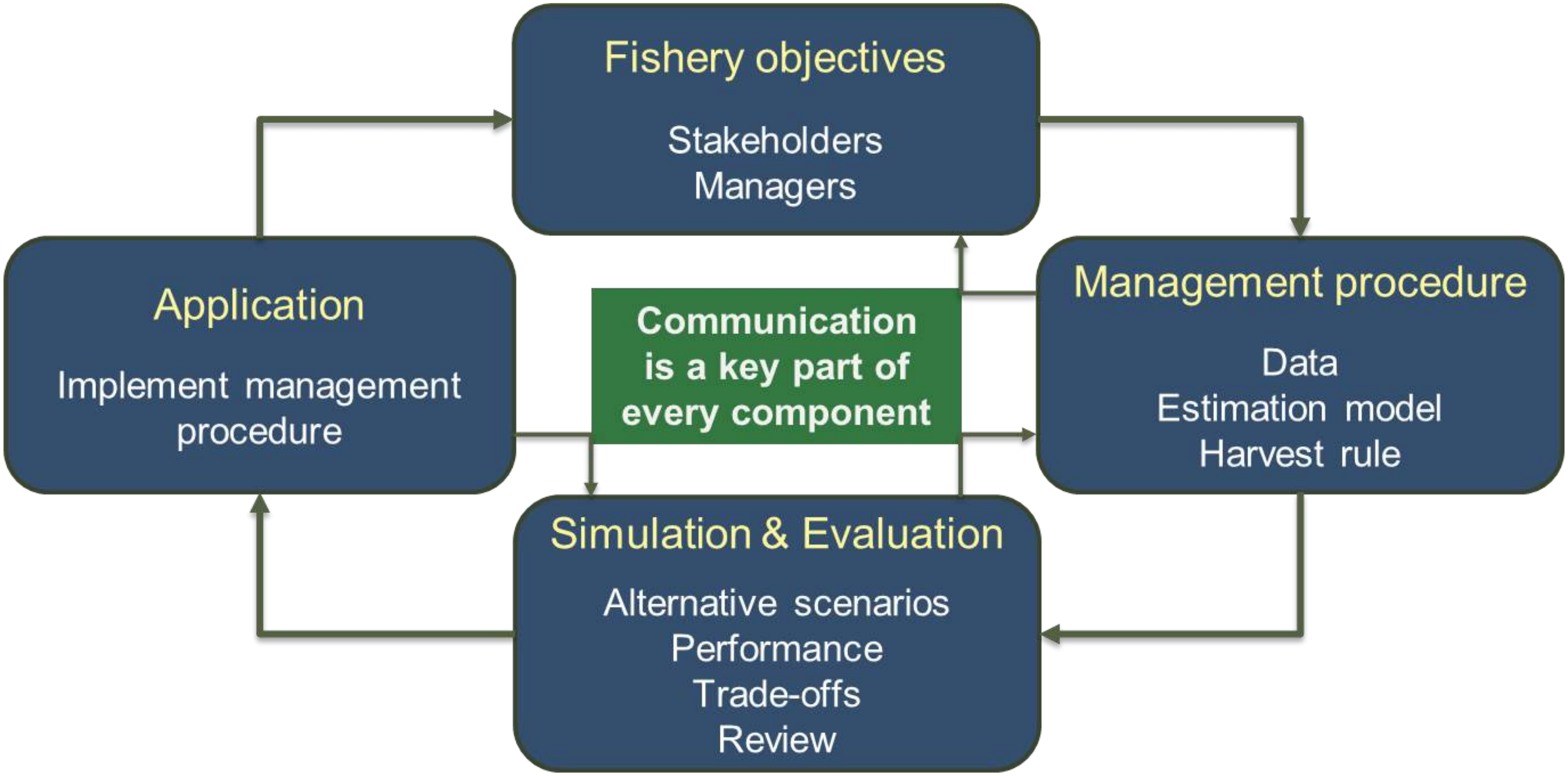
Management Strategy Evaluation

MSE is a process to evaluate the harvest strategy policy and develop a management procedure that is robust to uncertainty

Why MSE?

- Develop a harvest strategy that will provide a long-term sustainable fishery
- Determine a reference level for fishing intensity
- Understand the trade-offs of different management procedures and components of a harvest rule

Management Strategy Evaluation



Six goals

Fishery objectives

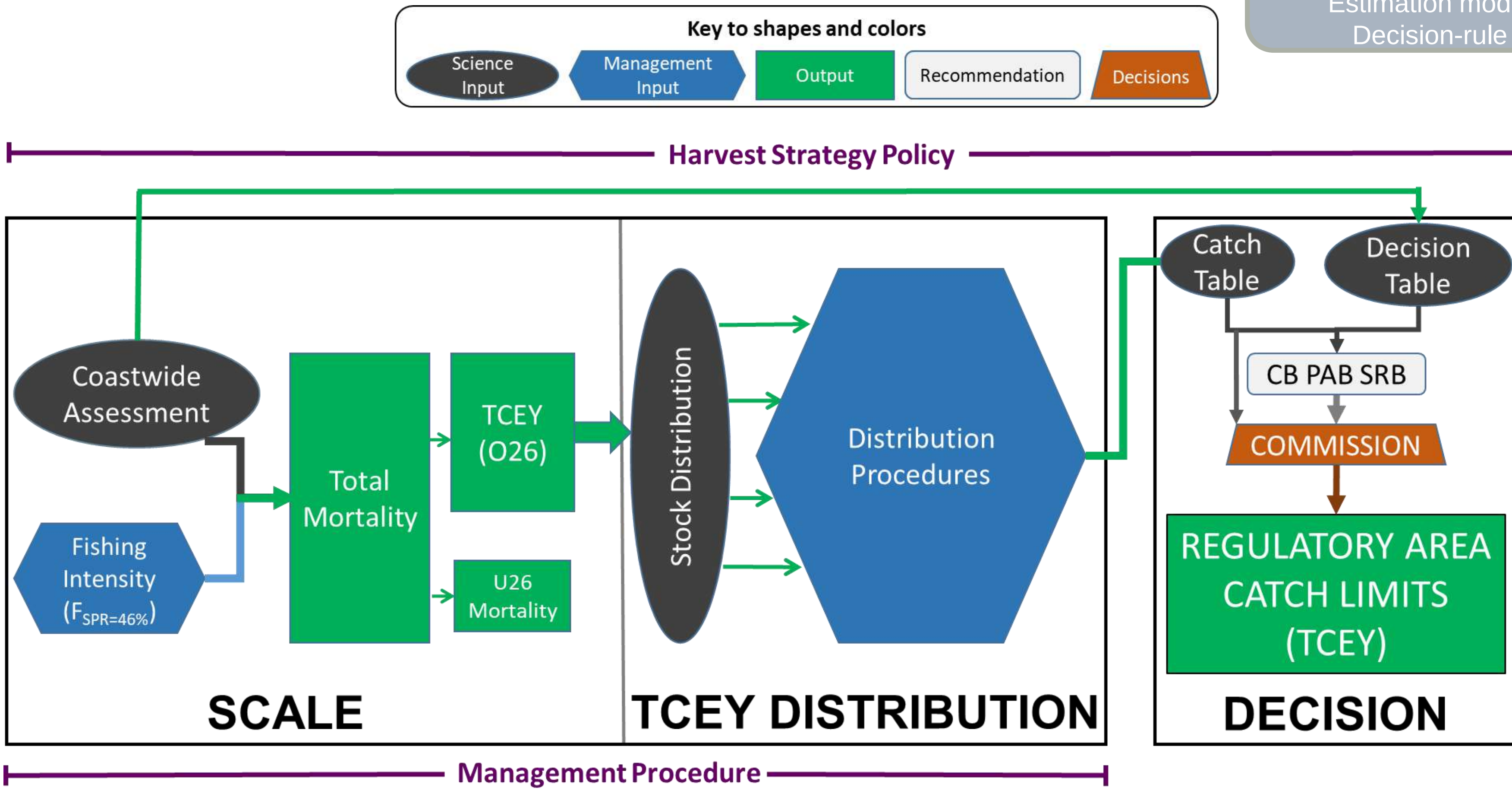
Stakeholders
Managers

1. Biological sustainability
2. Fishery sustainability, access, and stability
3. Minimize discard mortality
4. Minimize bycatch and bycatch mortality
5. Serve consumer needs
6. Preserve biocomplexity

Harvest Strategy Policy

Management procedure

Data
Estimation model
Decision-rule



Spawning Potential Ratio (SPR)

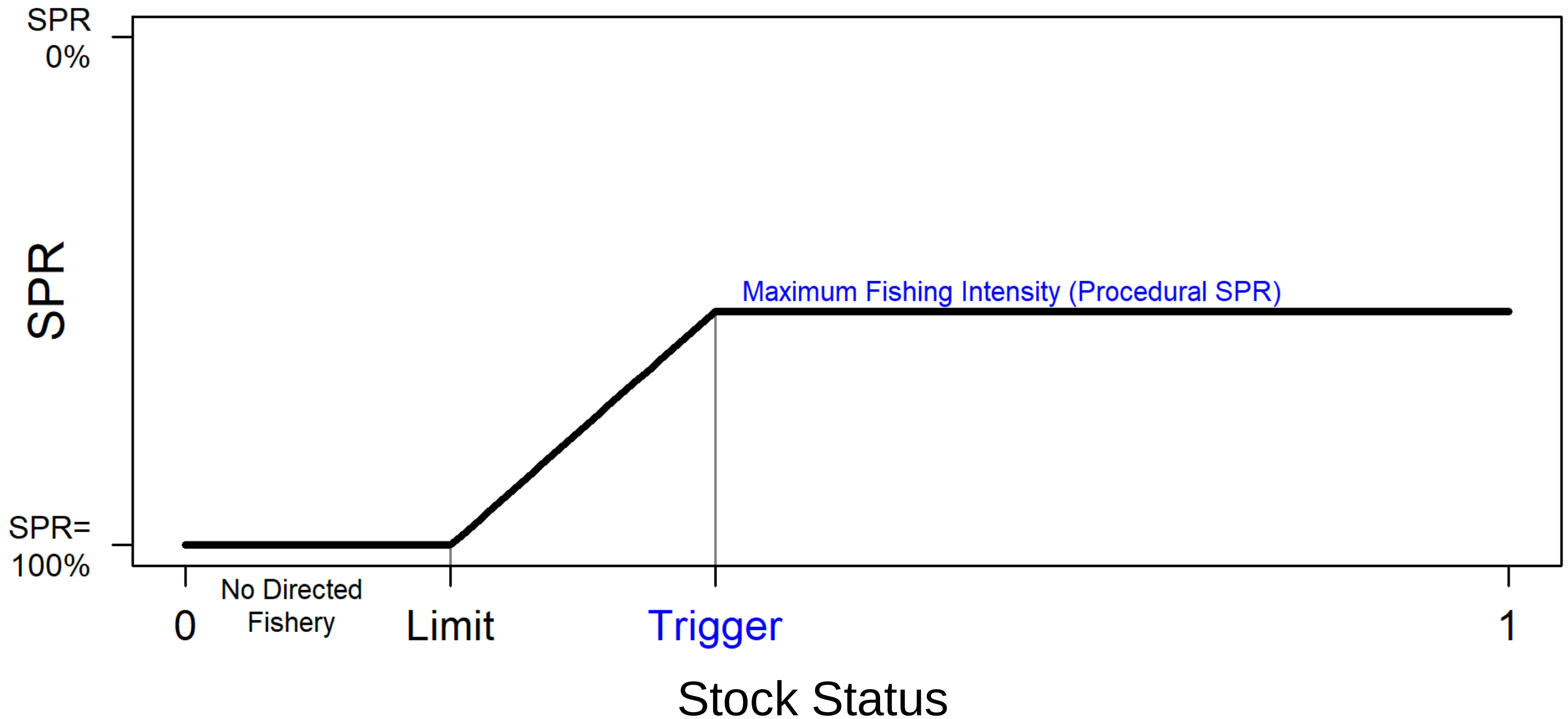
$$\frac{\text{Spawning Output Per Recruit with fishing}}{\text{Spawning Output Per Recruit with no fishing}}$$ *divided by*

- A measure of the reduction in spawning potential due to fishing at a constant rate (F_{SPR})
- A long-term, average concept
- SPR=100% means no fishing
- SPR=40% means a 60% reduction in spawning potential

Coastwide Fishing Intensity

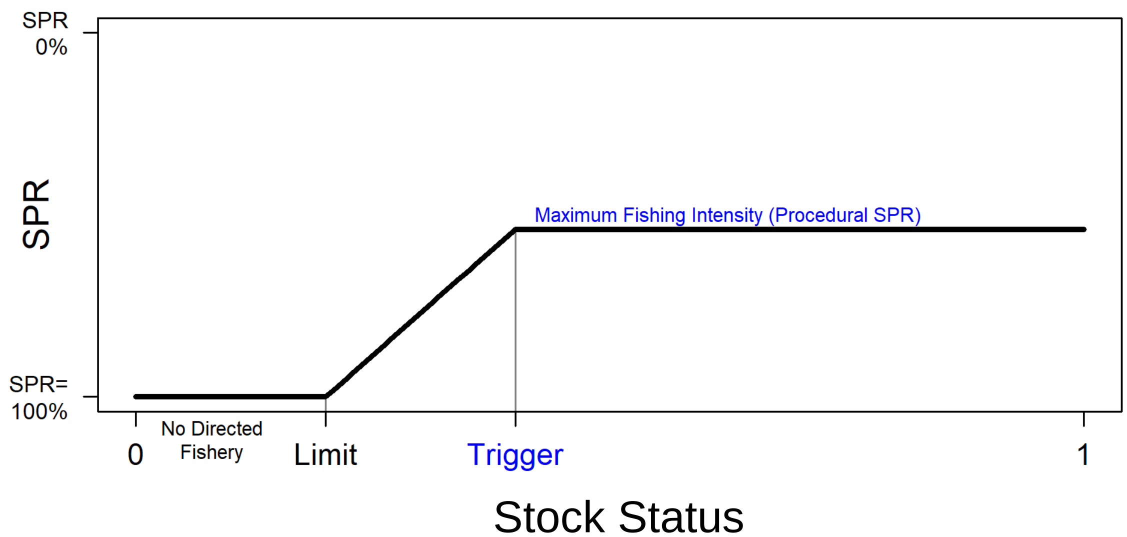
Fishing Intensity

- Determined from a harvest control rule



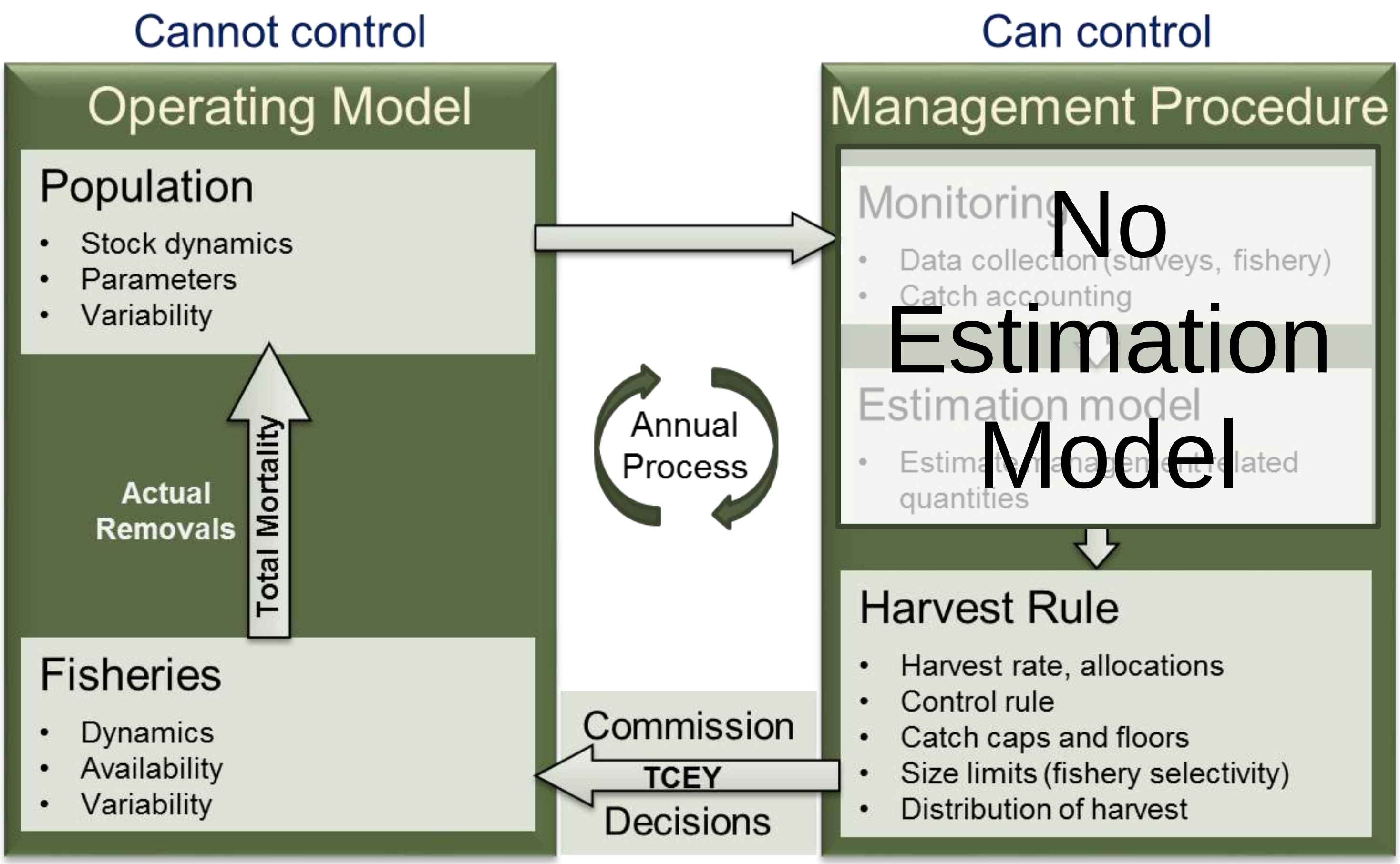
Investigating fishing intensity (scale)

- Procedural SPR
  - ranging from 25% to 60%
- Trigger
  - 30% or 40%



MSAB09 requested more than this, but I only report the salient results

Simulation framework



Simulation & Evaluation

Alternative scenarios
Performance
Trade-offs
Review

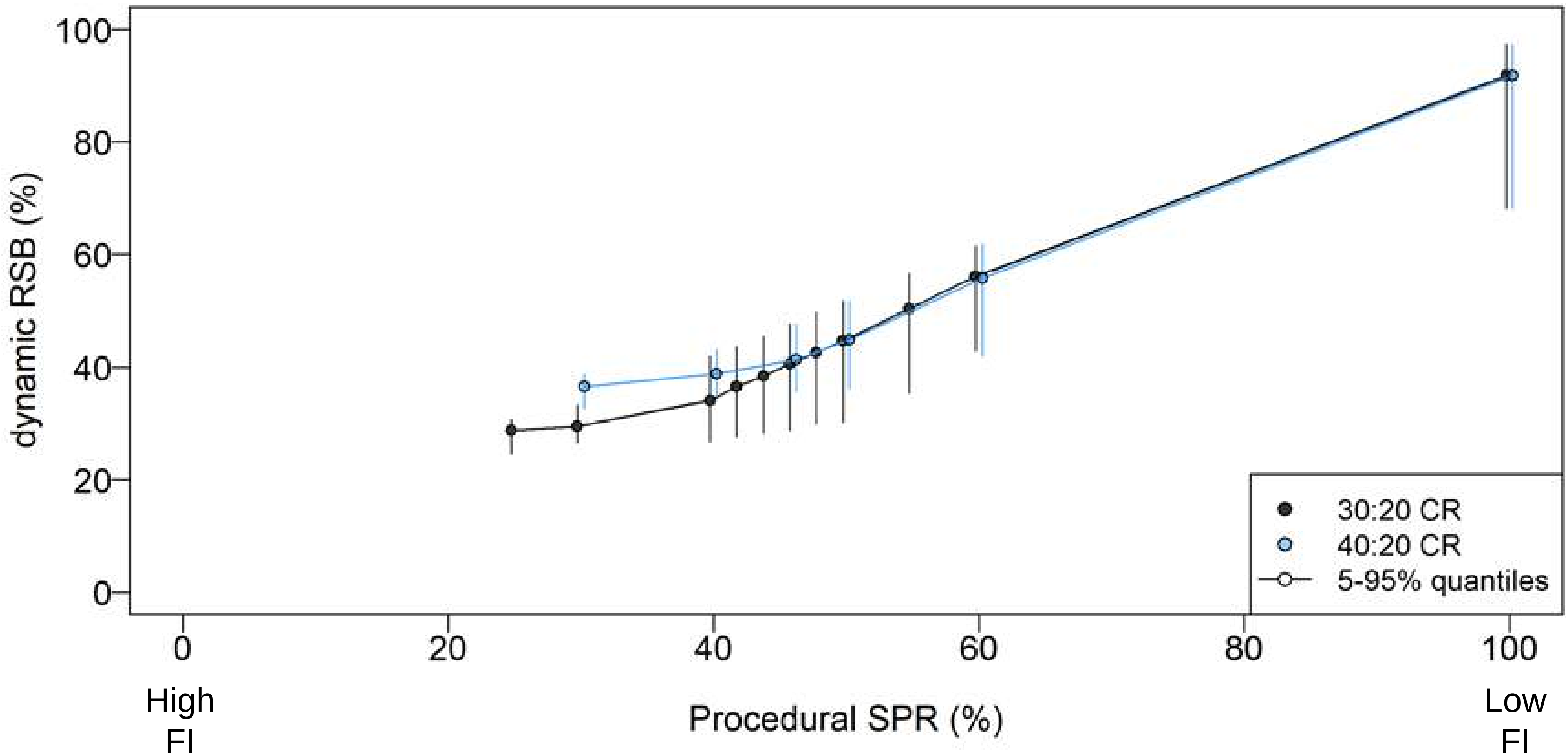
Equilibrium results

- Long-term, equilibrium results
  - Not predicting what may happen in 100 years
  - Instead, evaluating how the Management Procedure may generally behave given the uncertainty
  - A long-term strategy
- The assessment (3 year projection) is useful for short-term tactical decision making

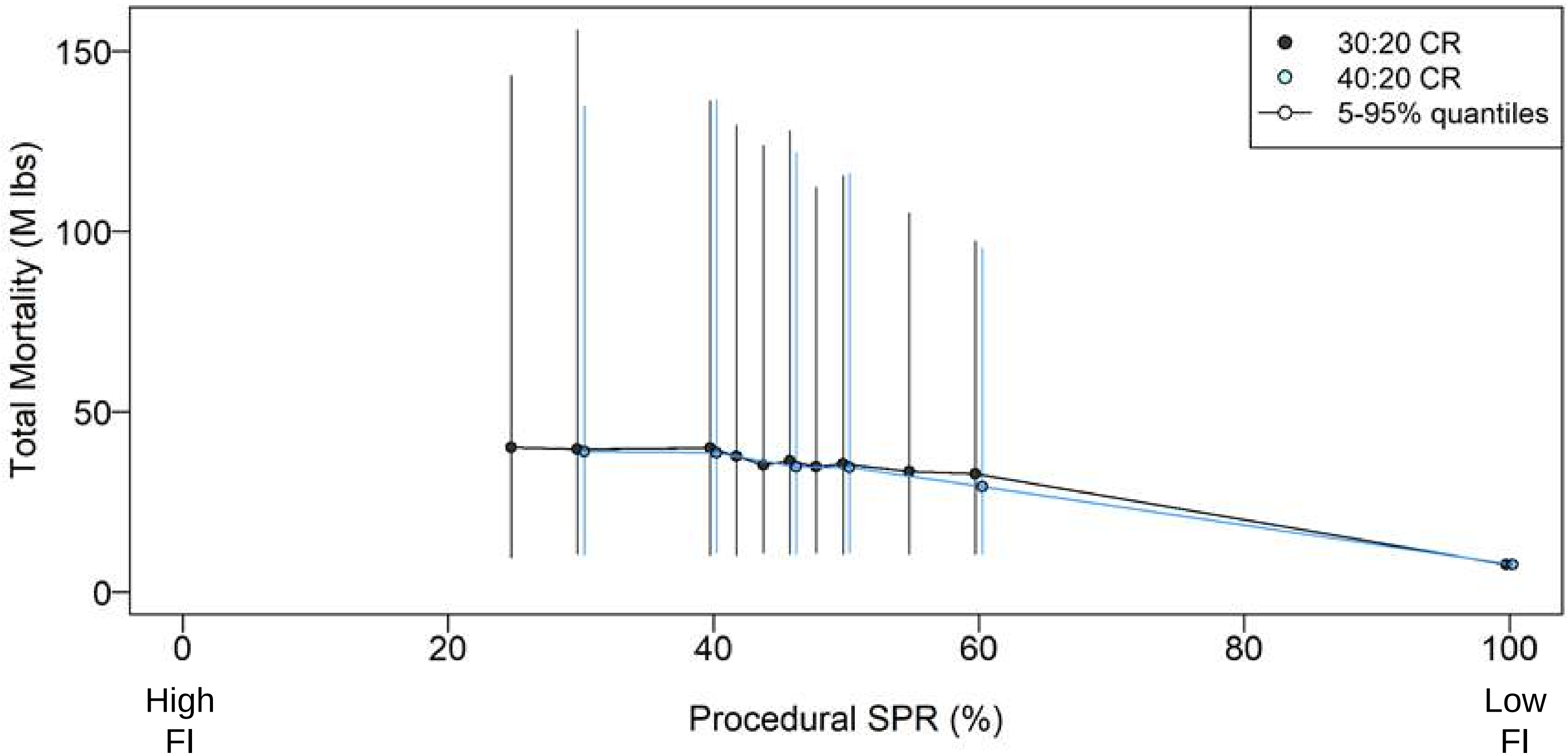
Results: Four Metrics

1. dRSB (*biological sustainability*)
   - dynamic relative spawning biomass
2. Total Mortality (*fishery yield*)
   - total removals from all sources
3. AAV (*fishery stability*)
   - average annual variability (in total mortality)
4. Relative SPR
   - actual SPR accounting for adjustments in harvest control rule

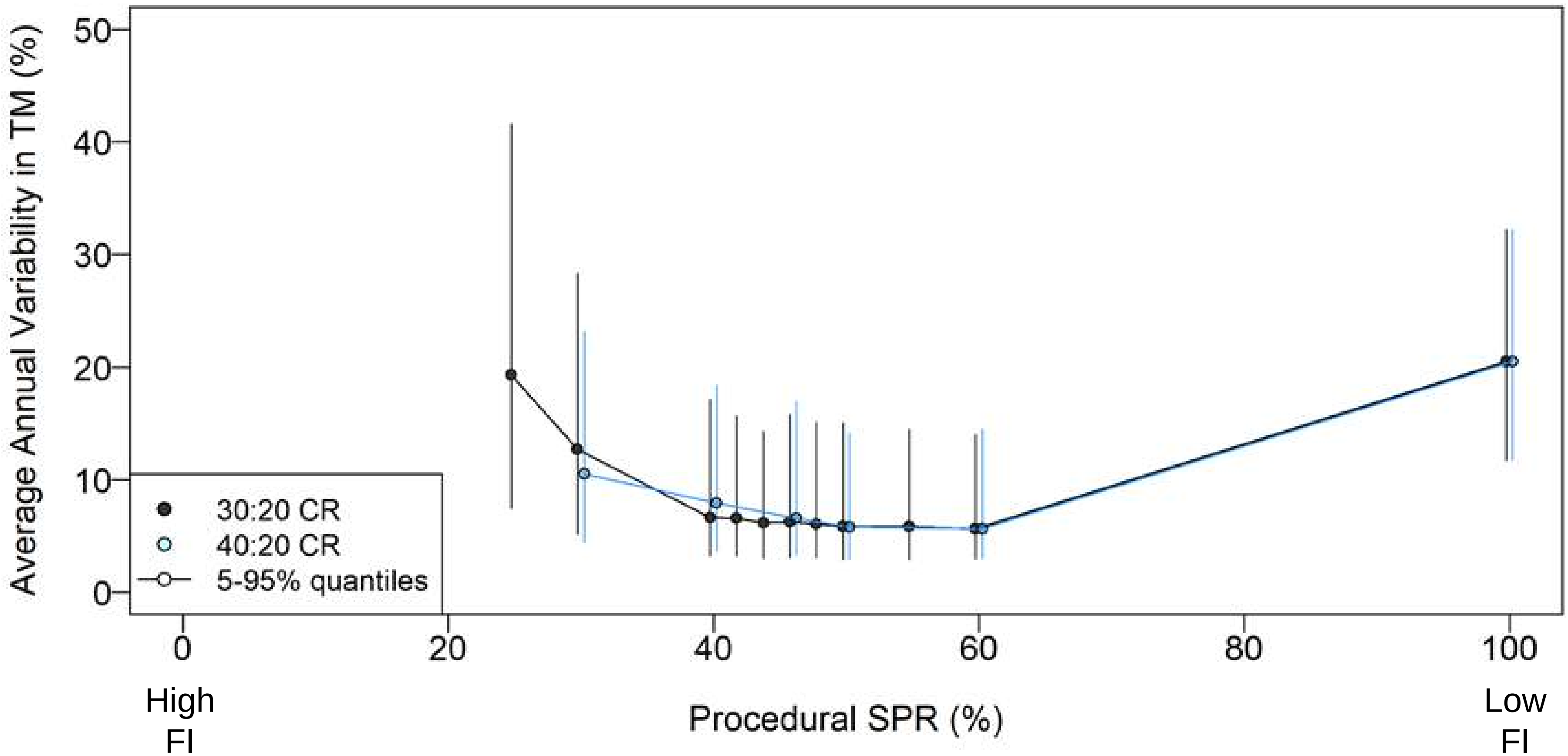
Dynamic relative spawning biomass



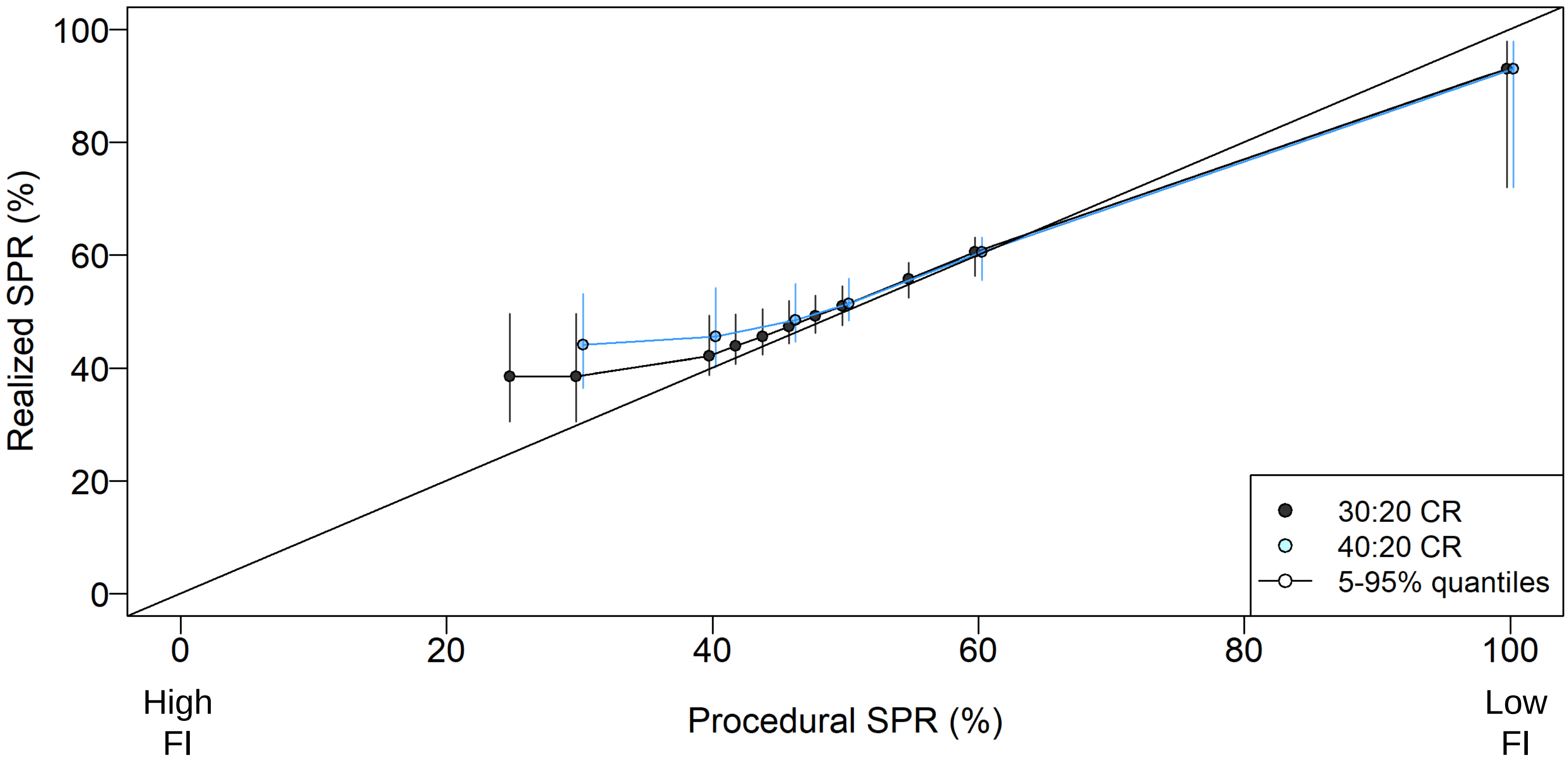
Total Mortality



Average Annual Variability (AAV)



Realized SPR



Summary of results

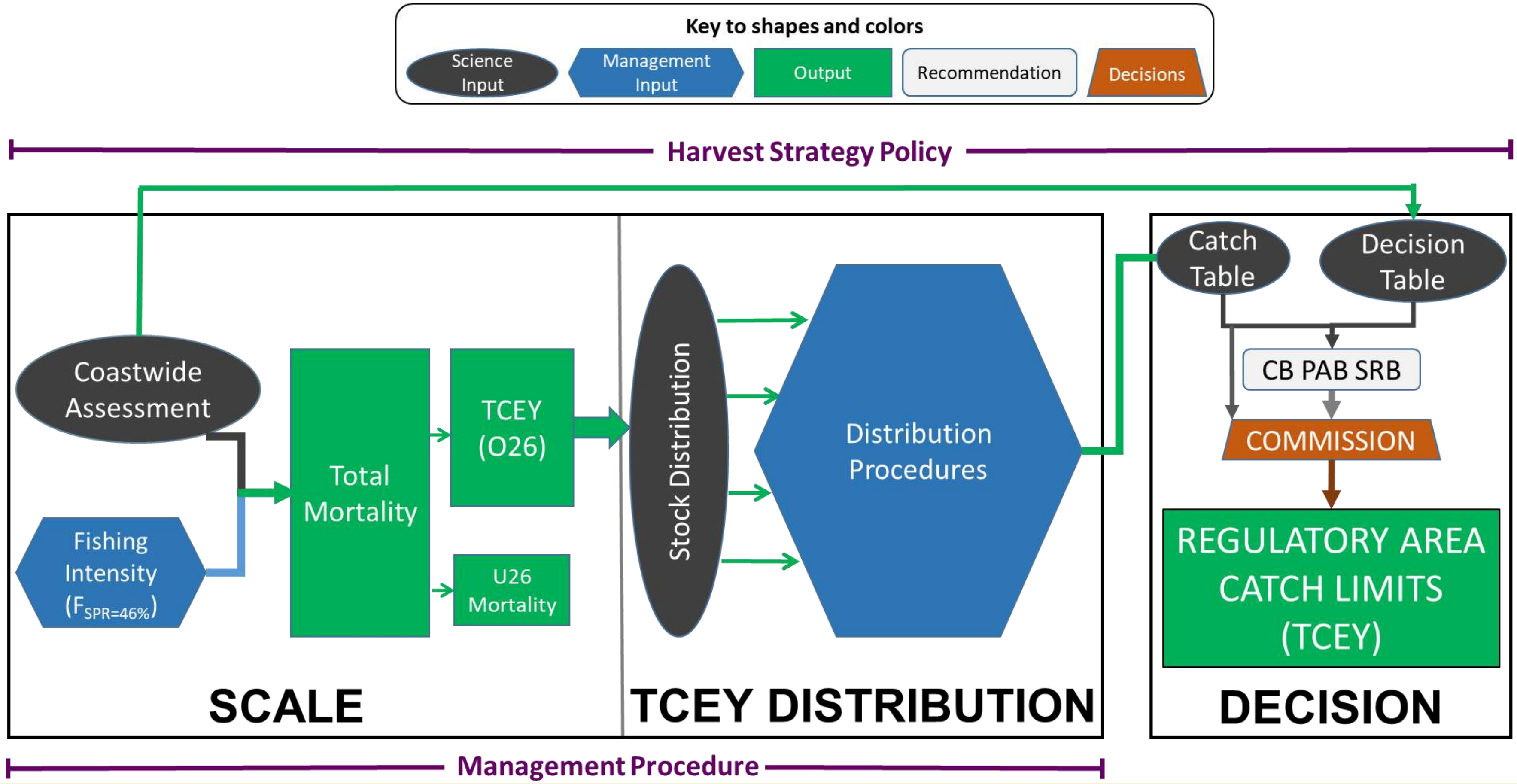
- **Stock status** declines with SPR, but the reduction in fishing intensity, when below the trigger, lessens the decline
  - The 40% trigger lessens the decline sooner
- **Average Total mortality** increases with lower SPR
- **Variability in total mortality** increases at low SPR
- **Realized SPR** is lower than the procedural SPR because ramping down fishing intensity when below trigger

Conclusions (for 30% trigger)

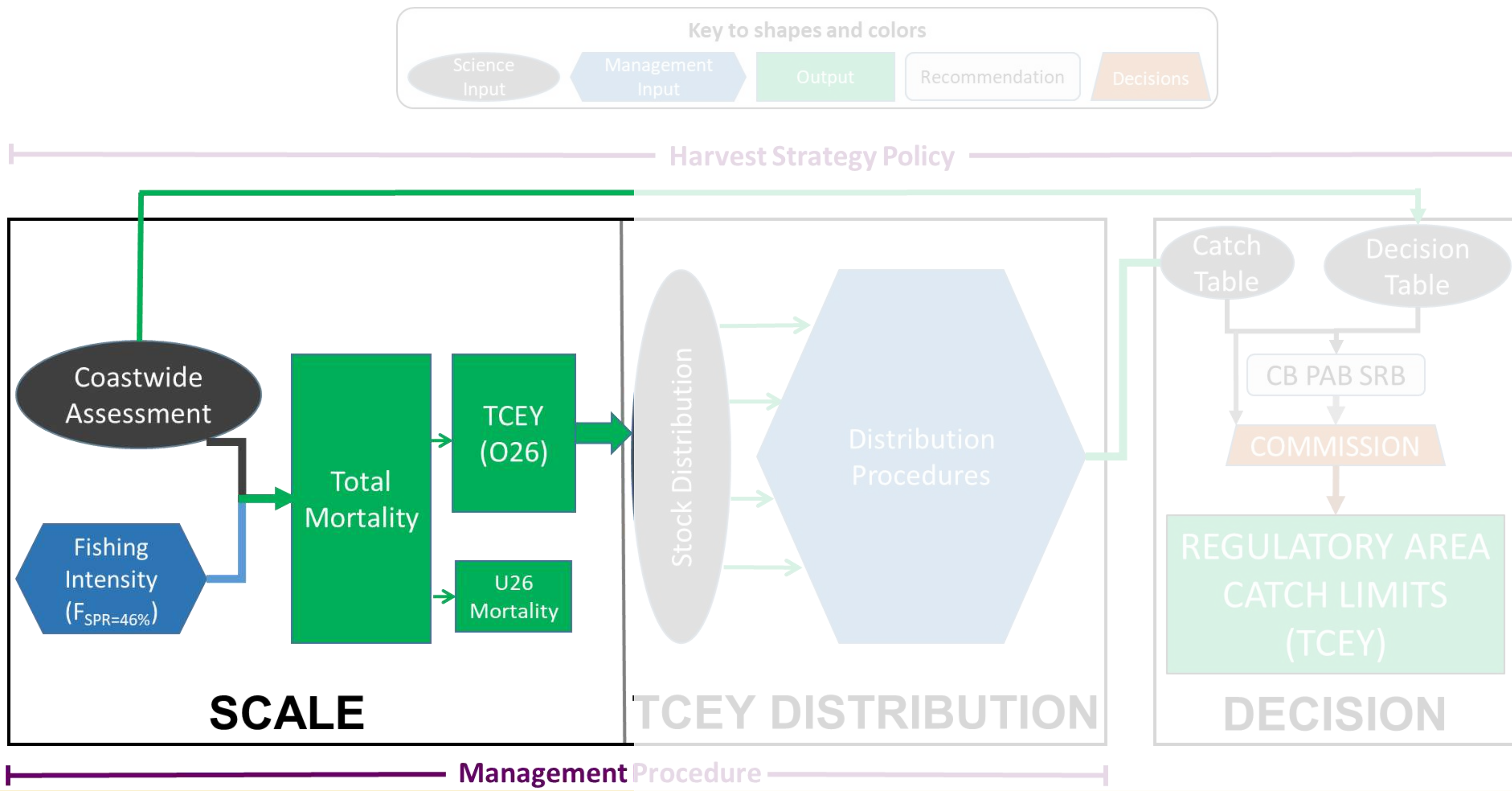
- Stock status reductions lessened at SPR values less than 40%
- Average Total Mortality increases very little at SPR values less than 40%
- Average Annual Variability shows a large increase at and below an SPR of 30%

- These conclusions are "best case" because not incorporating uncertainty from an estimation model
  - More comprehensive simulations will be done in 2018

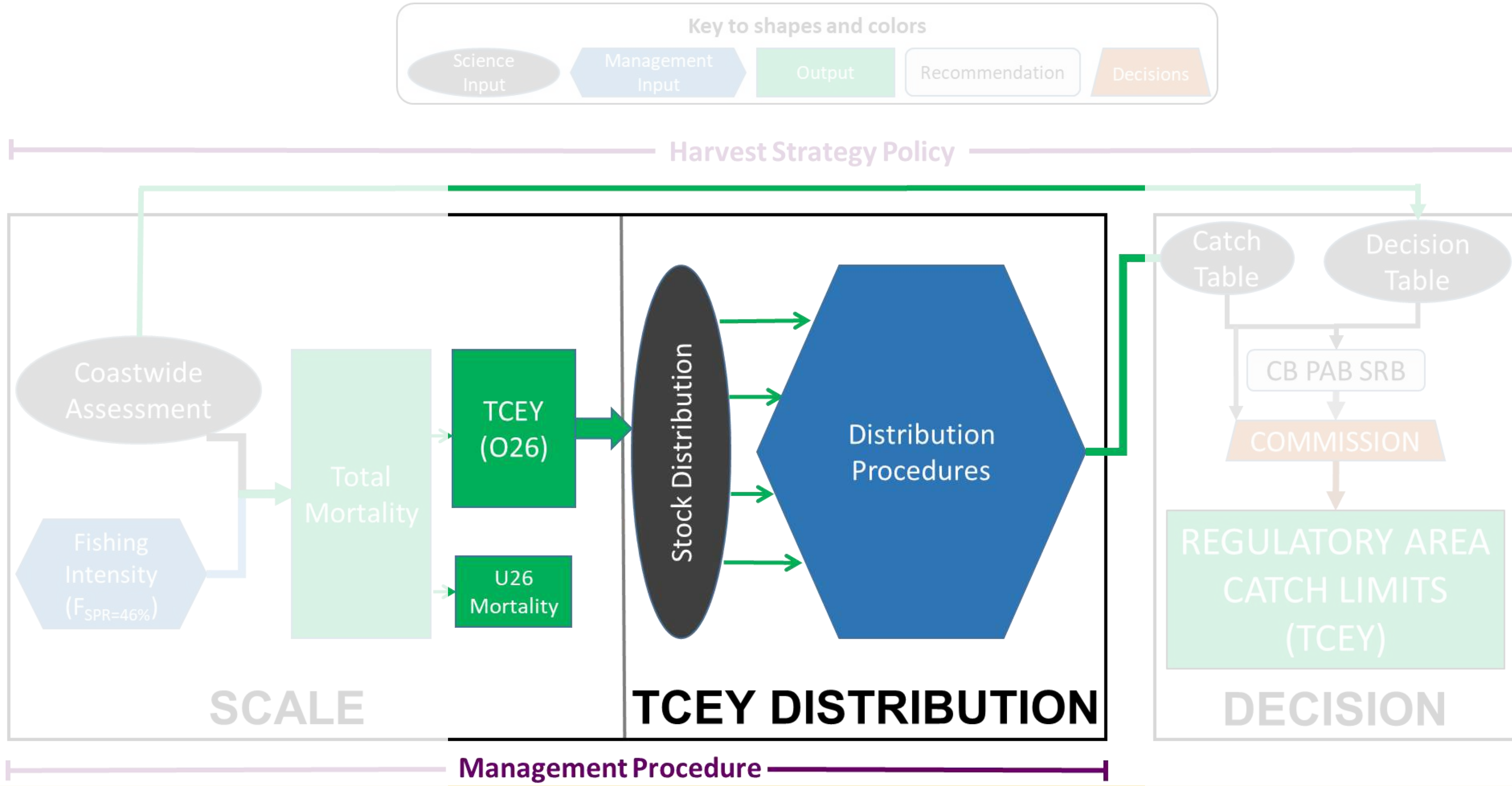
Harvest Strategy Policy



Harvest Strategy Policy



Harvest Strategy Policy

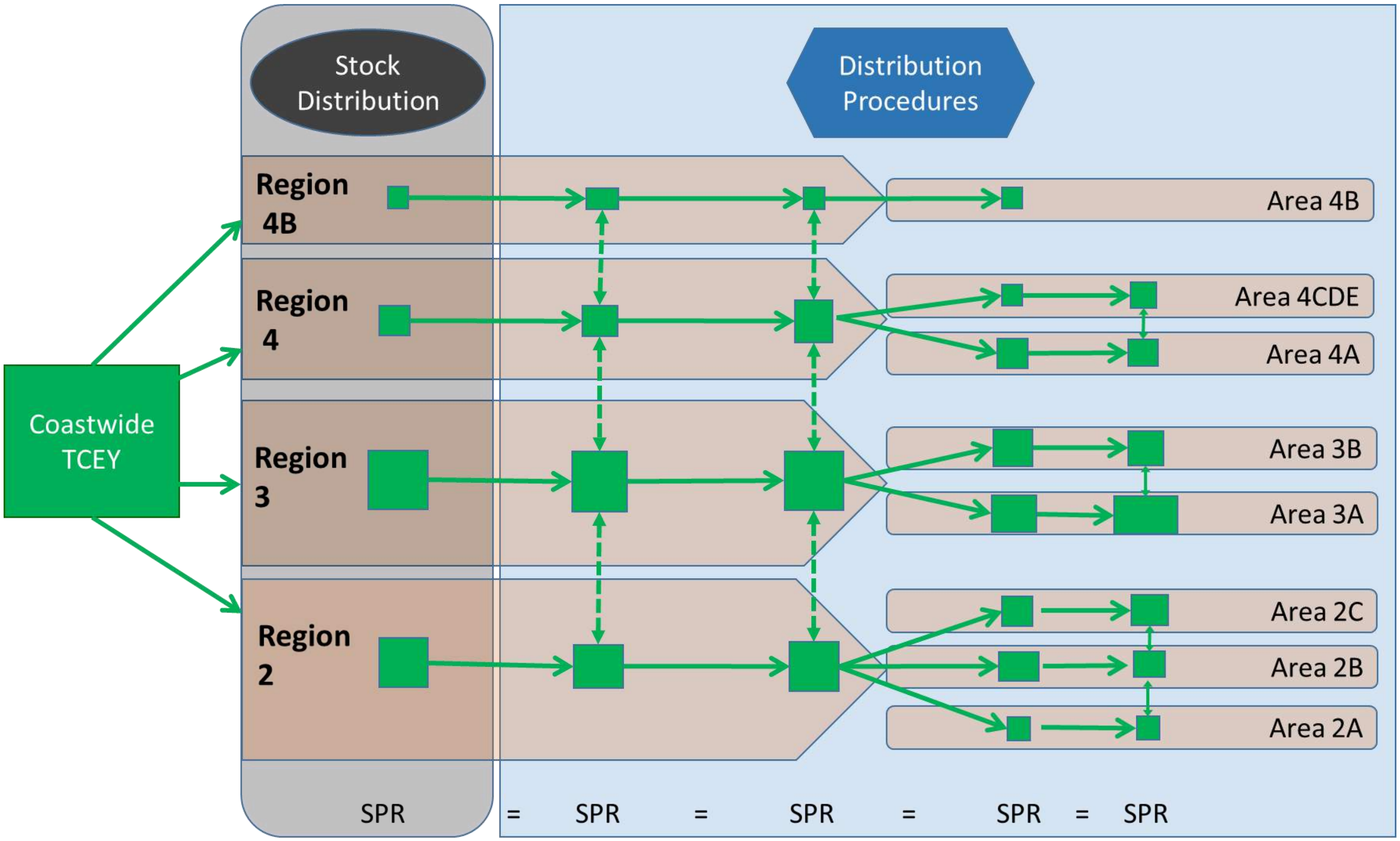


Recommendations from AM093

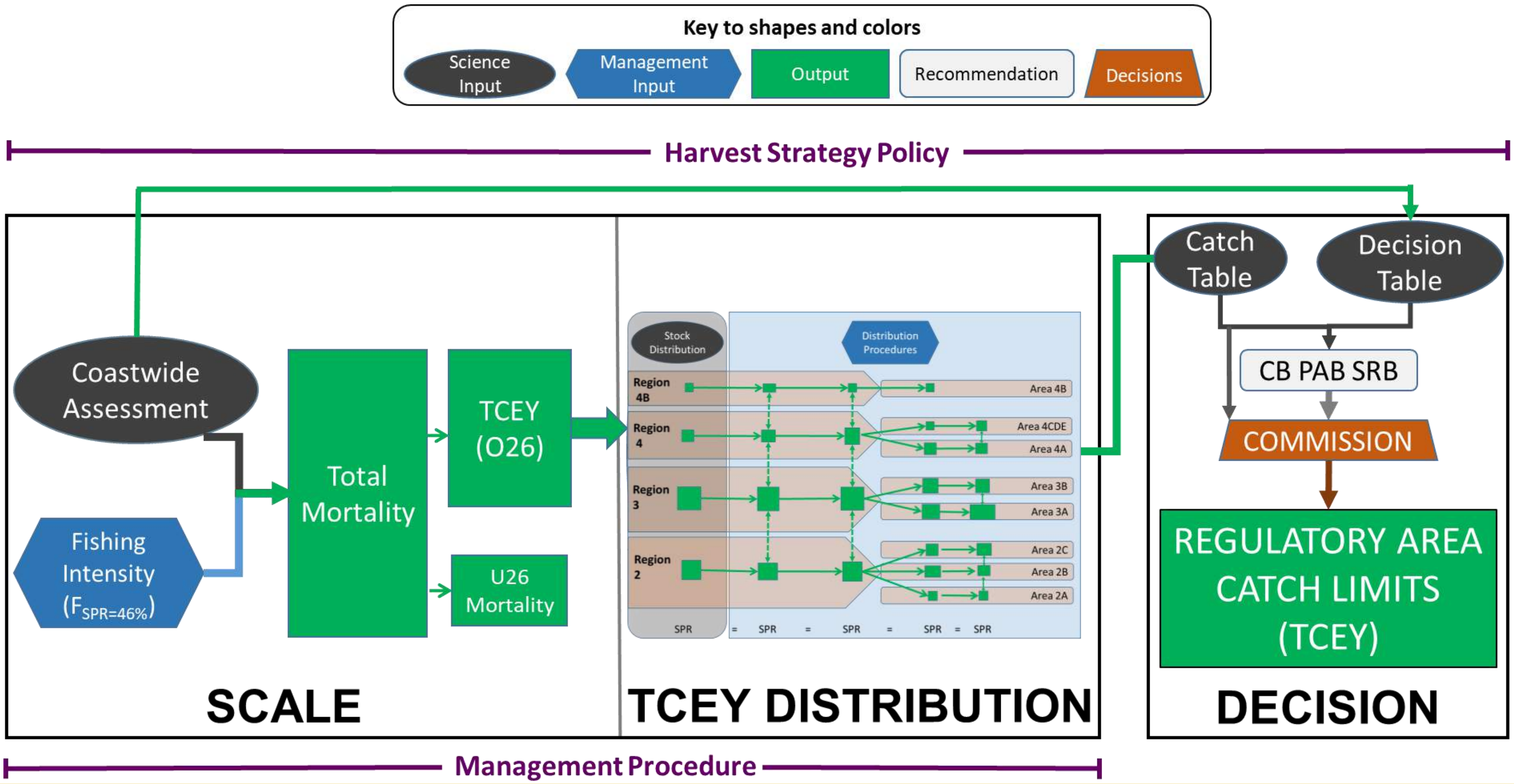
38. **NOTING** that the term “apportionment” has connotations broader than stock distribution that are not reflective of its meaning in the IPHC context, the Commission **RECOMMENDED** that it be replaced with the terms “stock distribution” or “stock distribution model(ing)”.

40. The Commission **REQUESTED** that the IPHC Secretariat initiate a process to develop alternative, biologically based stock distribution strategies for consideration by the Commission and its subsidiary bodies. This should also be incorporated into the MSE Program of Work.

Distributing the TCEY



Harvest Strategy Policy



Recommendations

- **NOTE** paper IPHC-2018-AM094-12
- **CONSIDER** the simulation framework and results
- **RECOMMEND** management procedures of interest to evaluate
- **AGREE** whether the clear separation of stock distribution, and distribution procedures satisfies the Commission's recommendation (38) to replace *apportionment* with a more suitable term.
- **ENDORSE** the concept of distributing the TCEY to biological regions defined here as a method to satisfy the Commission's request (40) to "*initiate a process to develop alternative, biologically based stock distribution strategies.*"

INTERNATIONAL PACIFIC

HALIBUT COMMISSION

Size limit evaluation

Agenda item: 10.4

IPHC-2018-AM094-14

INTERNATIONAL PACIFIC HALIBUT COMMISSION

Outline

- Background
- Scope
- Survey analysis
- Observer data
- Yield
- Summary

Background

- 1940: 5 lb MSL
- 1944: 26” MSL
- 1960s: YPR → 26” near-optimal age at entry
- 1973: 32” MSL
- 1974: Supported 32” if discard mortality rates low, DMRs above 25% suggested a lower MSL

Background

- 1995: YPR, SBPR → 32” MSL near optimal
- 1999: YPR → smaller MSL, SBPR → some decrease with smaller MSL; ‘reproductive refuge’ concept.
- 2012: Small reductions in MSL → small yield gain; however, $SBPR_{ratio}$ based on long-term conditions. Spatial dynamics important. ‘Management buffer’ introduced.
- 2015: Equilibrium models → higher yield for reduced MSL. DMRs, selectivity important.

Background

- Historical studies all focused on equilibrium yield rather than short-term yield
- Results have generally tracked size-at-age
- The perceived importance of discard mortality has increased over time
- *Reproductive refuge* and *management buffer* concepts are well documented benefits of an MSL

Reproductive refuge

- Reducing mortality of immature fish may provide for more spawning biomass for a given level of harvest
  – Requires a stock-recruitment relationship to provide a benefit
  – Also depends on fishing intensity, Control Rules, etc.

Management buffer

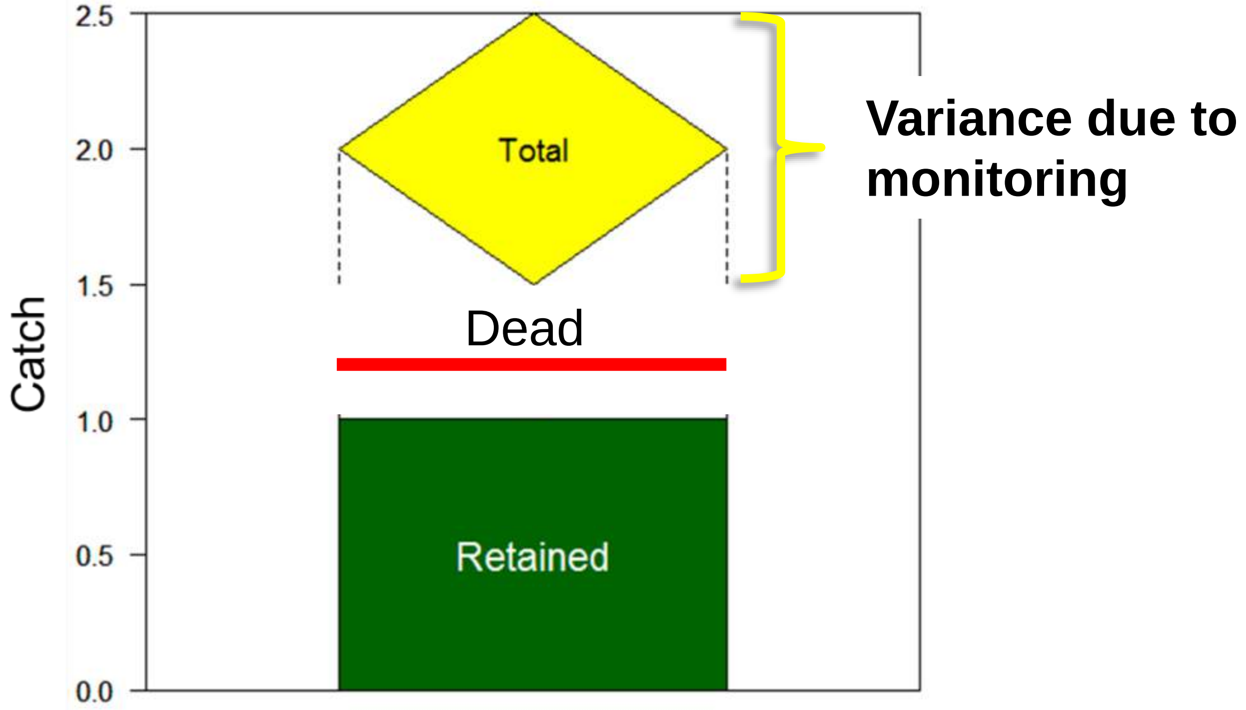
- Flatter yield curves
  - Errors in stock size and/or fishing intensity estimates have a smaller effect
- Also depends on Control Rules, fishing intensity, etc.

Scope - terms

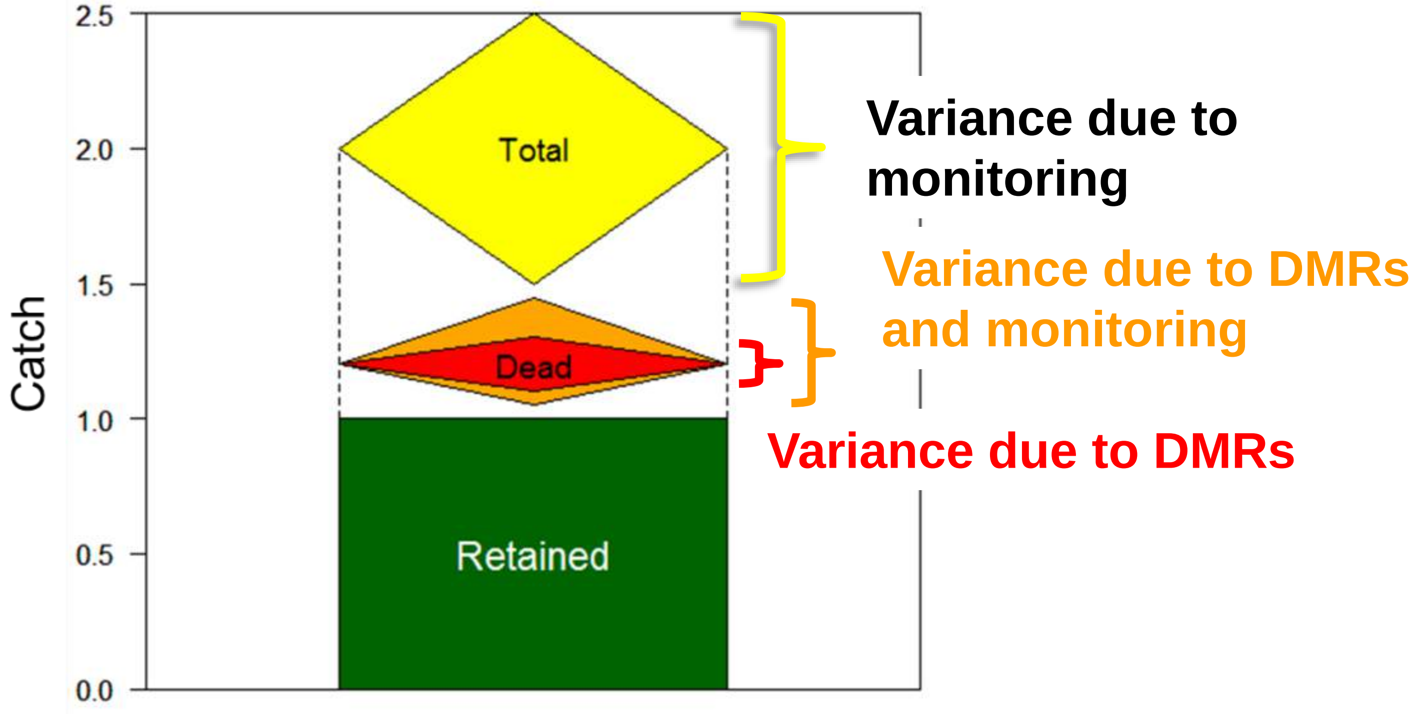
- Catch: All fish that were captured
- Retained catch: All fish landed
- Discards: All fish captured but not retained. Can be either *dead* or *surviving*.
- Mortality: Dead fish. Synonymous with removals.

Scope - example

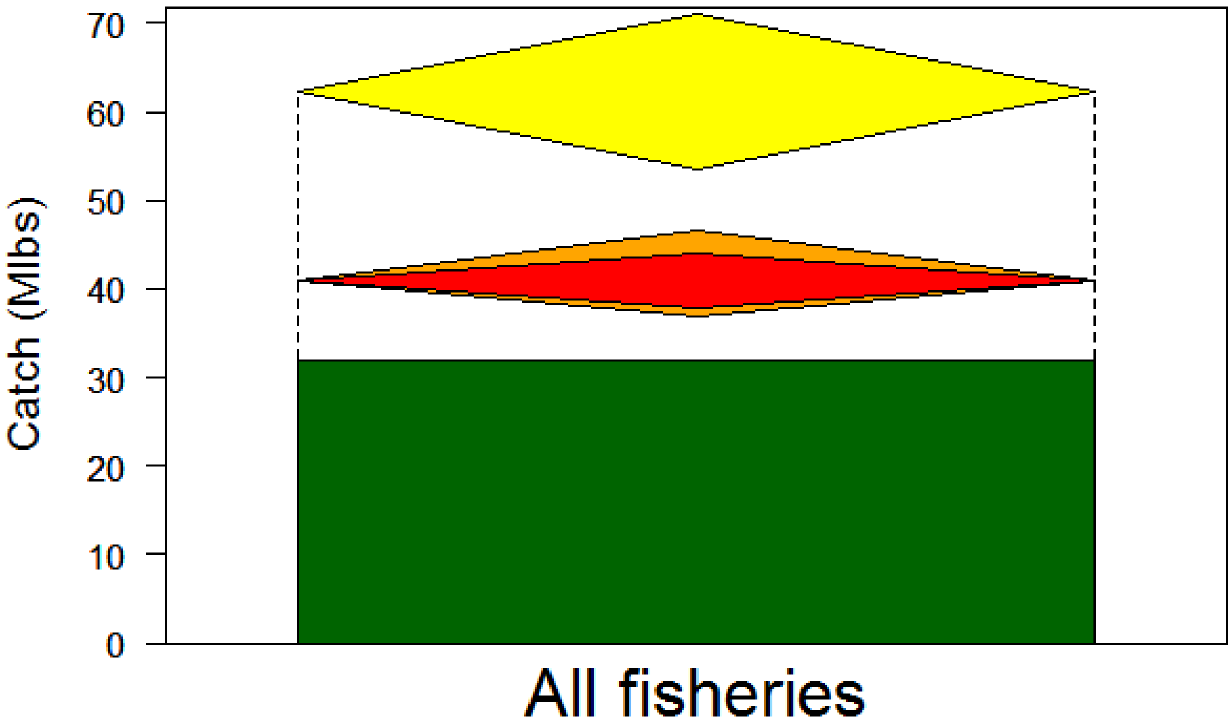
Scope - example



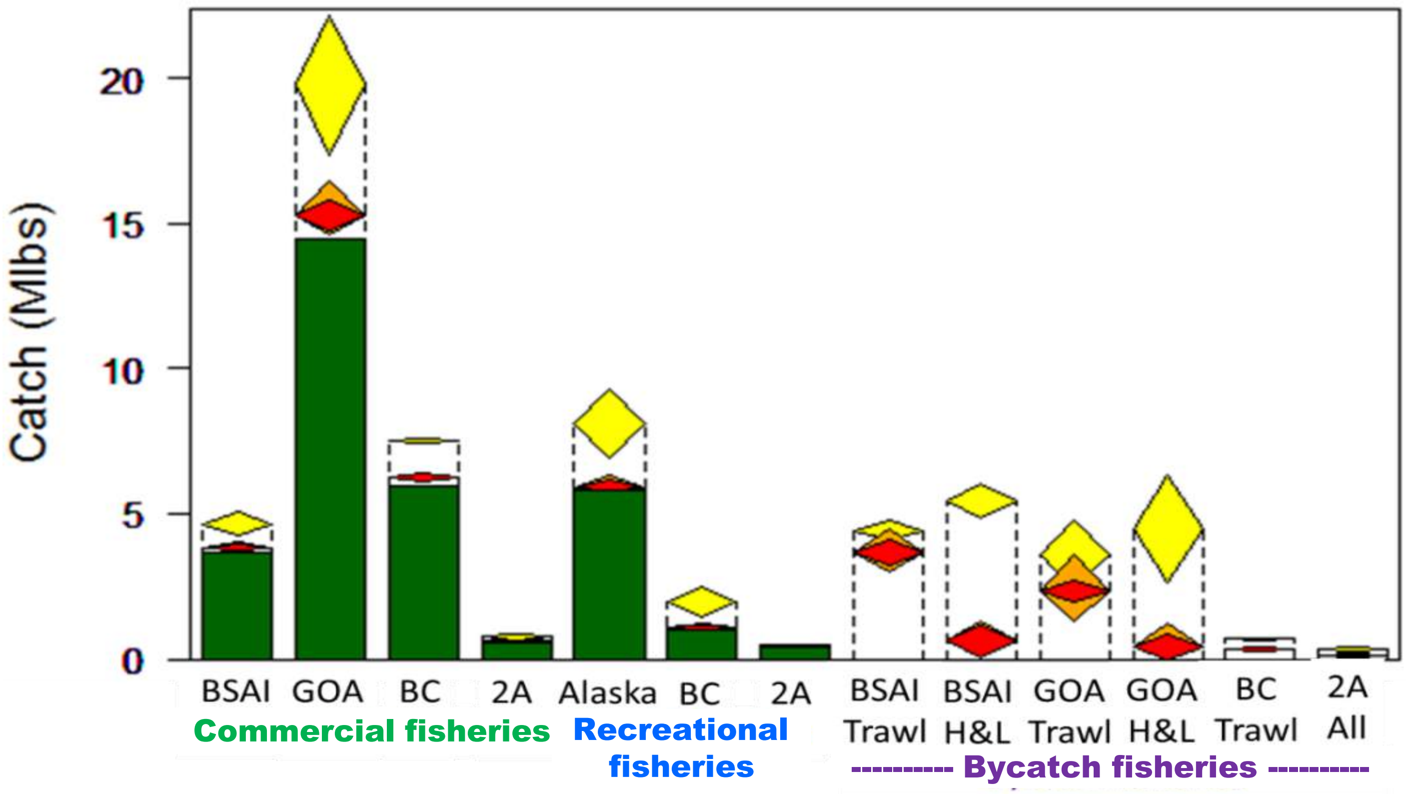
Scope - example



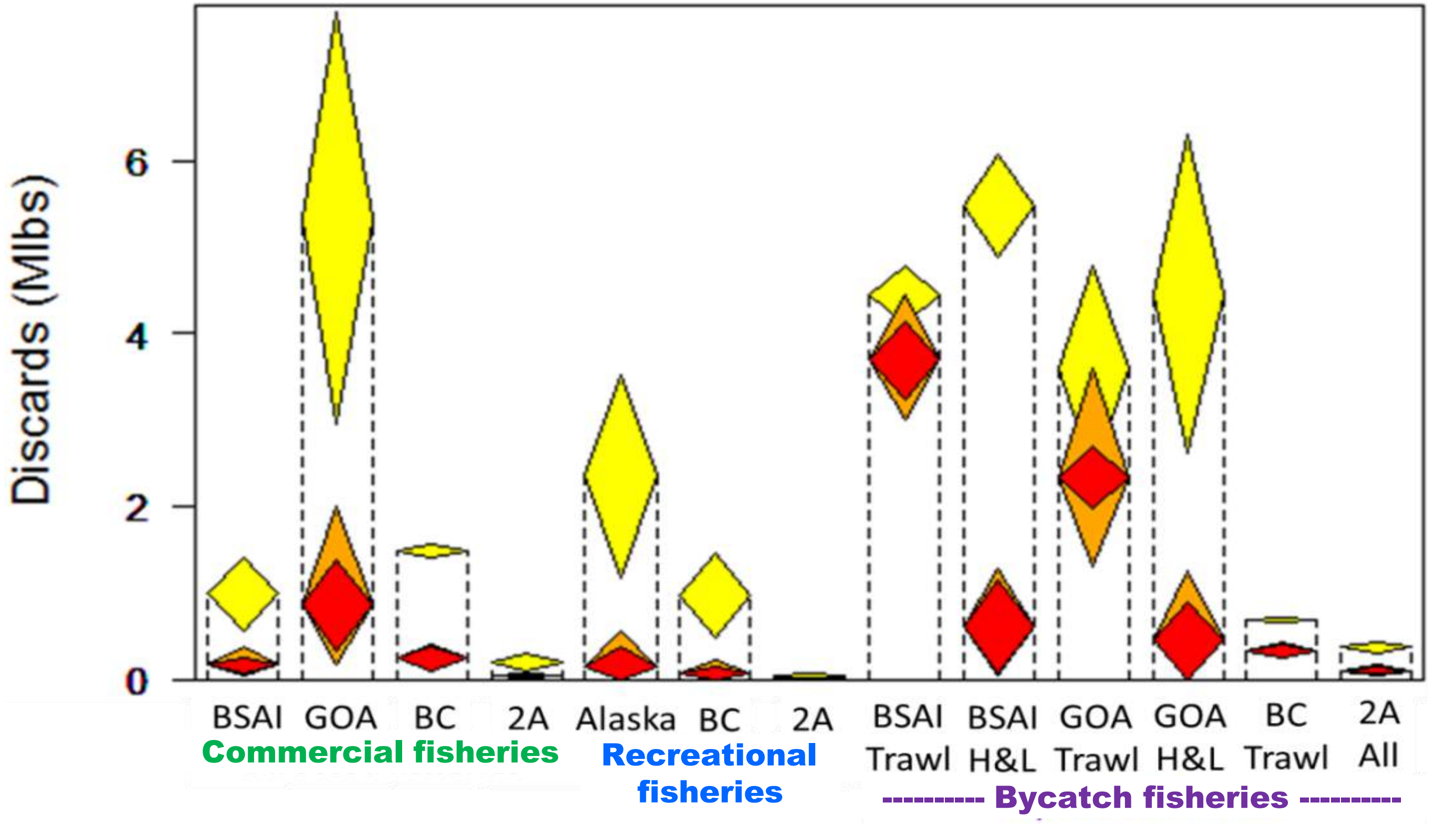
Scope – All catch



Scope – All catch



Scope - Discards



Scope

- Roughly 1 additional pound of Pacific halibut is handled for every pound landed
- Directed fisheries (commercial and sport) are handling a substantial quantity of Pacific halibut
- Commercial discard mortality is estimated to be <u>1.28</u> out of <u>8.97</u> M lb total discard mortality
  - This is generated mainly via the MSL

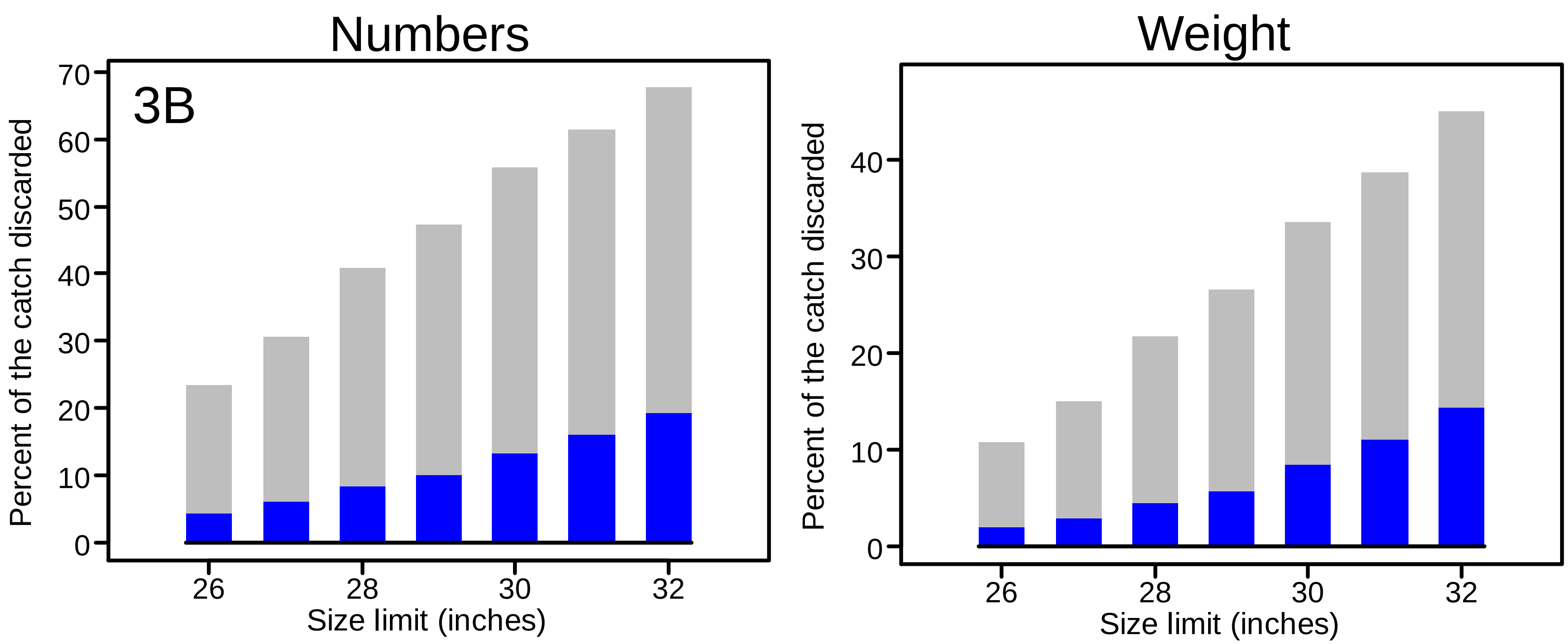
Survey data

- The fishery-independent setline survey provides the broadest view of size structure across all areas
- It is only a proxy for the fishery which targets areas of high catch-rate, and operates over a much broader portion of the year
- Summarizing setline survey catch by size-category may still provide a useful population comparison

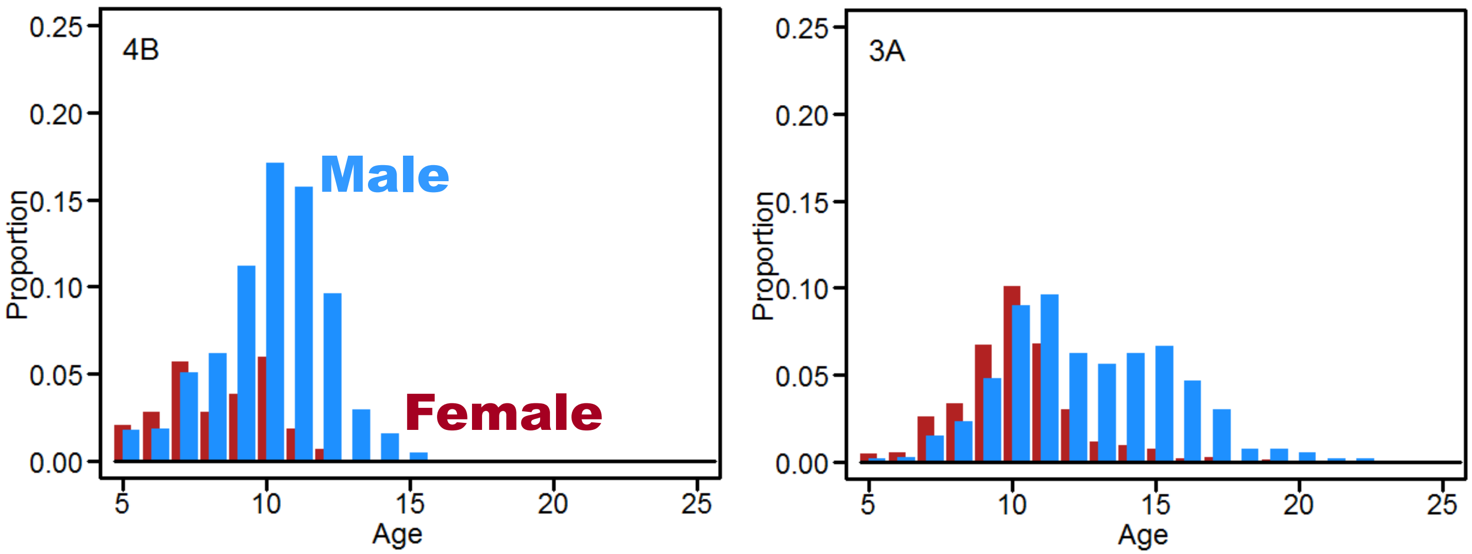
Setline survey – Catch (weight) discarded by MSL

	Size limit (inches)							
	26	27	28	29	30	31	32	
2A	0.3	0.9	3.0	5.1	10.4	13.9	20.4	
2B	0.7	1.8	4.7	7.4	12.7	17.0	22.9	
2C	0.6	1.2	2.8	4.2	6.8	9.4	13.5	- 12.9%
3A	2.5	3.9	6.9	10.5	16.9	20.6	26.7	
3B	10.7	15.0	21.7	26.5	33.6	38.7	45.0	- 34.3%
4A	6.3	8.3	11.8	14.0	18.2	21.4	26.1	
4B	2.5	4.0	7.4	10.4	16.4	20.7	26.0	
4CDE	2.4	4.1	7.6	11.0	17.3	21.2	27.3	

Setline survey – Catch discarded by MSL



Age distributions of Pacific halibut <32”



(Figures and tables for all Areas in Appendix B)

Setline survey – Percent female by MSL

	Size limit (inches)								
	None	26	27	28	29	30	31	32	
2A	81.3	81.4	81.8	83.0	84.1	86.1	87.3	89.3	
2B	75.9	76.4	76.9	78.5	79.8	82.3	83.6	85.9	
2C	82.9	83.3	83.6	84.3	84.9	85.7	86.2	87.2	- 4.3%
3A	73.7	75.1	75.7	77.0	78.6	81.5	83.2	85.9	
3B	58.1	62.9	64.9	68.5	71.4	74.8	76.8	79.6	- 21.5%
4A	70.3	73.3	74.2	75.7	76.5	78.1	79.1	80.9	
4B	45.7	46.2	46.6	47.5	48.3	49.9	51.1	52.4	
4CDE	81.0	81.8	82.3	83.1	84.0	86.0	86.8	87.8	

Setline survey

- Important differences among IPHC Regulatory Areas
- Aggregate coastwide result depends on the distribution of catch

Observer data

- No sex-specific information
- All IFQ fishing included (Pacific halibut and sablefish)
- Low observer coverage for >40’ LOA, no coverage for < 40’ LOA (~ 50% of vessels, 15-18% of catch)
  - Evidence of bias in properties of observer data (larger vessels, shorter trips landing more catch, more species)

→ Also just a proxy for actual fishery catch

Observer data – Catch discarded by MSL

	Size limit (inches)							Survey
	26	27	28	29	30	31	32	32
2A	NA	NA	NA	NA	NA	NA	NA	20.4
2B	NA	NA	NA	NA	NA	NA	NA	22.9
2C	0.7	1.1	2.0	2.8	4.6	5.8	9.1	13.5
3A	1.6	2.5	4.6	6.9	11.1	14.6	21.7	26.7
3B	4.4	5.8	9.1	11.2	15.0	17.6	22.0	45.0
4A	2.5	3.4	5.2	6.4	8.6	10.1	13.4	26.1
4B	0.7	1.1	2.6	3.9	6.9	8.9	12.2	26.0
4CDE	1.1	1.4	2.6	3.9	6.7	8.6	13.2	27.3

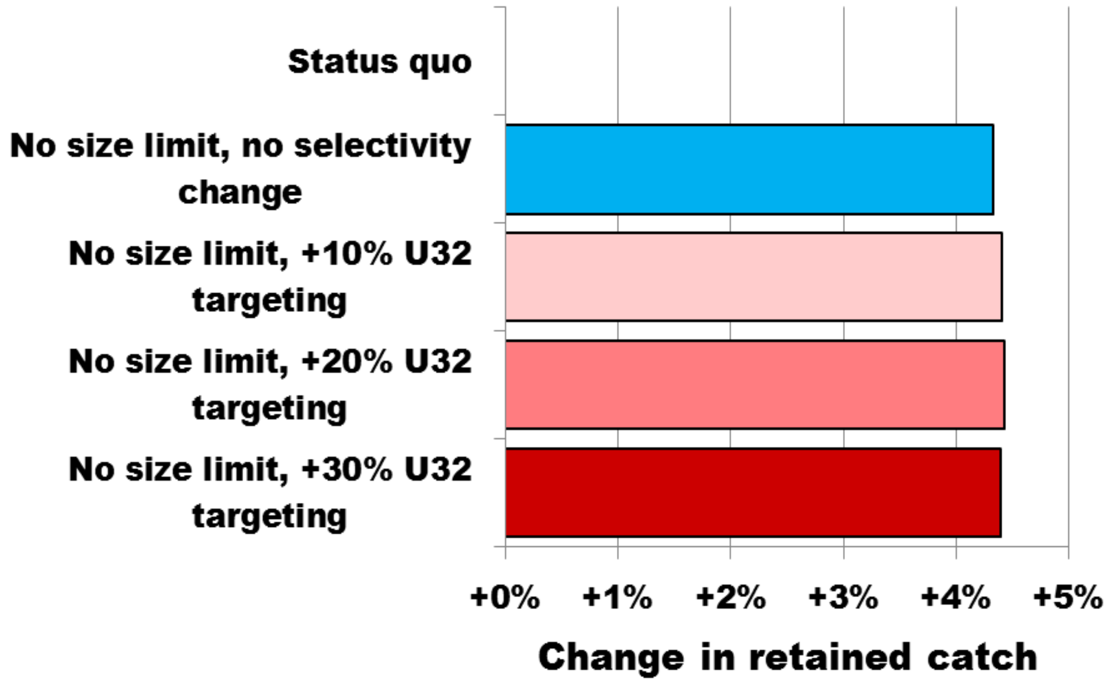
Yield calculations

- This approach differs from historical analyses, in that it considers current change in yield, not equilibrium performance
- Equilibrium calculations are better addressed via the MSE/MSAB process (but we need data on selectivity)

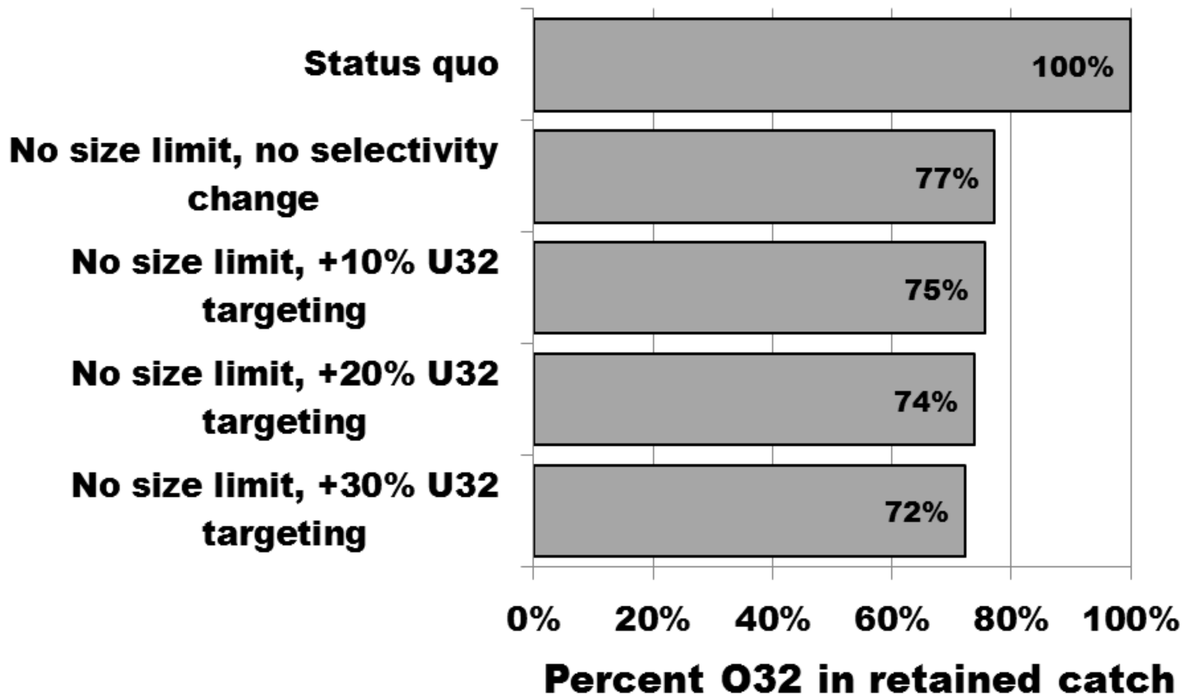
Yield

- The change to an SPR-based harvest policy for 2017 provides the basis for yield comparisons:
  - $SPR_{46\%}$ 2017 yield as baseline
    - Compare to no size limit
    - Repeat for 10, 20, 30% increases in removals of Pacific halibut less than 32” to mimic additional targeting

Yield – Net change



Yield – Catch composition



Summary

- Biological considerations
  - Management robustness
  - Recruitment refuge
- Operational considerations
  - Fishery efficiency (retained catch-rate)
  - Price for fish < 32”
  - Fishery value

(Full list in Table 5)

Summary of MSL considerations

	Reduced MSL
Discard mortality	unknown
Total yield	Up
Harvest of males	Up
Selectivity	unknown
Biological data on total catch	Incomplete
Management robustness	Down
Recruitment refuge	Down
Fishery efficiency (retained catch-rate)	Up
Price	Emergent
Fishery value	Depends on price

Summary of MSL considerations

	No MSL
Discard mortality	Down
Total yield	Up
Harvest of males	Up
Selectivity	unknown
Biological data on total catch	Sampled in port
Management robustness	Down
Recruitment refuge	Down
Fishery efficiency (retained catch-rate)	Up
Price	Emergent
Fishery value	Depends on price

Adaptive management approach

- A decision that is made in order to learn specific information that will improve future management.
  - Approach recommended for evaluation by the SRB in June
  - Draft options in Appendix E

"***SRB11–Req.05 (para. 21)*** *NOTING the thoughtful and detailed presentation on the potential impacts of changing the minimum size limit presented in Appendix E (Evaluation of adaptive management approaches) of paper IPHC-2017-SRB11-07, the SRB REQUESTED that the IPHC Secretariat, between now and SRB12, seek feedback from the Commissioners, Conference Board, Processors Advisory Board, and the Management Strategy Advisory Board, on a modified version of Appendix E. In particular, a modified version would include* ***(i) a process for starting and possibly ending an experiment, (ii) performance metrics, and (iii) criteria for making conclusions based on the experimental outcomes****.*"

IM093 (IPHC-2017-IM093-R)

- “59. The Commission **AGREED** that the MSL discussion would benefit greatly from additional stakeholder input and should be presented at the 94th Annual Meeting of the Commission in January 2018.

- 60. The Commission **AGREED** that the current MSL does not restrict the landed catch to only mature Pacific halibut: the majority of the catch is estimated to be female, and the age at 50% maturity is very close to the average age in the commercial landings. Therefore, the MSL may be providing a limited benefit in the form of a ‘recruitment refuge’. If that were the management goal, then it could be debated that a higher MSL would be warranted”.

Recommendations

- **NOTE** paper IPHC-2018-AM094-14 which provides an evaluation of the '*effectiveness*' of a range of size limits in the directed commercial Pacific halibut fishery
- **RECOMMEND** whether there is a need for further evaluation of the MSL by the IPHC Secretariat, or whether the current evaluation meets the Commission's needs.

INTERNATIONAL PACIFIC

HALIBUT COMMISSION

U.S. Coast Guard 17th District Enforcement Report

26 January— Portland, OR

LT Jeff Schoknecht
Response & Enforcement Division

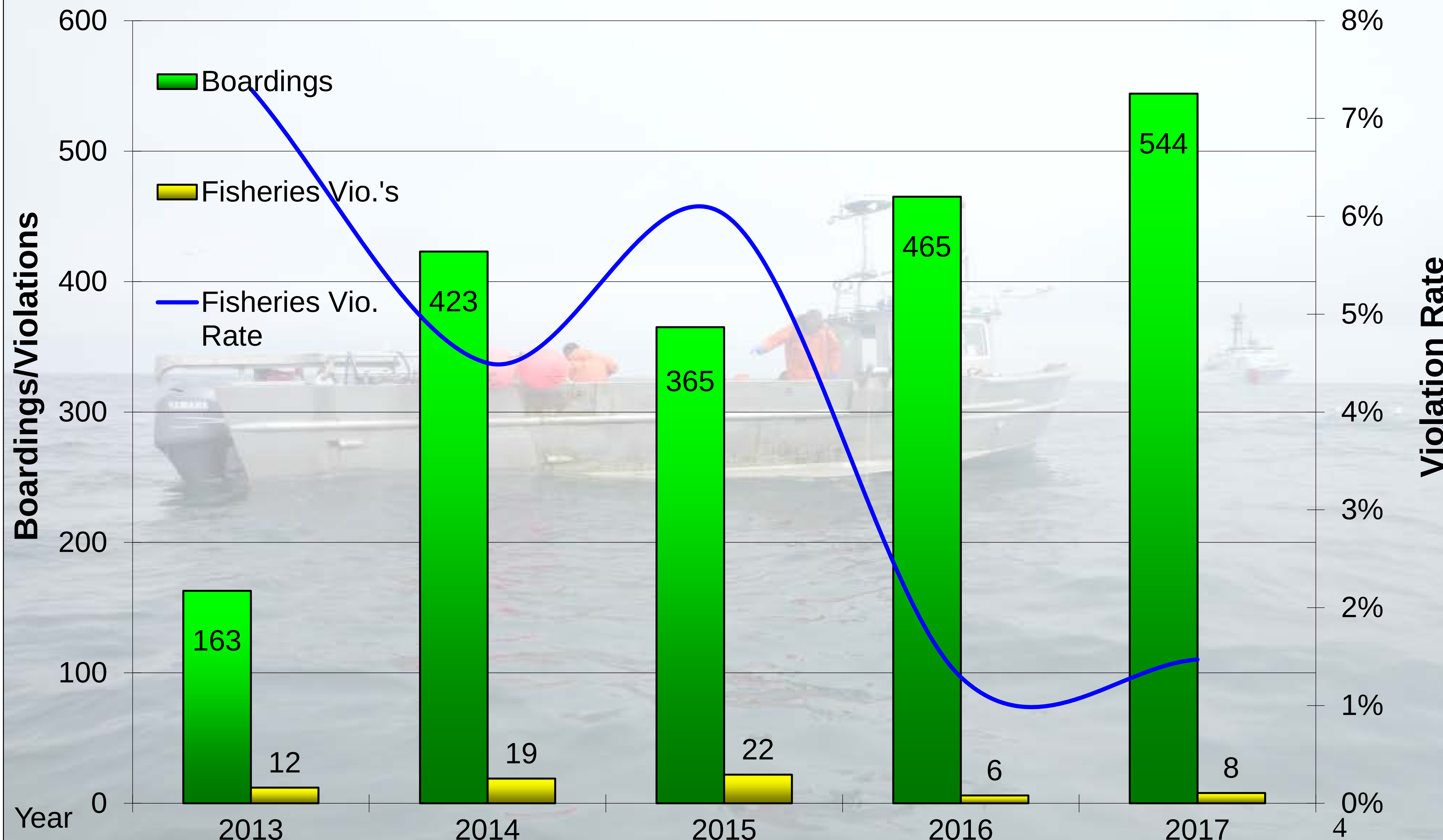
2016 and 2017 Boardings by IPHC Area

IPHC Area	2016 Boardings	2017 Boardings
2C	256	330
3A	178	195
3B	2	2
4A	17	11
4B	8	4
4C	1	0
4D	3	1
4E	0	1

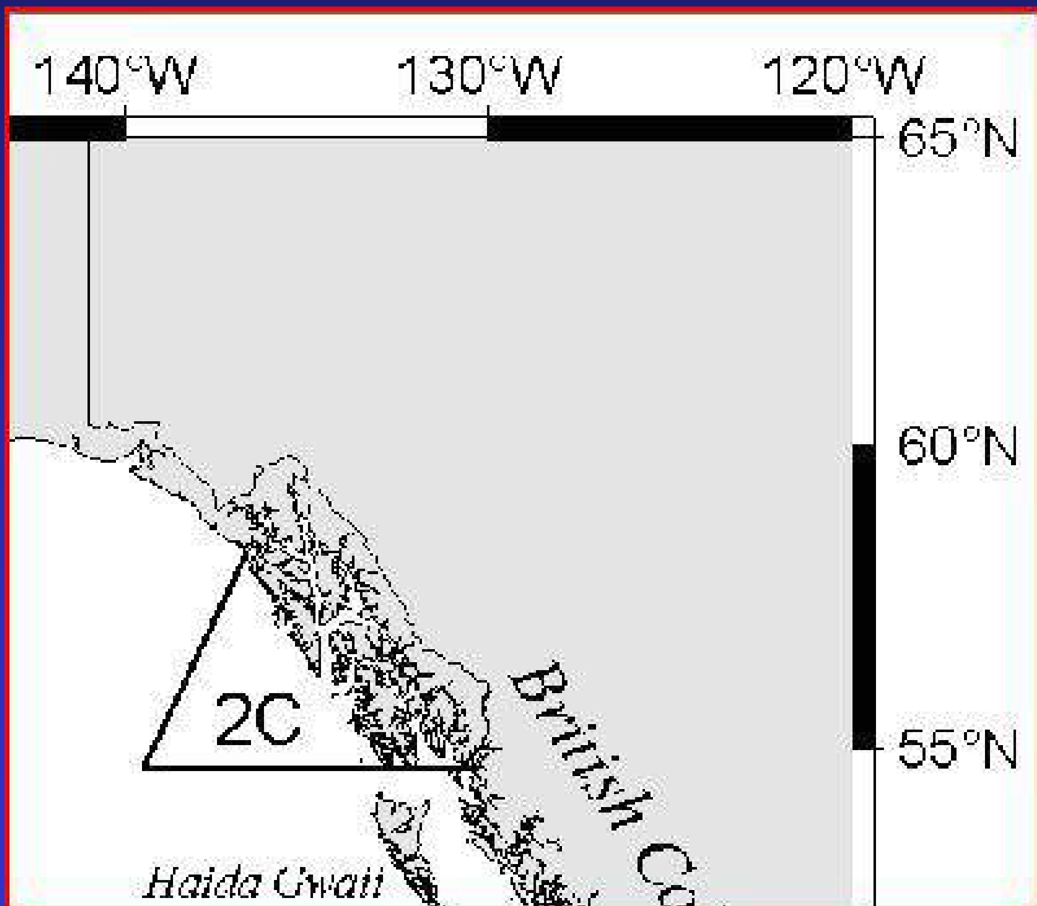
Boarding and Violation Summaries by Industry Sector

2016 Boardings/Violations (D17)		2017 Boardings/Violations (D17)	
Total At-Sea Boardings	**465**	Total At-Sea Boardings	**544**
Commercial	**66**	Commercial	**92**
Charter	**55**	Charter	**97**
Recreational/Subsistence	**344**	Recreational/Subsistence	**355**
Fisheries Violations	**6**	Fisheries Violations	**8**
Commercial	**2**	Commercial	**5**
Charter	**2**	Charter	**1**
Recreational/Subsistence	**2**	Recreational/Subsistence	**2**
Fisheries Violation Rates	**98.7%**	Fisheries Violation Rates	**98.5%**
Commercial	**97.0%**	Commercial	**94.5%**
Charter	**96.4%**	Charter	**99.0%**
Recreational/Subsistence	**99.4%**	Recreational/Subsistence	**99.4%**

IFQ Boarding Statistics



IPHC Area 2C



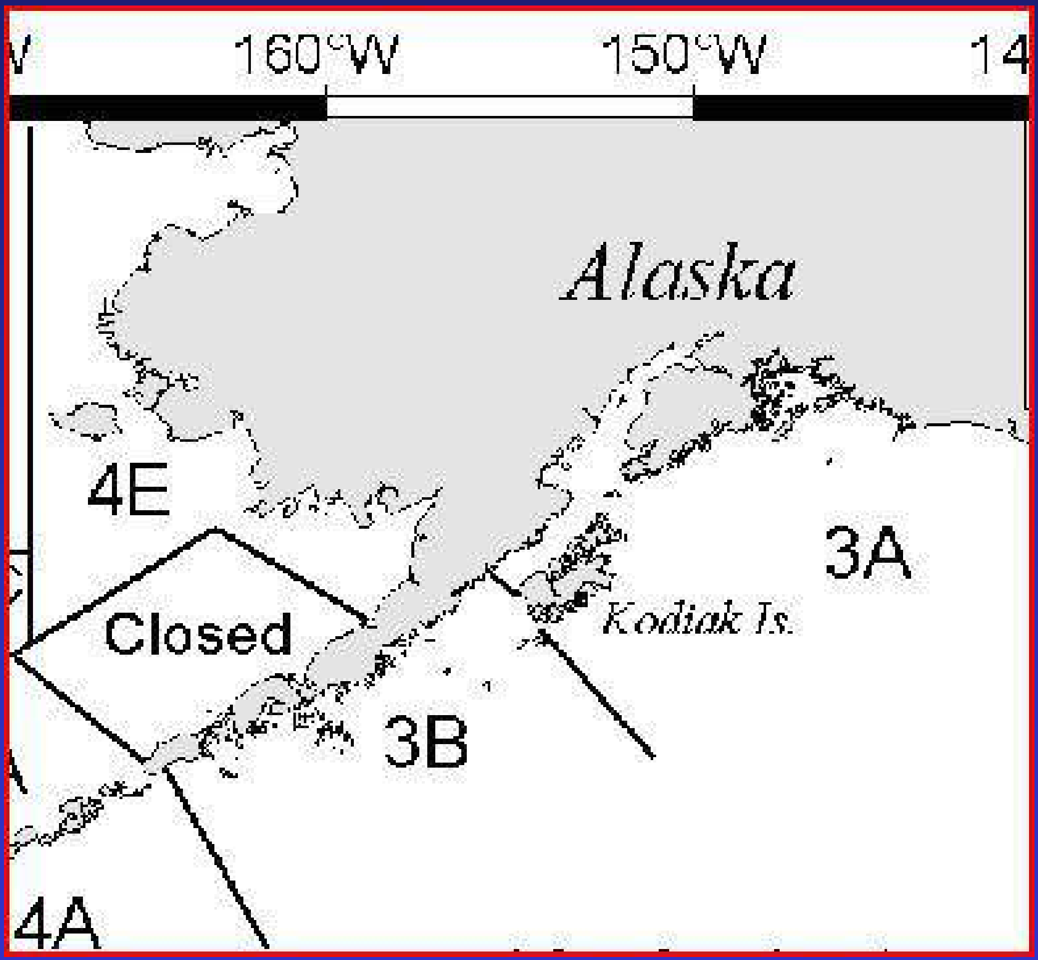
330 Boardings

– 46 IFQ
  • 1 violation

– 37 Charter
  • 0 violations

- 247 Recreational/ Subsistence
  • 0 violations

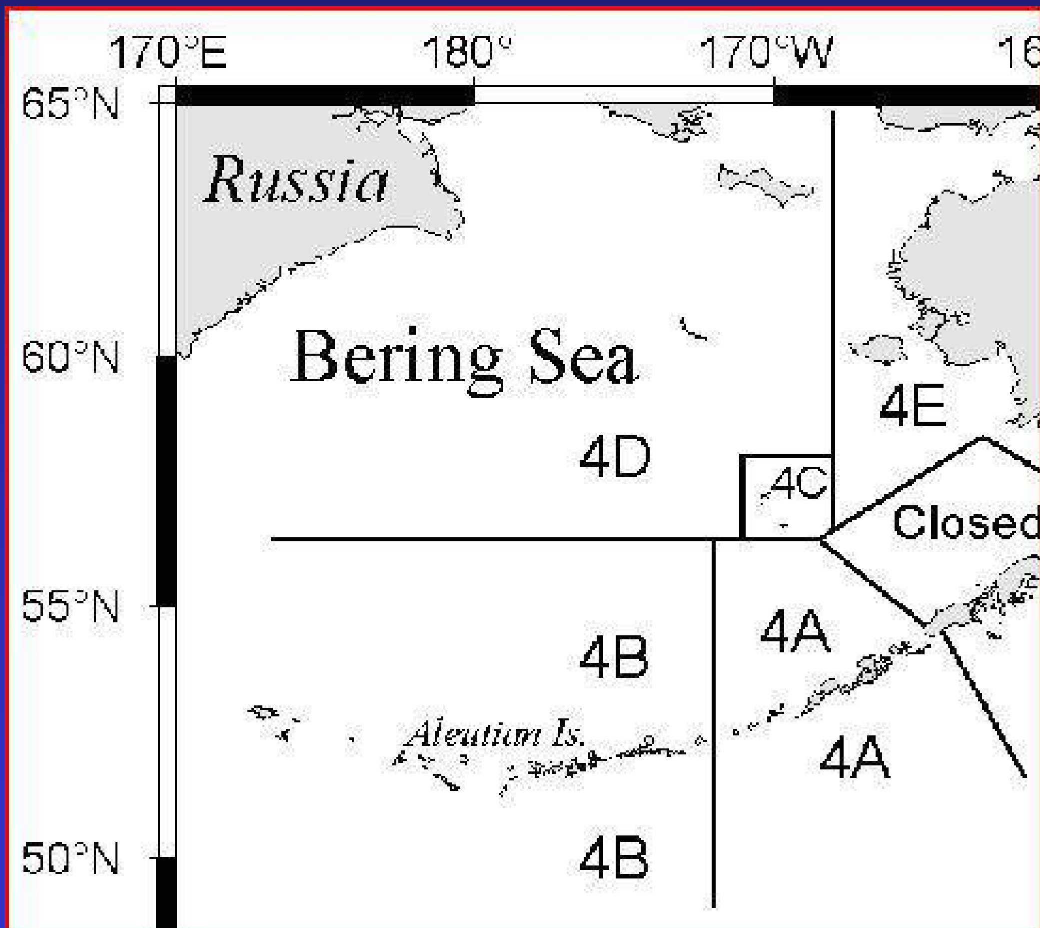
IPHC Areas 3A/3B



197 Boardings

- 29 IFQ
  - 1 violation
- 60 Charter
  - 1 violation
- 108 Recreational/ Subsistence
  - 2 violations

IPHC Areas 4A, B, C, D, & E



<u>17 Boardings</u>

- 17 IFQ/CDQ
  - 3 violations
- 0 Charter
- 0 Recreational/ Subsistence

Fisheries Violations in All Industry Sectors

2017	
Failure to use careful release methods	(1)
Mutilation of catch	(1)
Failure to maintain IFQ logbook	(2)
Failure to maintain charter logbook	(1)
Copy of IFQ permit not ready for inspection	(2)
Sport fishing without a permit	(2)


UNITED STATES COAST GUARD
17TH DISTRICT
LT Jeff Schoknecht
Response & Enforcement Division

Subsistence Harvests of Pacific Halibut in Alaska, 2016

Division of Subsistence
Alaska Department of Fish and Game

Presentation to the
International Pacific Halibut Commission

Portland, OR
January 2018

Project funded through a grant from the National Marine Fisheries Service: No. NA16NMF4370166

For the full study findings, see:

Fall, James A. and David Koster. 2018. Subsistence Harvests of Pacific Halibut in Alaska, 2016. Alaska Department of Fish and Game, Division of Subsistence Technical Paper No. 436. Anchorage.

Project Background

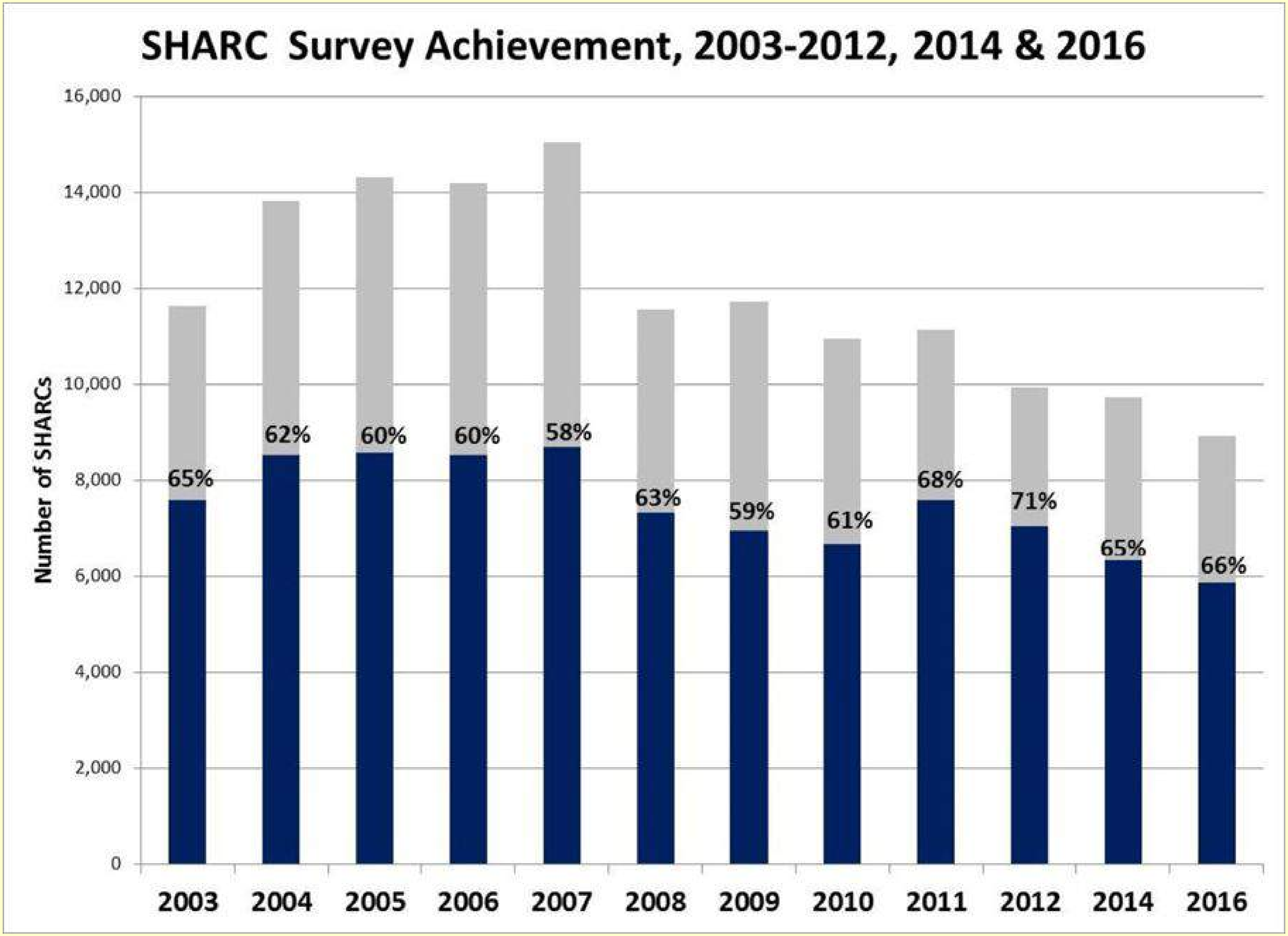
- New subsistence regulations in effect May 2003
- 118 communities and 123 tribes eligible, plus residents of designated rural areas
- Registration requirement (SHARC)
- Regulations have provision for collecting harvest data
- This report covers the 12th year of the harvest assessment program (harvests in 2016)
- Due to funding constraints, the project did not document 2013 or 2015 harvests and will not document 2017 harvests
- If funding available, could continue for 2018

Methods

- Mailed survey is primary data collection method; response voluntary
- Mailed to all persons holding SHARCs during 2016: 8,779
- Three rounds of mailings
- Supplemented by contacts & interviews in 5 communities in southeast and western AK
- Harvests of some non-SHARC holders (146) included in estimates
- Total target group = 8,925 potential fishers

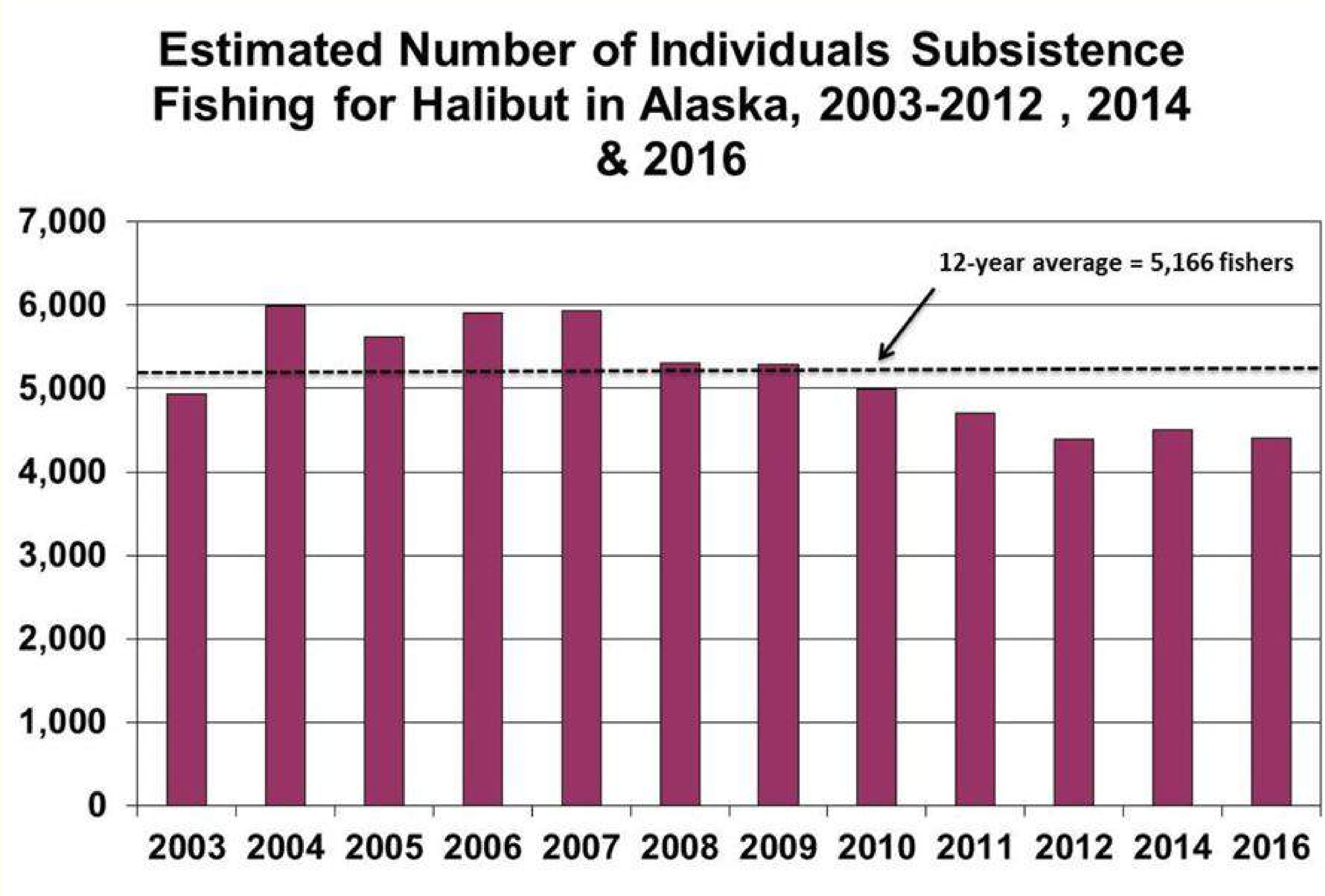
Sample Achievement for 2016

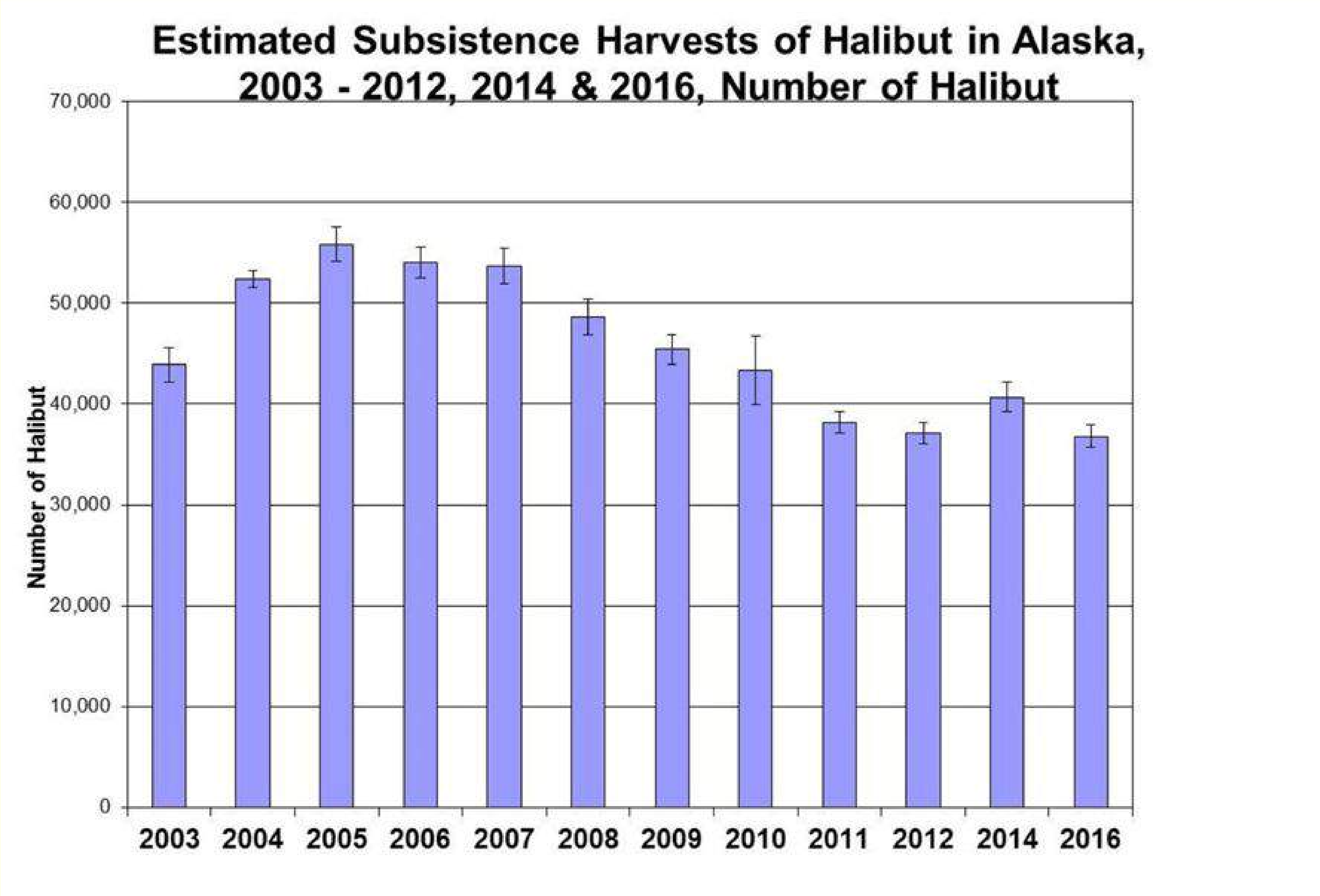
- **5,862 surveys returned**, of 8,925 potential fishers
- **Sampling fraction of 66%**
- **High rates of return** achieved in most larger communities with the most SHARCs issued


SHARC Survey Achievement, 2003-2012, 2014 & 2016
Number of SHARCs
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
65%
62%
60%
60%
58%
63%
59%
61%
68%
71%
65%
66%
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2014
2016

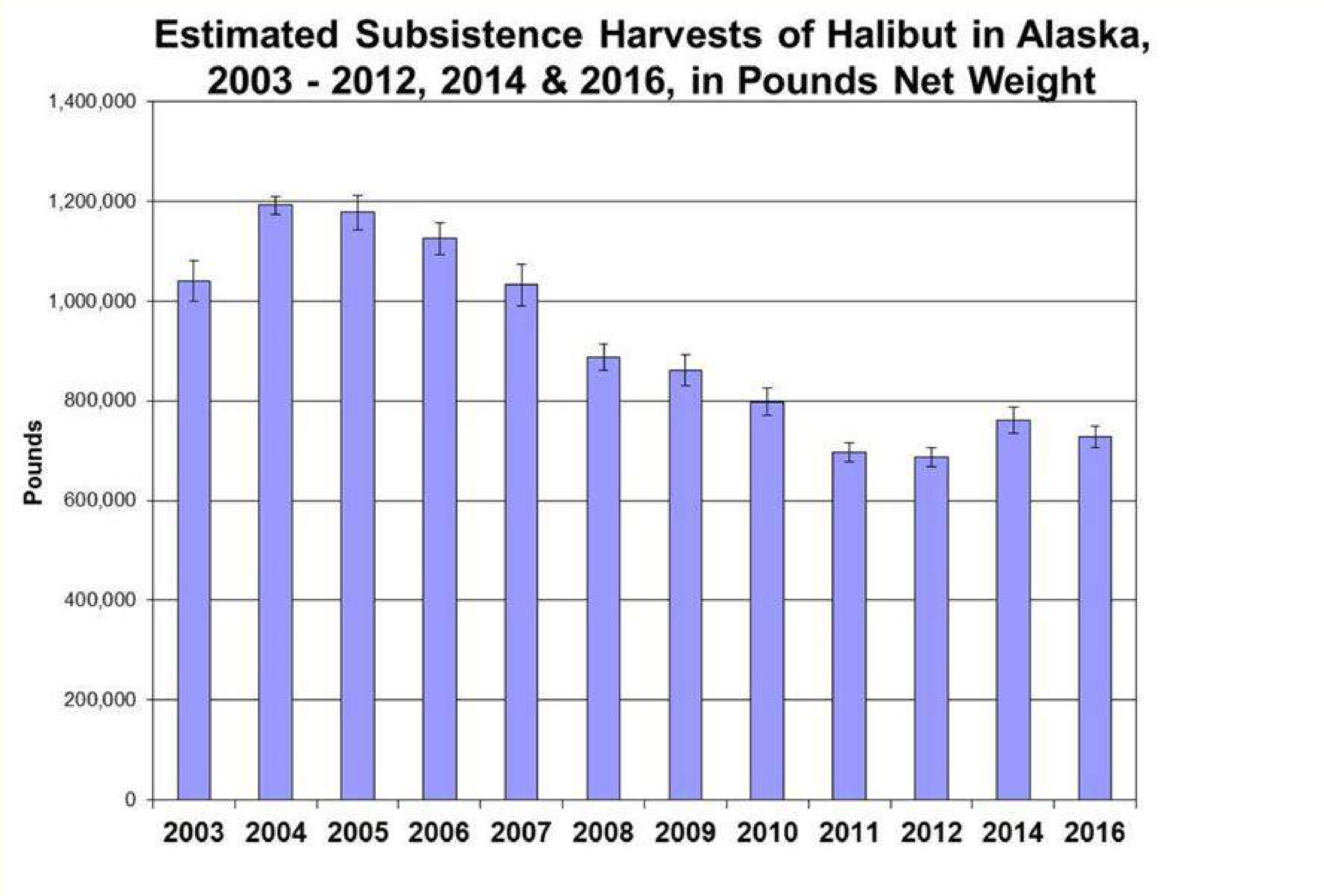
Study Findings: Halibut 2016

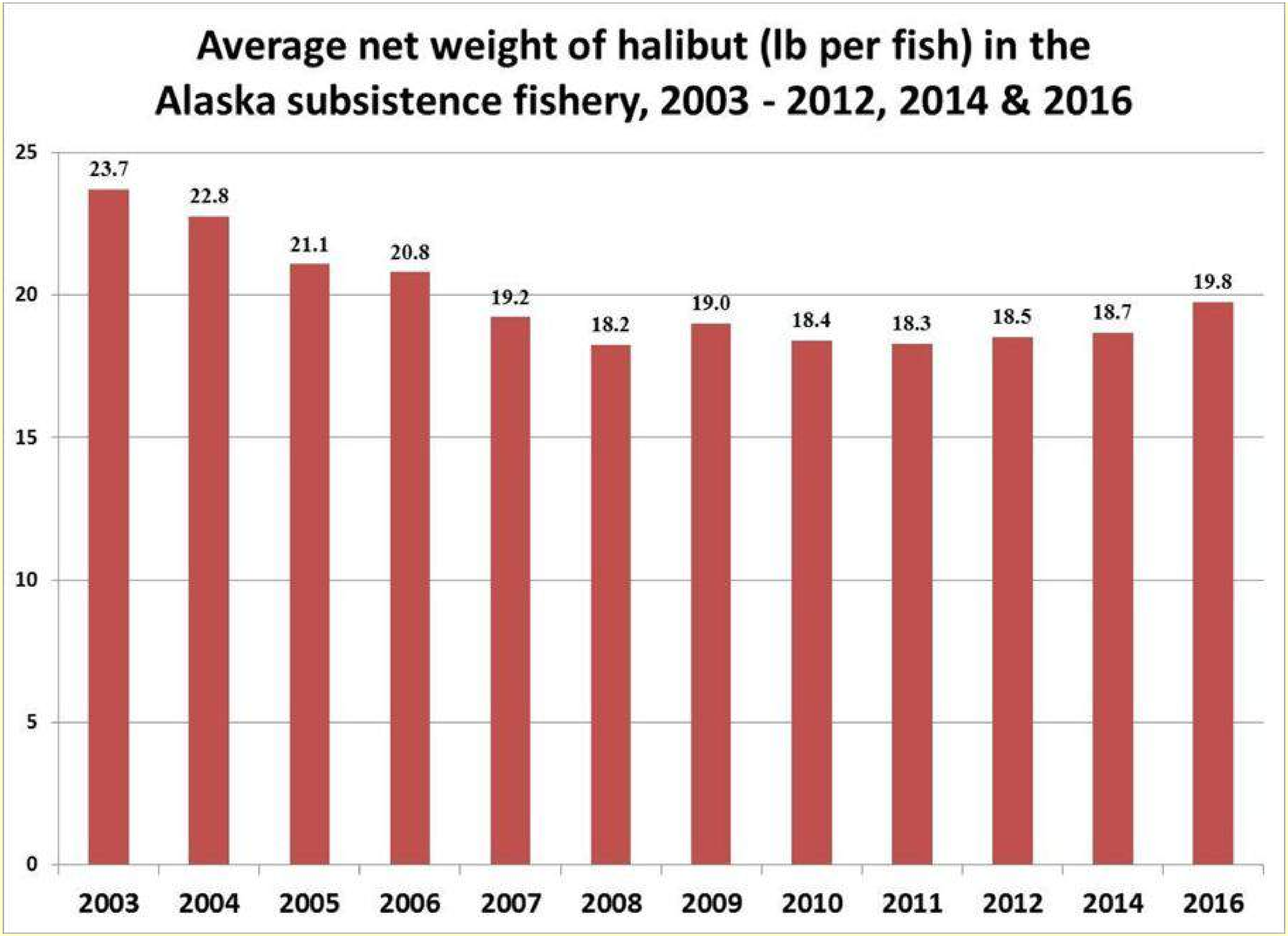
- Estimated number of **subsistence fishers = 4,408**
- Estimated subsistence harvest = **36,815 halibut**
- Estimated subsistence harvest = **727,178 lbs** net weight (= 75% of round weight) (19.8 lbs/fish)
- **60% of harvest occurred in Area 2C** (SE Alaska), 31% in Area 3A (SC Alaska), & 6% in Area 4E (East Bering Sea Coast)
- 75% of harvest taken with setline gear; 25% with hand-operated gear

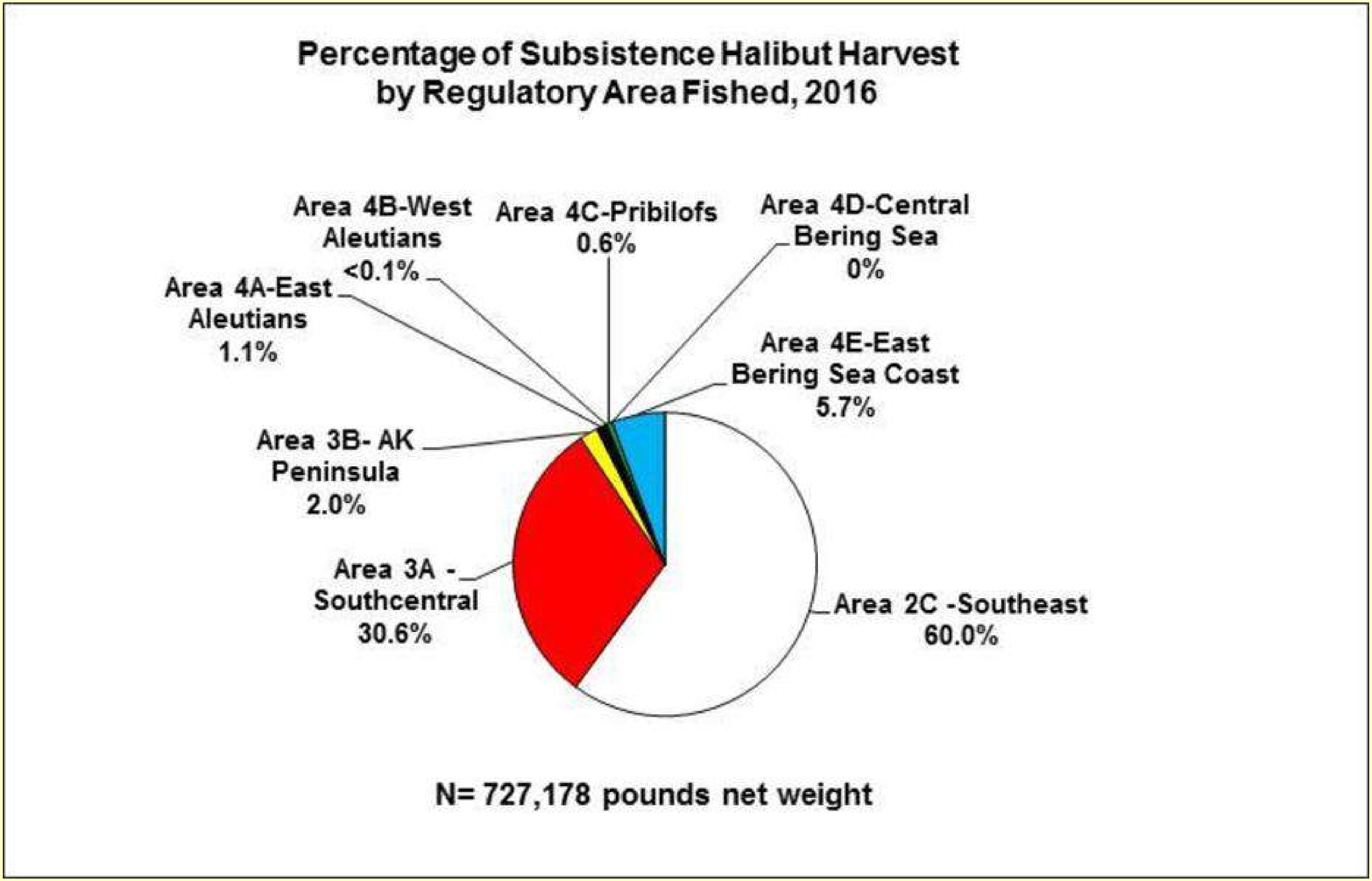

Estimated Number of Individuals Subsistence Fishing for Halibut in Alaska, 2003-2012 , 2014 & 2016
12-year average = 5,166 fishers
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2014 2016



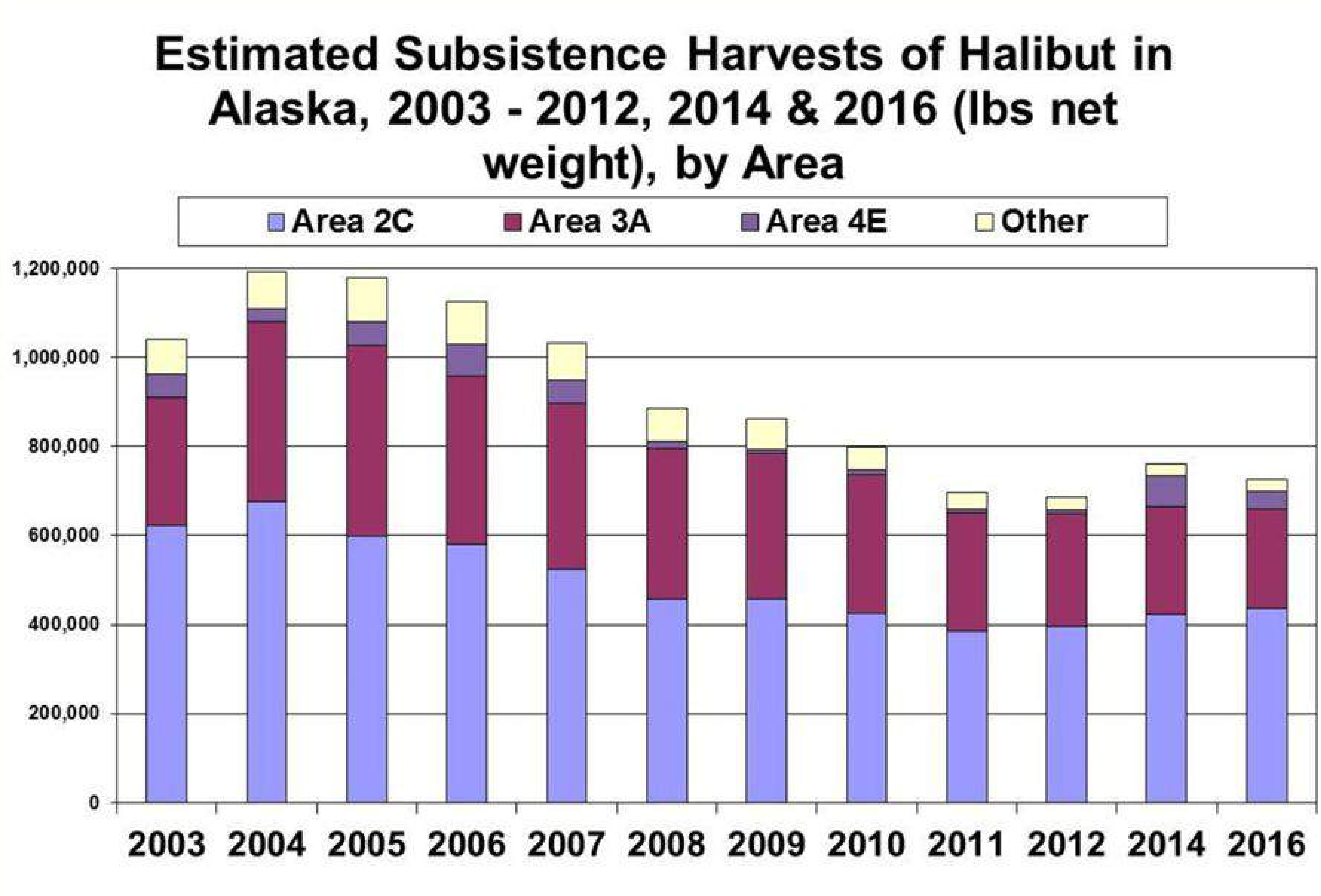
Estimated Subsistence Harvests of Halibut in Alaska, 2003 - 2012, 2014 & 2016, Number of Halibut
Number of Halibut
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2014
2016


Estimated Subsistence Harvests of Halibut in Alaska, 2003 - 2012, 2014 & 2016, in Pounds Net Weight
Pounds
1,400,000
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2014
2016

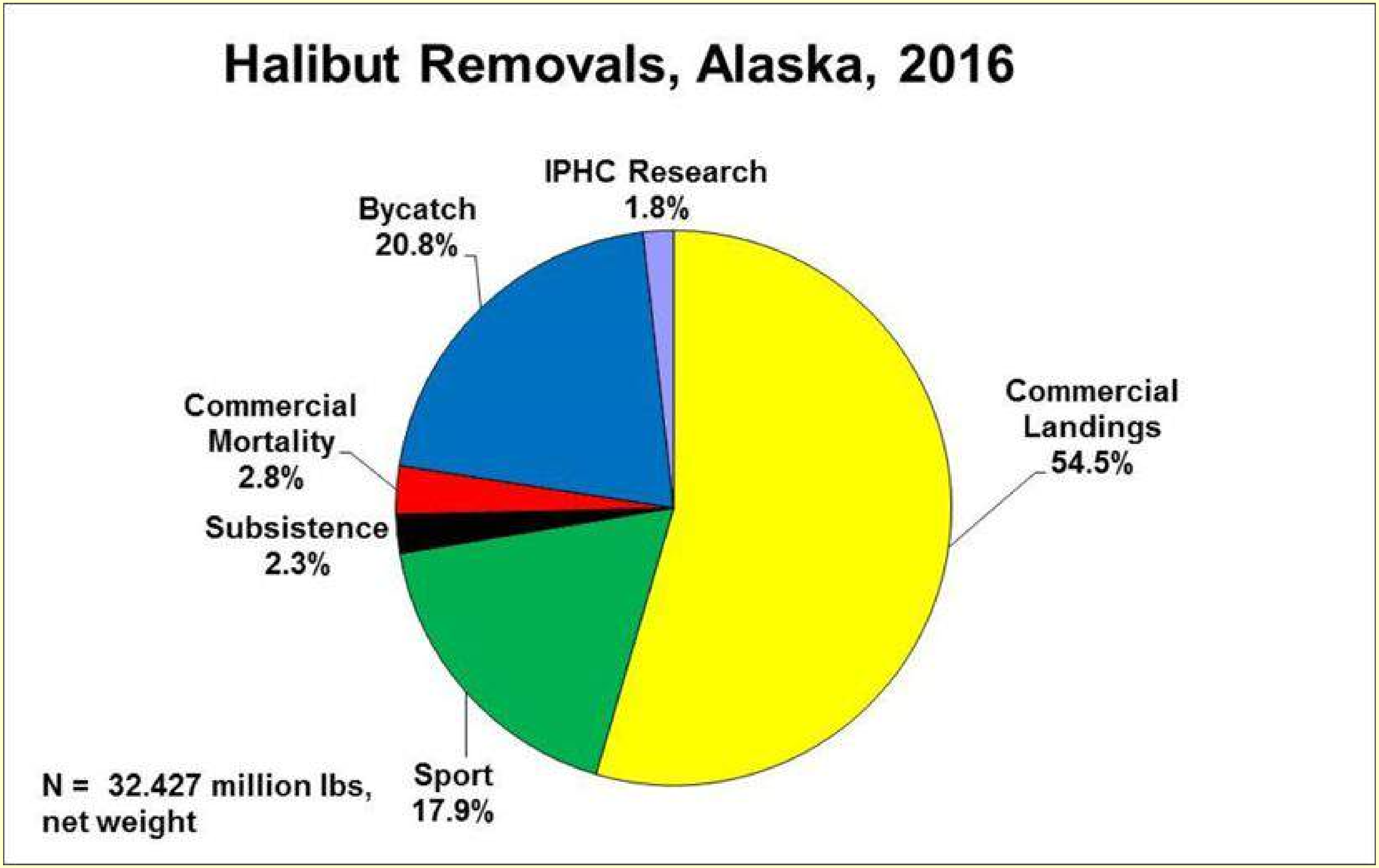

Average net weight of halibut (lb per fish) in the
Alaska subsistence fishery, 2003 - 2012, 2014 & 2016
25
20
15
10
5
0
23.7
22.8
21.1
20.8
19.2
18.2
19.0
18.4
18.3
18.5
18.7
19.8
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2014
2016



Percentage of Subsistence Halibut Harvest by Regulatory Area Fished, 2016
Area 4B-West Aleutians <0.1%
Area 4C-Pribilofs 0.6%
Area 4D-Central Bering Sea 0%
Area 4A-East Aleutians 1.1%
Area 4E-East Bering Sea Coast 5.7%
Area 3B- AK Peninsula 2.0%
Area 3A - Southcentral 30.6%
Area 2C -Southeast 60.0%
N= 727,178 pounds net weight



Estimated Subsistence Harvests of Halibut in Alaska, 2003 - 2012, 2014 & 2016 (lbs net weight), by Area
Area 2C
Area 3A
Area 4E
Other
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2014
2016



- Subsistence harvests by area ranged from 6.4% in Area 2C to 0.4% in Area 3B

Conclusions: Harvest Survey, 2016

- Overall, 2016 harvest survey was a success: good response rates and overall reliable harvest estimates
- Can discern some general patterns in the fishery since the new regulations came into effect
- Reasons for overall decline in harvests likely complex and require further investigation
- Concerns about nonrenewal of SHARCs, especially in certain regulatory areas
- Need to supplement mailed SHARC survey with in-person survey in portions of Area 4
- Recommendation to continue harvest monitoring

For More Information

- Division of Subsistence Website: www.subsistence.adfg.state.ak.us and go to publications for final report
- Or: call us at 907-465-4147, or 465-3617, or 267-2353
- Or write: ADF&G, Division of Subsistence, 333 Raspberry Road, Anchorage, AK, 99518
- Or contact NMFS at: 1-800-304-4846 (option 2) or www.fakr.noaa.gov/ram/subsistence/halibut.htm


L. Boitor

Regulatory Proposals

Agenda item 8

IPHC-2018-AM094-PropA1-A5: IPHC Secretariat
IPHC-2018-AM094-PropB1-B3: Agency staff
IPHC-2018-AM094-PropC1-17: Stakeholders

INTERNATIONAL PACIFIC HALIBUT COMMISSION

Regulatory proposals for 2018

- Submission deadline for AM094: 23 Dec 2017
  - 5 proposals from the IPHC Secretariat
  - 3 proposals from Contracting Party agencies
  - 17 proposals from other Stakeholders
- Other information for consideration
  - Stakeholder statements: IPHC-2018-AM094-INF04
  - Secretariat implementation notes: IPHC-2018-AM094-23

IPHC Secretariat

Document Number	Title
IPHC-2018-AM094-PropA1	IPHC closed area (Section 10
IPHC-2018-AM094-PropA2	Fishing periods (Section 8)
IPHC-2018-AM094-PropA3	VMS requirement for IPHC Regulatory Area 4 clearances (Section 15)
IPHC-2018-AM094-PropA4	IPHC Fishery Regulations: minor amendments
IPHC-2018-AM094-PropA5	Discussion paper: Frozen-at-sea exemption for head-on requirement (Section 13)

Contracting Party (by agency)

Document Number	Title	Contracting Party
IPHC-2018-AM094-PropB1 Rev_1	Leasing in IPHC Regulatory Area 4 (Sections 7 and 11 of the IPHC Regulations)	**United States of America** NOAA-Fisheries: Glenn Merrill (NMFS-AR)
IPHC-2018-AM094-PropB2	Clarify 2C-3A sport fishery regulations (Section 28)	**United States of America** NOAA-Fisheries: Glenn Merrill (NMFS-AR)
IPHC-2018-AM094-PropB3	Clarify head-on weight requirement (Section 17)	**United States of America** NOAA-Fisheries: Glenn Merrill (NMFS-AR)

Other stakeholders

Document Number	Title	Proponent
IPHC-2018-AM094-PropC1	Catch limit proposals (Section 11)	Various
IPHC-2018-AM094-PropC2	Preserving catch on private live-aboard vessels	A. Cooper
IPHC-2018-AM094-PropC3	Unguided angler harvest record	P. Phillips
IPHC-2018-AM094-PropC4	Sport cleaning regulations	S. Riehemann
IPHC-2018-AM094-PropC5	Elimination of skin-on regulation	J. Shirk
IPHC-2018-AM094-PropC6	Live-aboard processing and possession exemption	D. Robertson
IPHC-2018-AM094-PropC7	Eliminate the requirement for a charter halibut permit (CHP)	S. Riehemann

Other Stakeholders, continued

Document Number	Title	Proponent
IPHC-2018-AM094-PropC8	Allow shellfish pots on board	ALFA
IPHC-2018-AM094-PropC9	Processing greater than 4 fillets	M. Cowart
IPHC-2018-AM094-PropC10	Halibut length measurement method	R. Yamada
IPHC-2018-AM094-PropC11	Long-term storage on pleasure vessels	L. Thompson
IPHC-2018-AM094-PropC12	Long-term storage on cruising vessels	W. Cornell
IPHC-2018-AM094-PropC13	Halibut in Bering Sea pot gear	J. Kauffman
IPHC-2018-AM094-PropC14	Status quo harvest measures 3A	R. Yamada

Other Stakeholders, continued

Document Number	Title	Proponent
IPHC-2018-AM094-PropC15	Trawler Halibut Bycatch Tender boat program	J. Kearns
IPHC-2018-AM094-PropC16	Reduce daily bag limit for all anglers in Area 2C and 3A in times of low abundance	M. Grove
IPHC-2018-AM094-PropC17	Recreational sportfishing only allocation	J. Kearns

INTERNATIONAL PACIFIC

HALIBUT COMMISSION

Post-AM094 Commission approval process

- Text of regulatory changes to be approved at AM094
- Final text shortly after meeting
  - If typographical and formatting changes are necessary
- Submission to Contracting Parties