INTERNATIONAL PACIFIC HALIBUT COMMISSION

IPHC–2023–IM099–00
Last Update: 01 December 2023

99th Session of the IPHC Interim Meeting (IM099) – *Compendium of meeting documents*

30 November - 1 December 2023, Seattle, WA, USA

Commissioners

Canada	United States of America
Paul Ryall	Jon Kurland
Neil Davis	Robert Alverson
Peter DeGreef	Richard Yamada

Executive Director

David T. Wilson, Ph.D.

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INTERNATIONAL PACIFIC HALIBUT COMMISSION

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DRAFT: AGENDA & SCHEDULE FOR THE 99th SESSION OF THE IPHC INTERIM MEETING (IM099)

Date: 30 November – 1 December 2023
Location: Electronic
Venue: Adobe Connect
Time: 09:00-17:00 (PST) daily
Chairperson: Mr Jon Kurland (USA)
Vice-Chairperson: Mr Paul Ryall (Canada)

Notes:

- ***Document deadline****: 31 October 2023 (30 days prior to the opening of the Session)*
- *All sessions are open to observers and the general public, unless the Commission specifically decides otherwise.*
- *All sessions will be webcast. Webcast sessions will also take audience comments and questions as directed by the Chairperson of the Commission.*

AGENDA FOR THE 99th SESSION OF THE IPHC INTERIM MEETING (IM099)

1. OPENING OF THE SESSION (Chairperson)

2. ADOPTION OF THE AGENDA AND ARRANGEMENTS FOR THE SESSION (Chairperson & Executive Director)

3. IPHC PROCESS (D. Wilson)

- 3.1 Update on actions arising from the 99th Session of the IPHC Annual Meeting (AM099), 2023 Special Sessions, and intersessional decisions (D. Wilson)
- 3.2 Report of the IPHC Secretariat (2023): Draft (D. Wilson & B. Hutniczak)
- 3.3 2nd IPHC Performance Review (PRIPHC02): Implementation of recommendations (D. Wilson)
- 3.4 Report of the 18th Session of the IPHC Management Strategy Advisory Board (MSAB018) (Co-Chairpersons)
- 3.5 Reports of the IPHC Scientific Review Board (SRB Chairperson)
- 3.6 Report of the 24th Session of the IPHC Research Advisory Board (RAB024) (D. Wilson, J. Planas)
- 3.7 International Pacific Halibut Commission 5-year program of Integrated Research and Monitoring (2022-26) (D. Wilson, J. Planas, I. Stewart, A. Hicks, B. Hutniczak, & R. Webster)

4. FISHERY MONITORING

- 4.1 Fishery-dependent data overview (2023) (B. Hutniczak)
- 4.2 Fishery-independent data overview (2023)

4.2.1 IPHC Fishery-Independent Setline Survey (FISS) design and implementation in 2023 (K. Ualesi)

5. STOCK STATUS OF PACIFIC HALIBUT (2023)

5.1 Space-time modelling of survey data (R. Webster)
5.2 Stock Assessment: Data overview and stock assessment (2023)

6. MANAGEMENT STRATEGY EVALUATION

6.1 IPHC Management Strategy Evaluation: update (A. Hicks)

7. HARVEST DECISION TABLE 2024

7.1 Stock projections and harvest decision table 2024-2026 (I. Stewart & A. Hicks)

8. FISS DESIGN EVALUATIONS 2024-2028

8.1 2024-28 FISS design evaluation (R. Webster)

9. BIOLOGICAL AND ECOSYSTEM SCIENCES – PROJECT UPDATES

9.1 Report on Current and Future Biological and Ecosystem Science Research Activities (J. Planas)

10. IPHC FISHERY REGULATIONS: PROPOSALS FOR THE 2023-24 PROCESS

10.1 IPHC Secretariat fishery regulation proposals (B. Hutniczak)
10.2 Contracting Party fishery regulation proposals (Contracting Parties)
10.3 Stakeholder fishery regulation proposals (Stakeholders)
10.4 Stakeholder statements (B. Hutniczak)

11. FINANCE AND ADMINISTRATION

11.1 FY2023 Budget: update (D. Wilson, A. Keikkala)

12. OTHER BUSINESS

12.1 Preparation for the 100th Session of the IPHC Annual Meeting (AM100) and associated subsidiary bodies (D. Wilson)
12.2 Contracting Party National Reports (B. Hutniczak)

13. REVIEW OF THE DRAFT AND ADOPTION OF THE REPORT OF THE 99th SESSION OF THE IPHC INTERIM MEETING (IM099) (Chairperson & Executive Director)

SCHEDULE FOR THE 99th SESSION OF THE IPHC INTERIM MEETING (IM099)

Thursday, 30 November 2023		
Time	**Agenda item**	**Lead**
09:00-09:10	1. Opening of the Session	Chairperson
09:10-09:20	2. Adoption of the agenda and arrangements for the Session	Chairperson
09:20-10:15	3. IPHC Process 3.1 Update on actions arising from the 99th Session of the IPHC Annual Meeting (AM099), 2023 Special Sessions, and intersessional decisions (D. Wilson) 3.2 Report of the IPHC Secretariat (2023): Draft (D. Wilson & B. Hutniczak) 3.3 2nd IPHC Performance Review (PRIPHC02): Implementation of recommendations (D. Wilson) 3.4 Report of the 18th Session of the IPHC Management Strategy Advisory Board (MSAB018) (Co-Chairpersons) 3.5 Reports of the IPHC Scientific Review Board (SRB Chairperson) 3.6 Report of the 24th Session of the IPHC Research Advisory Board (RAB024) (D. Wilson, J. Planas) 3.7 International Pacific Halibut Commission 5-year program of Integrated Research and Monitoring (2022-26) (D. Wilson, J. Planas, I. Stewart, A. Hicks, B. Hutniczak, & R. Webster)	D. Wilson D. Wilson D. Wilson MSAB Co-Chairpersons SRB Chairperson D. Wilson & J. Planas D. Wilson
10:15-10:30	4. Fishery Monitoring 4.1 Fishery-dependent data overview (2023)	B. Hutniczak
10:30-10:45	Break	
10:45-11:15	4.2 Fishery-independent data overview (2023) 4.2.1 IPHC Fishery-Independent Setline Survey (FISS) design and implementation in 2023	K. Ualesi
11:15-12:30	5. Stock status of Pacific halibut (2023) 5.1 Space-time modelling of survey data	R. Webster
12:30-13:30	Lunch	
13:30-14:45	5.2 Stock Assessment: Data overview and stock assessment (2023) *Public comment and questions (Agenda Items 3-5.2)*	I. Stewart
14:45-15:30	6. Management strategy evaluation 6.1 IPHC Management Strategy Evaluation: update	A. Hicks
15:30-15:45	Break	

15:45-16:15	7. Harvest decision table 2024 *Public comment and questions (Agenda Item 6-7)*	I. Stewart
16:15-17:00	8. FISS design evaluations 2024-2028 8.1 2024-28 FISS design evaluation *Public comment and questions (Agenda Item 8)*	R. Webster
Friday, 1 December 2023		
09:00-10:00	9. Biological and ecosystem sciences – project updates *Public comment and questions (Agenda Item 9)*	J. Planas
10:00-10:30	10. IPHC Fishery Regulations: Proposals for the 2023-24 process 10.1 IPHC Secretariat fishery regulation proposals 10.2 Contracting Party fishery regulation proposals) 10.3 takeholder fishery regulation proposals 10.4 Stakeholder statements *Public comment and questions (Agenda Item 10)*	B. Hutniczak Contracting Parties Stakeholders B. Hutniczak
10:30-10:45	Break	
10:45-12:15	11. Finance and Administration 11.1 FY2023 Budget: update	D. Wilson & A. Keikkala
12:15-12:30	12. Other business 12.1 Preparation for the 100th Session of the IPHC Annual Meeting (AM100) and associated subsidiary bodies	D. Wilson & A. Keikkala
12:30-13:30	Lunch	
13:30-14:30	Report drafting Session	IPHC Secretariat
14:30-14:45	Break	
14:45-17:00	13. Review of the draft and adoption of the Report of the 99th Session of the IPHC Interim Meeting (IM099)	Chairperson & Executive Director

LIST OF DOCUMENTS FOR THE 99th SESSION OF THE IPHC INTERIM MEETING (IM099)

Last updated: 29 Nov 2023

Document	Title	Availability
IPHC-2023-IM099-01	Agenda & Schedule for the 99th Session of the IPHC Interim Meeting (IM099)	✓ 21 Jun 2023 ✓ 27 Oct 2023
IPHC-2023-IM099-02	List of Documents for the 99th Session of the IPHC Interim Meeting (IM099)	✓ 21 Jun 2023 ✓ 27 Oct 2023 ✓ 29 Nov 2023
IPHC-2023-IM099-03	Update on actions arising from the 99th Session of the IPHC Annual Meeting (AM099), 2023 Special Sessions, and intersessional decisions (D. Wilson)	✓ 27 Oct 2023
IPHC-2023-IM099-04	Report of the IPHC Secretariat (2023): Draft (D. Wilson & B. Hutniczak)	✓ 27 Oct 2023
IPHC-2023-IM099-05	Implementation of the Recommendations from the 2nd IPHC Performance Review (PRIPHC02) (D. Wilson)	✓ 27 Oct 2023
IPHC-2023-IM099-06	International Pacific Halibut Commission 5-Year program of integrated research and monitoring (2023-26): Updates (D. Wilson, J. Planas, I. Stewart, A. Hicks, B. Hutniczak, & R. Webster)	✓ 27 Oct 2023
IPHC-2023-IM099-07 Rev_2	Fisheries data overview (2023): Preliminary statistics (B. Hutniczak, H. Tran, T. Kong, K. Sawyer van Vleck, & K. Magrane)	✓ 30 Oct 2023 ✓ 10 Nov 2023 ✓ 29 Nov 2023
IPHC-2023-IM099-08	IPHC Fishery-independent setline survey (FISS) design and implementation in 2023 (K. Ualesi, R. Rillera, T. Jack, & K. Coll)	✓ 30 Oct 2023
IPHC-2023-IM099-09 Rev_1	Space-time modelling of survey data (R. Webster)	✓ 31 Oct 2023 ✓ 8 Nov 2023
IPHC-2023-IM099-10 Rev_1	Data overview and stock assessment for Pacific halibut (*Hippoglossus stenolepis*) at the end of 2023 (I. Stewart, A. Hicks, R. Webster, D. Wilson)	✓ 30 Oct 2023 ✓ 20 Nov 2023
IPHC-2023-IM099-11	IPHC Management Strategy Evaluation and Harvest Strategy Policy updates (A. Hicks, I. Stewart, & D. Wilson)	✓ 30 Oct 2023
IPHC-2023-IM099-12 Rev_1	Stock projections and harvest decision table for 2024-2026 (I. Stewart & A. Hicks)	✓ 30 Oct 2023 ✓ 20 Nov 2023
IPHC-2023-IM099-13 Rev_1	2024, and 2025-28 FISS Design evaluation (R. Webster, I. Stewart, K. Ualesi, & D. Wilson)	✓ 31 Oct 2023

		✓ 17 Nov 2023
IPHC-2023-IM099-14	Report on Current and Future Biological and Ecosystem Science Research Activities (J. Planas)	✓ 30 Oct 2023
IPHC-2023-IM099-15	IPHC Fishery Regulations: Proposals for the 2023-24 process (B. Hutniczak)	✓ 27 Oct 2023
IPHC-2023-IM099-16 Rev_1	Financial Statement for FY2023 - Draft (D. Wilson)	✓ 31 Oct 2023 ✓ 28 Nov 2023
IPHC Fishery Regulation proposals for 2024		
IPHC Secretariat Fishery Regulation proposals for 2024		
IPHC-2023-IM099-PropA1	IPHC Fishery Regulations: Mortality and Fishery Limits (Sect. 5)	✓ 27 Oct 2023
IPHC-2023-IM099-PropA2	IPHC Fishery Regulations: Commercial Fishing Periods (Sect. 9)	✓ 27 Oct 2023
IPHC-2023-IM099-PropA3	IPHC Fishery Regulations: Logs (Sect 19)	✓ 27 Oct 2023
Contracting Party Fishery Regulation proposals for 2024		
IPHC-2023-IM099-PropB1	IPHC Fishery Regulations: Recreational (Sport) Fishing for Pacific Halibut – IPHC Regulatory Areas 2C, 3A, 3B, 4A, 4B, 4C, 4D, 4E (Sect. 29) - Charter Management Measures in IPHC Regulatory Areas 2C and 3A (USA)	Deferred to AM100
Other Stakeholder Fishery Regulation proposals for 2024		
IPHC-2023-IM099-PropC1	Nil-to-date	-
Reports from IPHC subsidiary bodies		
IPHC-2023-MSAB018-R	Report of the 18th Session of the IPHC Management Strategy Advisory Board (MSAB018)	✓ 25 May 2023
IPHC-2023-SRB022-R	Report of the 22nd Session of the IPHC Scientific Review Board (SRB022)	✓ 22 Jun 2023
IPHC-2023-SRB023-R	Report of the 23rd Session of the IPHC Scientific Review Board (SRB023)	✓ 26 Sept 2023
IPHC-2023-RAB024-R	Report of the 24th Session of the IPHC Research Advisory Board (RAB024)	✓ 28 Nov 2023
Information papers		
IPHC-2023-IM099-INF01	Stakeholder Statements on IPHC Fishery Regulation proposals (B. Hutniczak)	✓ 27 Oct 2023
IPHC-2023-IM099-INF02	IPHC data products – progress report (B. Hutniczak)	✓ 28 Nov 2023
IPHC-2023-IM099-INF03	National Report Template (B. Hutniczak)	✓ 28 Nov 2023

Update on actions arising from the 99th Session of the IPHC Annual Meeting (AM099), 2023 Special Sessions, 2023 intersessional decisions

PREPARED BY: IPHC SECRETARIAT (27 OCTOBER 2023)

PURPOSE

To provide the Commission with an opportunity to consider the progress made during the inter-sessional period in relation to the direct requests for action by the Commission.

BACKGROUND

At the 99th Session of the IPHC Annual Meeting (AM098), Contracting Parties agreed on a series of actions to be taken by Commissioners, subsidiary bodies, and the IPHC Secretariat on a range of issues as detailed in Appendix A.

In addition, the Commission made a number of decisions during a Special Session in 2023 (SS013), and intersessional decisions, as detailed in Appendix B.

DISCUSSION

Noting that best practice governance requires the prompt delivery of core tasks assigned to the IPHC Secretariat by the Commission, at each session of the Commission and its subsidiary bodies, any recommendations 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 staff, 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 a subsidiary body, or other date).

This involves numbering and tracking all action items from the Commission, as well as including clear progress updates and document reference numbers.

RECOMMENDATION/S

That the Commission:

1) **NOTE** paper IPHC-2023-IM099-03, which provided the Commission with an opportunity to consider the progress made during the inter-sessional period, in relation to the direct requests for action by the Commission.

APPENDICES

Appendix A: Update on actions arising from the 99th Session of the IPHC Annual Meeting (AM099: January 2023)

Appendix B: 2023 Special Session decisions, and 2023 intersessional decisions

APPENDIX A

Update on actions arising from the 99th Session of the IPHC Annual Meeting (AM099: January 2023)

99th Session of the IPHC Annual Meeting (AM099)		
Action No.	**Description**	**Update**
	RECOMMENDATIONS	
AM099–Rec.01 (para. 12)	***International Pacific Halibut Commission 5-year program of Integrated Research and Monitoring (2022-26)*** The Commission **RECOMMENDED** that the Secretariat annually present potential changes to the Plan at the IPHC Interim Meeting. The Commission would then have the opportunity to provide any redirection based on Commission priorities and available funding. To assist in making that assessment, the Secretariat will be preparing a progress report annually.	**Lead**: IPHC Secretariat (D. Wilson) **Status/Plan**: Ongoing See paper: **IPHC-2023-IM099-06**
AM099–Rec.02 (para. 76)	***IPHC Management Strategy Evaluation: update*** The Commission **RECOMMENDED** that for the purpose of a comprehensive and intelligible Harvest Strategy Policy (HSP), four coastwide objectives should be documented within the HSP, in priority order: a) Maintain the long-term coastwide female spawning stock biomass above a biomass limit reference point (B20%) at least 95% of the time. b) Maintain the long-term coastwide female spawning stock biomass at or above a biomass reference point (B36%) 50% or more of the time. c) Optimise average coastwide TCEY. d) Limit annual changes in the coastwide TCEY.	**Lead**: IPHC Secretariat (A. Hicks) **Status/Plan**: In progress Potential edits to the HSP document are presented, included the inclusion of the four priority coastwide objectives. See paper: **IPHC-2023-IM099-11**
AM099–Rec.03 (para. 84)	The Commission **AGREED** sufficient analysis has been completed and **RECOMMENDED** not to change the current 32 inch size limit.	**Lead**: IPHC Secretariat **Status/Plan**: Completed MSE results were presented at AM099 and the status quo size limit (32 inches) was maintained in the Fishery Regulations for 2023.
AM099–Rec.04 (para. 104)	***IPHC Fishery Regulations: Logs (Sect. 20) – Logs requirements*** The Commission **RECOMMENDED** that the IPHC work with NOAA Fisheries on data sharing arrangement to retrieve Pacific halibut data submitted via Pacific Coast Groundfish non-trawl logbook.	**Lead**: IPHC Secretariat (B. Hutniczak) **Status/Plan**: Completed Data sharing agreement in place and available on IPHC website.

99th Session of the IPHC Annual Meeting (AM099)		
Action No.	**Description**	**Update**
AM099–Rec.05 (para. 137)	***IPHC meetings calendar (2023-25)*** The Commission **RECOMMENDED** that the 13th Special Session of the Commission be held electronically in mid-April 2023 to review and adopt an FY2024 budget.	**Lead**: IPHC Secretariat (D. Wilson) **Status/Plan**: Completed Meeting held 18 April 2023. https://www.iphc.int/venues/details/13th-special-session-of-the-iphc-ss013
	REQUESTS	
AM099–Req.01 (para. 35)	***2023-25 FISS design evaluation*** The Commission **REQUESTED** a desktop review to determine if reducing bait size on the FISS would substantially reduce costs, while not reducing catch rates and associated fish sale revenue to any large degree.	**Lead**: IPHC Secretariat (R. Webster) **Status/Plan**: Completed Changing the bait size was discussed among other options for FISS cost reduction in IPHC-2023-BN09
AM099–Req.02 (para. 44)	The Commission **REQUESTED** that the Secretariat provide a breakdown of costs associated with the FISS over the last three (3) years and what is projected for the 2023 FISS, and for this to be presented at the 13th Special Session of the Commission (SS013).	**Lead**: IPHC Secretariat (K. Ualesi) **Status/Plan**: Completed Detailed provided in the margins of SS013.
AM099–Req.03 (para. 61)	***Pacific halibut mortality projections using the IPHC mortality projection tool (2023)*** The Commission **REQUESTED** a table be prepared annually that details the historical TCEY decisions, that is currently published on the IPHC website [https://www.iphc.int/uploads/data/time-series-datasets/excel/iphc-2023-tsd-017.xlsx]	**Lead**: IPHC Secretariat (I. Stewart) **Status/Plan**: Completed Table to be updated annually for Commission use.
AM099–Req.04 (para. 66)	The Commission **REQUESTED** that the Secretariat provide a summary of the proposed and ongoing research projects at the Secretariat, including status updates, suggestions for potential priority setting by the Commission, links to the IPHC's mandate and how the research will inform decision-making, guidance on types of research that should be considered for internal funding versus types of research that would be contingent on the availability of external funding or partnerships, among other criteria that may be requested by the Commission.	**Lead**: IPHC Secretariat (J. Planas) **Status/Plan**: Completed See paper: **IPHC-2023-IM099-06**
AM099–Req.05 (para. 67)	***Report on current and future biological and ecosystem science research activities*** The Commission **REQUESTED** that the Secretariat highlight the elements of its 5YRPIRM (the Plan) that will inform its understanding of the impacts of climate change on Pacific halibut in its annual presentations of the research Plan to the Commission.	**Lead**: IPHC Secretariat (J. Planas) **Status/Plan**: In progress This is planned for the AM100. See paper: **IPHC-2023-IM099-06**

99th Session of the IPHC Annual Meeting (AM099)		
Action No.	**Description**	**Update**
AM099–Req.06 (para. 88)	***IPHC Management Strategy Evaluation: update*** **NOTING** paragraph 60 from the 21st Session of the SRB (SRB021), the Commission **REQUESTED** the Secretariat develop a description of options to responding to exceptional circumstances that would trigger a stock assessment in non-assessment years and additional MSE analyses. IPHC-2022-SRB021-R, para 60: *The SRB RECOMMENDED that Exceptional Circumstances be defined to determine whether monitoring information has potentially departed from their expected distributions generated by the MSE. Declaration of Exceptional Circumstances may warrant re-opening and revising the operating models and testing procedures used to justify a particular management procedure.*	**Lead**: IPHC Secretariat (A. Hicks) **Status/Plan**: In progress The Secretariat is working with the SRB to develop a description of options for exceptional circumstances.
AM099–Req.07 (para. 132)	***IPHC Rules of Procedure (2022)*** The Commission **ADOPTED** the IPHC Rules of Procedure (2023), as provided in IPHC-2023-FAC098-09, and **REQUESTED** that the IPHC Secretariat finalise and publish them accordingly, with the following amendments: a) Amend para. 14b-e of the PAB TOR's to read as follows: *b) Proxies are allowed from accredited members from the PAB;* *c) Only one proxy per attending member;* *d) Proxies will be submitted to the IPHC Secretariat prior to the PAB meeting in written or electronic form;* *e) A general proxy will authorize a designated PAB member to vote on any or all topics brought before the PAB on behalf of a PAB member who cannot attend. A specific proxy will authorize a PAB member to vote on specifically named topics (listed on the proxy itself) on behalf of the PAB member who can not attend.*	**Lead**: IPHC Secretariat (D. Wilson) **Status/Plan**: Completed Published on 13 February 2023 via IPHC Circular (IPHC-2023-CR-002) Direct link to 2022 ROP: IPHC-2023-ROP23
AM099–Req.08 (para. 133)	The Commission **REQUESTED** that a working group involving interested PAB members, convened by the IPHC Secretariat, be formed to determine if additional edits to the PAB Rules of Procedure are necessary on topics including but not limited to membership eligibility. Any further amendments are to be provided to the Commission within three (3) months.	**Lead**: IPHC Secretariat (A. Keikkala) **Status/Plan**: Completed The suggestions by the Ad-Hoc WG were provided to the Commission.

99th Session of the IPHC Annual Meeting (AM099)		
Action No.	**Description**	**Update**
AM099–Req.09 (para. 144)	***Review of the draft and adoption of the report of the 99th Session of the IPHC Annual Meeting (AM099)*** The Commission **REQUESTED** that the IPHC Secretariat finalise and publish the IPHC *Pacific Halibut Fishery Regulations (2023)* as soon as possible, **NOTING** that only minor editorial and formatting changes are permitted beyond the decisions made by the Commission at the AM099.	**Lead**: IPHC Secretariat (B. Hutniczak) **Status/Plan**: Completed Published on 2 February 2023. Direct link to 2022 Fishery Regulations: IPHC-2023-FISHR23

APPENDIX B

2023 Special Sessions of the Commission

Action No.	Description	Update
13th Special Session of the IPHC (SS013) (18 April 2023)		
SS013-Rec.01 (para. 17)	***Budget Estimates: FY2024 (for approval): Fund 30 – Statistics: Directed commercial catch sampling of Pacific halibut in Alaska*** The Commission **DISCUSSED** the merit in continuing with the NOAA-Fisheries grant program, and **RECOMMENDED** the following: a) The IPHC has no mandate to undertake activities on sablefish, and should only do so with an expressed directive from the Commission to do so; b) Should the Commission direct the IPHC Secretariat to undertake sablefish activities in Alaska as part of the new grant period, then: • the IPHC should not take on any risks associated with uncertainty regarding the amount of funding available or with the variation in the amount of work required to fulfill sablefish activities; • the IPHC should be reimbursed in-full for any sablefish work (100% cost-recovered) in-year and without delay, and that the Secretariat will cease work at the point that its eligible costs exceed the grant funding available; • Sablefish work would be secondary to Pacific halibut work.	**Lead**: IPHC Secretariat (D. Wilson & A. Keikkala) **Status/Plan**: In progress The Commission has not provided a directive to include sablefish into the new NOAA-Fisheries Alaska cost-recovery grant. The Grant was submitted by the deadline provided by NOAA-Fisheries, without sablefish activities included. Unless otherwise directed by the Commission, the IPHC Secretariat will provide sablefish logbooks from 2023 to NOAA-Fisheries. It may be useful for the Commission to revisit and confirm its direction at the WM2023.

Action No.	Description	Update
SS013-Rec.02 (para. 19)	The Commission **RECOMMENDED** that further intersessional discussions be held between the IPHC and NOAA-Fisheries (including the AFSC), to determine if the sablefish logbook data could be entered into NMFS logbooks rather than IPHC logbooks, thereby removing the IPHC from the sablefish process. Alternatively, such discussion should determine if IPHC logbooks containing sablefish landings could be provided directly to NOAA-Fisheries for data entry.	**Lead**: IPHC Secretariat (B. Hutniczak) **Status/Plan**: Ongoing Sablefish logbook data can already be entered into the NMFS logbooks, rather than the IPHC logbooks. There is no impediment. Making it mandatory would require amending 50 CFR Part 679. The IPHC logbooks containing sablefish landings could be provided to NOAA Fisheries for data entry via Auke Bay Lab. A formal agreement is suggested for sharing logbooks that contain also Pacific halibut fishing activity. Safeguards provided by IPHC Data Confidentiality Policy and Data Sharing Procedures would apply. This should be implemented also for previously collected logs. Effective date: 1 October 2023.
SS013-Rec.03 (para. 20)	The Commission **RECOMMENDED** that, as soon as possible, the IPHC Secretariat provide an analysis of commercial sampling needs for Pacific halibut in Alaska, including an examination of biological sampling rates by port, and whether all ports need to be staffed annually or could be staffed at some lesser interval on a staggered basis to reduce costs without unacceptably compromising data quality.	**Lead**: IPHC Secretariat (I. Stewart, R. Webster) **Status/Plan**: Completed **See: IPHC-2023-WM2023-INF03** PHC-2023-BN10: Potential modifications and efficiencies for IPHC sampling of directed commercial landings (IPHC Secretariat)
SS013-Rec.04 (para. 28)	***Budget Estimates: FY2024 (for approval): Contributions to the General Fund*** **NOTING** that the primary purpose of the annual IPHC Interim Meeting (typically held in November each year) is to share preliminary updates and assessment results with interested stakeholders, and that this has been achieved effectively over the past three (3) years via the use of online meeting platforms, the Commission **RECOMMENDED** that effective FY2024, the IPHC Interim Meeting shall permanently be held via online meeting platforms, including for Contracting Party delegations (FY2024 cost saving: US$13,500).	**Lead**: IPHC Secretariat (D. Wilson) **Status/Plan**: Completed The Interim Meeting was removed from the FY2024 budget. Moving forward it will be held online only.

Action No.	Description	Update
	REQUESTS	
SS013-Req.01 (para. 9)	***Budget Estimates: FY2024 (for approval): Fund 20 – Research: Biological and Ecosystem Sciences annual reporting*** The Commission **REQUESTED** that, as part of the annual reporting to the Commission on the Biological and Ecosystem Science Branch activities, that the Secretariat provide a summary table that incorporates the following elements for Commission review: a) Current project abstract, including objectives, links to IPHC's core mandate and how it will inform Commissioner's decisions; b) Related Commission decisions and directives; c) Timeline for deliverables; d) Funding sources; e) Progress report.	**Lead**: IPHC Secretariat (D. Wilson & J. Planas) **Status/Plan**: Ongoing Note that the 5YPIRM covers all research and monitoring and not only the BESB. See paper **IPHC-2023-WM2023-06**
	Intersessional Decisions (ID)	
IPHC-2023-ID001:	The Commission **AGREED** to make an exception to paragraph 3 of Rule 15 (Reports and Records) of the IPHC Rules of Procedure, and to exceptionally adopt the Report of the 13th Special Session (SS013) beyond the 15-day post-meeting deadline for report adoption by the Commission.	**Lead**: Commission and IPHC Secretariat (D. Wilson) **Status/Plan**: Completed The Report of the SS013 was adopted via correspondence on 16 May 2023 via IPHC Circular IPHC-2023-CR-007, the '*date of notification*'.
IPHC-2023-ID002:	***2023 FISS DESIGN AMENDED*** The Commission **ENDORSED** an optimized design for the 2023 FISS as provided at Attachment I, that balances the Commissions primary and secondary objectives for the FISS, noting that the design amends that which was previously endorsed at IM098 in November 2022 and will consist of 891 stations.	**Lead**: IPHC Secretariat (K. Ualesi and R. Webster) **Status/Plan**: Completed See paper **IPHC-2023-IM099-08**
IPHC-2023-ID003:	***SELECTION OF AUDITOR FOR FY2023, FY2024 AND FY2025 STATEMENT AUDITS*** The Commission **ENDORSED** the appointment of the external auditor 'Clark Nuber' to audit the accounts of the IPHC for FY2023, FY2024, and FY2025.	**Lead**: IPHC Secretariat (D. Wilson and A. Keikkala) **Status/Plan**: Completed. IPHC-2023-CR012 (ID003): 5 June 2023 The Contract with Clark Number was signed on 21 July 2023.
IPHC-2023-ID004:	***CONTRACTING PARTY CONTRIBUTIONS FOR FY2024*** The Commission **NOTED** the indicated Contracting Party (CP) contributions for FY2024 prescribed by each CP subsequent to the 13th Special Session of the Commission (SS013) as follows:	**Lead**: Commission **Status/Plan**: Completed.

Action No.	Description	Update
	Canada: Contribution to the IPHC General Fund would be 3% higher than the amount provided in FY2023 = US$927,419.21 U.S.A.: Contribution to the IPHC General Fund would be 3% higher than the amount provided in FY2023 = US$4,282,492.80 (subject to appropriations) Extra-budgetary funds: U.S.A.: Contribution to the IPHC Secretariat Headquarters Lease and Maintenance: US$513,712.50 Canada/U.S.A.: US$127,848.00 each (for the old IFCPF deficit - voluntary payment)	
IPHC-2023-ID005:	**NOTING** that the abovementioned contributions equate to US$528,812.25 less than the FY2024 budget proposed for adoption at SS013 to maintain the current staffing levels and level of operations of the IPHC Secretariat into FY2024, the Commission **RECOMMENDED** the following budget and associated service reductions: i. -US$13,500 – removal of the IPHC Interim Meeting from the IPHC Meetings budget line. The meeting shall be held in a fully remote/online format moving forward; ii. -US40,060 – removal of the IPHC MSAB meeting from the IPHC Meetings budget line for FY2024. The meetings scheduled for FY2024 (1 Oct 2023 to 30 Sept 2024) shall be held in a fully remote/online format; iii. -US$217,456 – removal of 1 x FTE at the level IPHC-GS-13 (Manager) (salary, wages, and benefits); iv. -US257,796 – removal of FTE's sufficient to match (salary, wages, and benefits)	**Lead**: IPHC Secretariat (D. Wilson and A. Keikkala) **Status/Plan**: Completed.
IPHC-2023-ID006:	The Commission **RECOMMENDED** that the IPHC Secretariat provide a revised FY2024 budget with the above-mentioned Contracting Party contributions and reductions for adoption via the Intersessional Decision-making process prescribed in the IPHC Rules of Procedure (2023).	**Lead**: IPHC Secretariat (D. Wilson and A. Keikkala) **Status/Plan**: Completed IPHC-2023-CR018: For Decision FY2024 budget IPHC-2023-CR019: Intersessional Decision ID008 – FY2024 Budget
IPHC-2023-ID007:	***2023 IPHC BAIT CALIBRATION STUDY*** The Commission **RECOMMENDED** that the IPHC Secretariat undertake a bait calibration study using two bait types (Chum salmon (*Oncorhynchus keta*) and Pink salmon (*Oncorhynchus gorbuscha*)) in fall 2023.	**Lead**: IPHC Secretariat (K. Ualesi and I. Stewart) **Status/Plan**: In progress **IPHC-2023-MR012** IPHC Media Release 2023-012 Fall 2023 Bait Comparison Study Request for Tender. Results are expected by the end of November/early December.

Action No.	Description	Update
IPHC-2023-ID008:	***Budget Estimates: FY2024*** The Commission: 1) **NOTED** paper IPHC-2023-ID008 that provided the budget estimates for FY2024 (1 October 2023 to 30 September 2024) for adoption. 2) **ADOPTED** the FY2024 budget (1 October 2023 to 30 September 2024) as detailed in Appendix I, including the contributions from the Contracting Parties to the General Fund for FY2024 as follows: • Canada: Contribution to the General Fund: **US$927,419.21** • U.S.A.: Contribution to the General Fund: **US$4,282,492.80** (subject to appropriations) • U.S.A.: Contribution to the headquarters building lease and maintenance costs: **US$513,712.50** 3) **NOTED** the optional extra-budgetary (IFCP Fund deficit) contributions from each Contracting Party for FY2024 as follows: • Canada: o 50% Contribution to the IFCP Fund deficit (former staff pension plan): **US$127,848** • U.S.A.: o 50% Contribution to the IFCP Fund deficit (former staff pension plan): **US$127,848** 4) **NOTED** that Fund 35 – AK Cost-Recovery expenses are budgeted at **US$947,371** for FY2024, however, the amount that NOAA fisheries will agree to reimburse will not be known until March/April 2025, and the IPHC will not be reimbursed until 1 October 2025, two fiscal years after the expenses were incurred. Thus, as a precautionary measure, the heads of delegation have directed the Secretariat to include an estimated **US$875,000** to be reimbursed through the cost-recovery program and a further **US$72,371** to be provided in supplementary income from NOAA fisheries. Reductions in services may be necessary if the supplementary income received is less than the **US$72,371** needed to meet the total estimated FY2024 expenditures of **US$947,371**.	**Lead**: IPHC Secretariat (D. Wilson) **Status/Plan**: Completed Invoices will be sent to each Contracting Party no later than 1 September 2023.
IPHC-2023-ID009:	The Commission **ENDORSED** the amendments to the IPHC Rules of Procedure, as provided at Appendix I, and **REQUESTED** that the IPHC Secretariat finalise and publish them accordingly.	**Lead**: IPHC Secretariat **Status/Plan**: Completed IPHC-2023-CR-026 https://www.iphc.int/the-commission

DRAFT: Report of the IPHC Secretariat (2023)

PREPARED BY: IPHC SECRETARIAT (D. WILSON & B. HUTNICZAK, 27 OCTOBER 2023)

CONTENTS

1 PURPOSE

To provide the Commission with a draft update on the activities of the IPHC Secretariat in 2023, not already contained within other papers before the Commission.

2 IPHC SECRETARIAT 2023

The IPHC is a public international organization so designated via Presidential Executive Order 11059 and established by a Convention between Canada and the United States of America. The IPHC Convention was signed on 2 March 1923, ratified on 21 July 1924, and came into effect on **21 October 1924** upon exchange.

The basic texts of the Commission are available on the IPHC website: https://www.iphc.int/the-commission, and prescribe the mission of the organization as:

*"….. **to develop the stocks of [Pacific] 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**. ….." IPHC Convention*, Article I, sub-article I, para. 2).

The IPHC Secretariat, formed in support the Commission's activities, is based in Seattle, WA, U.S.A. (Fig. 1) and currently consists of 30 fulltime positions (FTEs) and ~24-44 temporary/seasonal positions to staff our ports and research vessels (Appendix I). As our shared vision, ***the IPHC Secretariat aims to deliver positive economic, environmental, and social outcomes for the Pacific halibut resource for Canada and the U.S.A. through the application of rigorous science, innovation, and the implementation of international best practice*.**

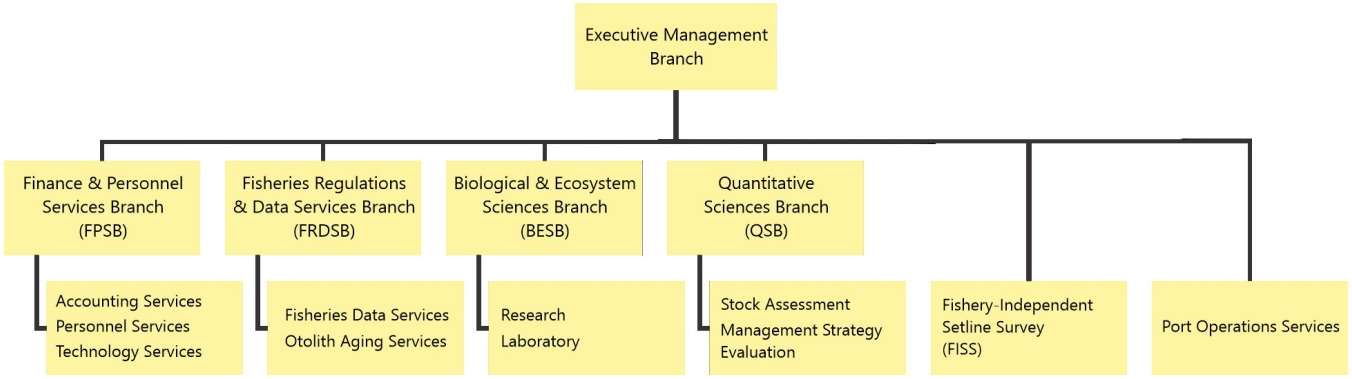

Figure 1. IPHC Secretariat organisation chart (2023).

3 IPHC INTERNSHIP PROGRAM: 2023

The IPHC funds full-time internships each summer. In 2023 the IPHC hosted one (1) undergraduate intern, Mr William **Le**, pursuing a major in Aquatic and Fishery Sciences at the University of Washington (Seattle, WA). William has participated in research activities at the Biological and Ecosystem Sciences Branch and has also assisted the Otolith Services team. In addition, William has participated in the FISS and was deployed in the F/V Star Wars. In terms of his research activities, William has contributed to the research project entitled "Mapping the juvenile Pacific halibut" by mining data sources from surveys conducted in the early to mid 1990's

by researchers at the University of Alaska Fairbanks. These data will be incorporated into a large database of juvenile habitat coastwide currently being compiled by the IPHC and that will be used in connectivity and population dynamics studies. The internship period runs from 13 June through 31 August 2023.

4 IPHC MERIT SCHOLARSHIP FOR 2022-25

The IPHC funds several Merit Scholarships to support university, technical college, and other post-secondary education for students from Canada and the United States of America who are connected to the Pacific halibut fishery. Generally, a single new scholarship valued at US$4,000 per year is awarded every two years. The scholarships are renewable annually for the normal four-year period of undergraduate education, subject to maintenance of satisfactory academic performance.

Since the scholarships inception in 2002, the IPHC has awarded over US$150,000 in scholarship funds to 18 recipients.

In 2022, the IPHC Merit Scholarship Selection Panel reviewed applications and selected an outstanding candidate from a very strong application pool, based on academic qualifications, career goals, and relationship to the Pacific halibut industry.

The Selection Panel consists of the following five (5) panelists:

- Robert Alverson (USA Commissioner)
- Peter DeGreef (Canadian Commissioner)
- Patrick DePoe
- Angel Drobnica
- Christa Rusel

The Selection Panel unanimously awarded Lucy Hankins (Seward, AK, USA) 2022 IPHC Merit Scholarship. The current recipients and their expected years of receipt are provided below.

Name	2022	2023	2024	2025
Hahlen Behnken-Barkhau (Sitka, AK, USA)	$4,000	$4,000	-	-
Lucy Hankins (Seward, AK, USA)	-	$4,000	$4,000	$4,000

5 MEETINGS OF THE COMMISSION AND SUBSIDIARY BODIES DURING 2023

Meeting	No.	Date	Location	Secretariat material
Finance and Administration Committee (FAC)	99th	23 Jan	Victoria, BC, Canada	7 working papers
Annual Meeting (AM)	**99th**	**23-27 Jan**	Victoria, BC, Canada	14 working papers, 4 regulatory proposals
Conference Board (CB)	93rd	24-25 Jan	Victoria, BC, Canada	Commission papers
Processor Advisory Board (PAB)	28th	24-25 Jan	Victoria, BC, Canada	Commission papers
Special Session (SS)	13th	18 Apr	Electronic	2 working papers

Management Strategy Advisory Board (MSAB)	18th	24-25 May	Electronic	5 working papers
Scientific Review Board (SRB)	22nd	20-22 June	Seattle, USA & Electronic	7 working papers
Work Meeting (WM)	2023	11-12 Sept	Bellingham, USA	13 working papers
Scientific Review Board (SRB)	23rd	25-27 Sept	Seattle, USA & Electronic	7 working papers
Research Advisory Board (RAB)	24th	28 Nov	Seattle, USA & Electronic	6 working papers
Interim Meeting (IM)	**99th**	**30 Nov – 1 Dec**	Electronic	15 working papers

6 IPHC PACIFIC HALIBUT FISHERY REGULATIONS ADOPTED IN 2023

In 2023, the Commission adopted **eight (8)** fishery regulations proposals (IPHC-2023-AM099-R) in accordance with Article III of the Convention, as follows:

6.1 IPHC Secretariat fishery regulation proposals

IPHC Fishery Regulations: Morality and Fishery Limits (Sect. 5)

(par. 89) The Commission **ADOPTED** fishery regulation proposal IPHC-2022-AM099-PropA1, which provides the mortality and fishery limits framework for population at AM098 (Appendix IV).

(par. 90) The Commission **ADOPTED** the distributed mortality limits for each Contracting Party, by IPHC Regulatory Area, (Table 4) and sector, as provided in Appendix IV. [Unanimous]

Table 4. Adopted TCEY mortality limits for 2023

Contracting Party IPHC Regulatory Area	Mortality limit (TCEY) (mlbs)	Mortality limit (TCEY) (metric tonnes)
Canada Total: 2B	**6.78**	**3,075**
USA: 2A	1.65	748
USA: 2C	5.85	2,654
USA: 3A	12.08	5,479
USA: 3B	3.67	1,665
USA: 4A	1.73	785
USA: 4B	1.36	617
USA: 4CDE	3.85	1,746
United States of America Total	**30.19**	**13,694**
Total (IPHC Convention Area)	**36.97**	**16,769**

IPHC Fishery Regulations: Commercial fishing periods (Sect. 9)

(par. 97) The Commission **ADOPTED** fishing periods for 2023 as provided below, thereby superseding the relevant portions of Section 9 of the IPHC Pacific halibut fishery regulations (Appendix V) by specifying that commercial fishing for Pacific halibut in all IPHC Regulatory Areas may begin no earlier than 1200 (noon) local lime on **10 March 2023** and must cease at 1200 (noon) local time on **07 December 2023**. [Unanimous]

IPHC Fishery Regulations: Fishing Period Limits (Sect. 14) & Licensing Vessels for IPHC Regulatory Area 2A (Sect. 15) – Accommodation of the transition of management in the IPHC Regulatory Area 2A

(par. 98) The Commission **ADOPTED** fishery regulation proposal IPHC-2023-AM099-PropA3, to accommodate the transition of management in the IPHC Regulatory Area 2A from the IPHC to the Pacific Fishery Management Council (PFMC) and NOAA Fisheries (Appendix VI). [Unanimous]

IPHC Fishery Regulations: minor amendments

(par. 99) The Commission **ADOPTED** fishery regulation proposal IPHC-2023-AM099-PropA4 Rev_1, which proposed minor amendments to the existing IPHC Fishery Regulations, improving their clarity and consistency (Appendix VII). [Unanimous]

6.2 *Contracting Party fishery regulation proposals*

Recreational (sport) fishing for Pacific halibut—IPHC Regulatory areas 2c, 3a, 3b, 4a, 4b, 4c, 4d, 4e (Sect. 29) – Charter management measures in IPHC Regulatory Areas 2C and 3A

(par. 100) The Commission **ADOPTED** fishery regulation proposal IPHC-2023-AM099-PropB1, that proposed IPHC Regulation changes for charter recreational Pacific halibut fisheries in IPHC Regulatory Areas 2C and 3A (Appendix VIII), in order to achieve the charter Pacific halibut allocation under the North Pacific Fisheries Management Council's (NPFMC) Pacific halibut Catch Sharing Plan. [Unanimous]

IPHC Fishery Regulations: Recreational (Sport) Fishing for Pacific Halibut - IPHC Regulatory Area 2B (Sect. 28) - Daily bag limit in IPHC Regulatory Area 2B

(par. 101) The Commission **ADOPTED** fishery regulation proposal IPHC-2023-AM099-PropB2 Rev_1, that proposed IPHC Regulation changes to allow the daily bag limit of up to three fish per day per person in the recreational fishery in IPHC Regulatory Area 2B beginning on or after August 1 of each year until 2025 unless extended by a vote of the Commission (Appendix IX). [Unanimous]

IPHC Fishery Regulations: Recreational (Sport) Fishing for Pacific Halibut - IPHC Regulatory Areas 2C, 3A, 3B, 4A, 4B, 4C, 4D, 4E (Sect. 29) - Onboard consumption

(par. 102) The Commission **ADOPTED** fishery regulation proposal IPHC-2023-AM099-PropB3, that proposed adding flexibility to existing recreational (sport) Pacific halibut fishing regulations in Alaska Regulatory Areas and allow limited consumption of recreationally-caught Pacific halibut on board charter vessels and pleasure craft, while retaining existing regulations that provide effective enforcement of daily bag limits and possession limits (Appendix X). [Unanimous]

IPHC Fishery Regulations: Logs (Sect. 20) – Logs requirements

(par. 103) The Commission **ADOPTED** fishery regulation proposal IPHC-2023-AM099-PropB4, that proposed updates to IPHC regulatory language regarding the qualifying logbooks in IPHC Regulatory Area 2A (Appendix XI). [Unanimous]

7 INTERACTIONS WITH CONTRACTING PARTIES

7.1 Contracting Party reports

The IPHC Secretariat engages annually with agency representatives from both Contracting Parties regarding comprehensive reporting of all forms of Pacific halibut removals. The IPHC Secretariat is working to identify and address data gaps in reporting. In 2023, the focus was on additional sources of information on whale interactions.

7.2 Canada

Fisheries and Oceans Canada (DFO)

Multiyear permit for the IPHC survey in Gwaii Haanas National Marine Conservation Area

In May 2022, the Archipelago Management Board (AMB) approved the application the DFO put forward to permit multi-year approvals for the IPHC Fishery-Independent Setline Survey (FISS) in Gwaii Haanas National Marine Conservation Area (NMCA). What this means is that the IPHC has approval to fish the FISS stations within Gwaii Haanas for the 2022, 2023 and 2024 FISS without having to annually apply for these permissions when they apply for their Canadian scientific licences.

Areas of conservation concern

The IPHC Secretariat continues to work with the DFO representatives to address gaps in coverage for the IPHC FISS in the IPHC Regulatory Area 2B. Currently, the FISS license excludes Marine Protected Areas as described by Hecate Strait and Queen Charlotte Sound Glass Sponge Reefs Marine Protected Areas Regulations, and Rockfish Conservation Areas (RCAs).

Memorandum of Understanding/Collective Agreement – Rockfish

In collaboration with DFO, Pacific Halibut Management Association of BC and Archipelago Marine Research (AMR), IPHC tagged Yelloweye, Quillback and Rougheye rockfish aboard both 2B FISS vessels for dockside sampling by AMR staff. This collaboration was formed to replace prior collective agreement involving rockfish caught aboard 2B FISS vessels. 545 Yelloweye, 139 Quillback and 178 Rougheye rockfish were sampled so far throughout the 2B coast during the 2023 FISS.

Northern Shelf Bioregion

The action plan for the development of a network of marine protected areas (MPAs) in the Northern Shelf Bioregion is a collaborative partnership between the Government of Canada, the Province of British Columbia and First Nations. The action plan supports implementation of the Reconciliation Framework Agreements. The MPA Network zones have been organized into three implementation categories with category 1 zones targeted for establishment by 2025. A *What We Heard* report, based on the public engagement sessions in fall 2022, will be released this fall.

While detailed management plans for individual MPAs within the network remain in the planning phase, the Secretariat follows the process in relation to network's overlap with FISS (see Fig. 2). Proposed extension of the network covers 29 FISS stations.

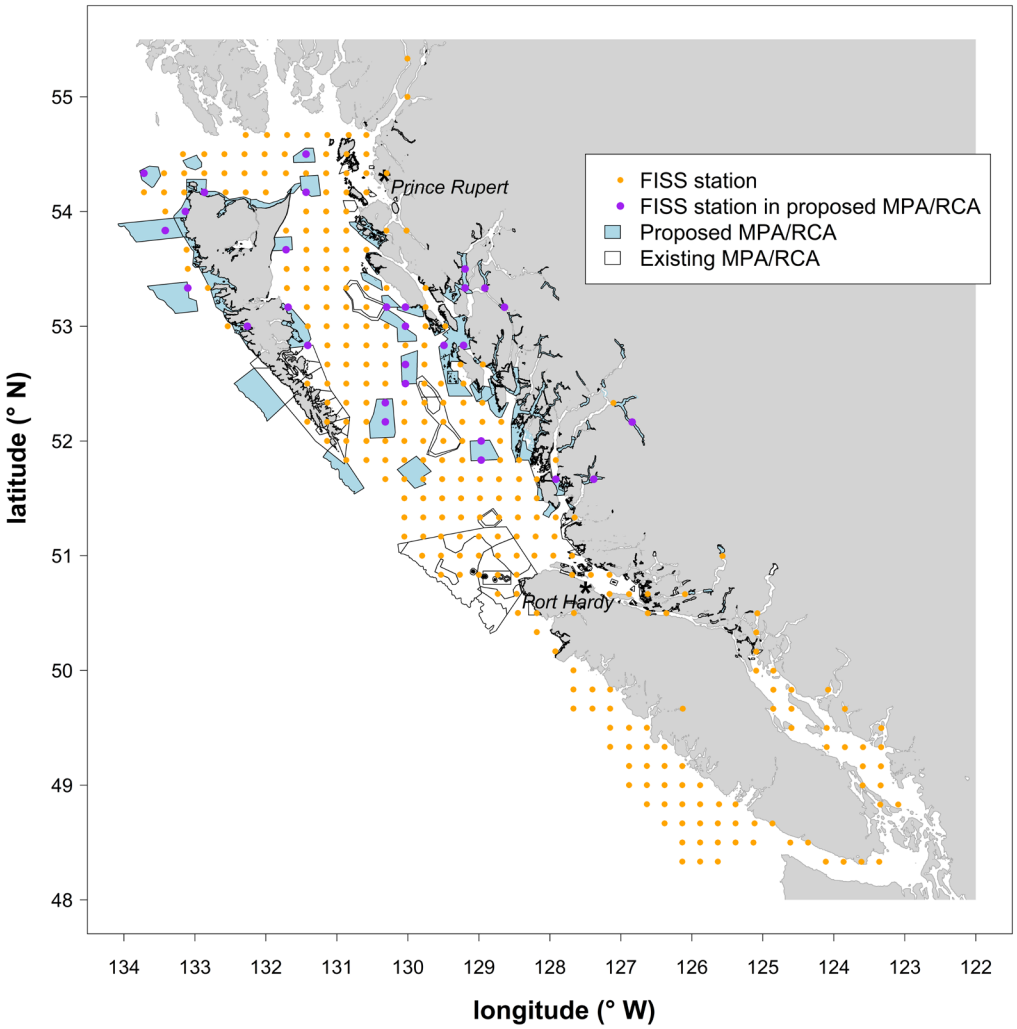

Figure 2: Overlap between locations of FISS stations and proposed area of the Northern Shelf Bioregion.

Trawl electronic monitoring

Pacific halibut length sampling protocol was developed in collaboration with industry, AMR, after discussions with IPHC. Pilot began on 3 vessels late September and will continue until fishing is complete. Data to be sent to IPHC and pending pilot review, expansion will be considered.

Halibut Advisory Board (HAB)

The Executive Director (Dr. Wilson) participates as a HAB member, with the Fisheries Regulations and Data Services Branch manager (Dr. Hutniczak) as the IPHC alternate. This relationship is expected to continue into the future given the HAB's contributions to the Canadian decision-making process.

7.3 United States of America

NOAA Fisheries

Management in IPHC Regulatory Area 2A

For the first time, the annual management measures for the non-tribal directed commercial fishery in IPHC Regulatory Area 2A were implemented by NOAA Fisheries. The process of transitioning management authority from the IPHC to NOAA Fisheries was initiated in 2019. The final rule (87 FR 74322) implementing the transition was published on 5 December 2022 and became effective on 4 January 2023. Details about the fishing periods and vessel limits were announced via NOAA Fisheries website. The IPHC Secretariat actively supported setting the measures by providing relevant data and sharing past experience.

The Secretariat has also established a data sharing agreement with NOAA Fisheries West Coast Region to access confidential data, including:

- All non-trawl logbook data submissions that include landings or discards of Pacific halibut, either sourced from the electronic application (FishVue Float) or paper logbooks, which are currently located in a data system maintained by the Pacific States Marine Fisheries Commission (PacStates); and
- All permit data for directed commercial fishery, recreational charter fishery, incidental salmon troll, and incidental longline sablefish fishery permits for Pacific halibut, which are currently located in a data system maintained by NOAA Fisheries.

These data are essential for efficient fulfilment of tasks related to collection of biological sampling and compiling log data for IPHC Regulatory Area 2A. Agreement has been signed on 16 October 2023 and is valid for five years.

Nomination of the Alaĝum Kanuux̂ (Heart of the Ocean) for consideration as a new national marine sanctuary

In June 2022, NOAA announced nomination of the Alaĝum Kanuux̂ (Heart of the Ocean) for consideration as a new national marine sanctuary (87 FR 34851), which was the first phase of the of the Pribilof Island Marine Island Ecosystem (PRIME) initiative. The IPHC will monitor the progress of the designation for potential implications for FISS survey.

North Pacific Fishery Management Council (NPFMC)

At the meeting in February 2023, the IPHC presented to the Council the outcomes of the 99th Session of the IPHC Annual Meeting (AM099) (B8 PPT).

At the meeting in February 2023, the Council adopted for final action to remove vessel cap limitations specified at 50 CFR Section 679.42(h)(1) for IFQ halibut harvested in Areas 4A, 4B, 4C and 4D through the 2027 fishing season. If the Council takes subsequent action to modify vessel cap limits in area 4, such action will supersede if implemented before 2027.

At the same meeting, the Council also moved to rescind the February 2022 D1 Halibut CSP Review Motion. The motion proposed a review of the Pacific halibut Catch Sharing Plan (CSP)

and the consideration of alternatives to address the impacts of charter management measures on the charter sector during times of lower abundance. It also noted that the preferred approach is compensated reallocation through the Recreational Quota Entity (RQE). The final action on establishing a fee collection program for charter vessel operators to fund the RQE was taken at the meeting in April 2022 (C2 CM).

At the meeting in October 2023, the Council requested (C3 CM) the Interagency [Pacific] Halibut DMR [discard mortality rates] workgroup review methods used to estimate halibut mortality with a particular focus on marine mammal feeding on discards per their recommendation, for all fisheries with marine mammal interactions in the Bering Sea and Aleutian Islands (BSAI) and the Gulf of Alaska (GOA).

At the meeting in December 2023, the Council is expected to recommend management measures (e.g., bag limits, size restrictions, day-of-the-week closures, etc.) for the charter halibut fisheries in IPHC Areas 2C and 3A for implementation in 2024.

Pacific Fishery Management Council (PFMC)

Incidental Catch Limits for Fixed Gear Sablefish Fisheries

Adopted in March 2023, the Council's final recommendation for the 2023 incidental Pacific halibut catch restrictions in the fixed gear fishery north of Point Chehalis beginning April 1 is 150 pounds of dressed weight halibut for every 1,000 pounds dressed weight of sablefish, plus 2 additional halibut in excess of the ratio, which was consistent with the Groundfish Advisory Subpanel recommendations.

Incidental Catch Limits for Salmon Troll Fishery

In April 2023, the Council adopted final incidental Pacific halibut catch limits as follows: Open May 16, 2023, through the end of the 2023 salmon troll fishery, and beginning April 1, 2024, until modified through in-season action or superseded by the 2024 management measures. License holders may land no more than one Pacific halibut per two Chinook, except one Pacific halibut may be landed without meeting the ratio requirement, and no more than 35 halibut landed per trip.

Scoping Topics for Catch Sharing Plan (CSP) and Regulation Changes

In response to the scoping topics report from June 2023 the Council asked for additional analysis on the following items:

1) Update and improve, where needed, the management objectives in the Pacific Halibut Catch Sharing Plan for each sector or sub-area with a specific allocation.
2) Request California review their fishery objectives to achieve a longer season (e.g., delay opening, open fewer days per week).
3) Expand the PFMC Pacific halibut Catch Sharing Plan's flexible inseason management provisions to allow transfer of projected unused quota between all WA, OR, and CA recreational sub-areas and commercial sectors after August 15.

4) Move 0.5 percent of the WA sport allocation and 1.0 percent of the OR sport allocation to the California sport sector in years when the 2A FCEY is 1.5 (option 1) or 1.3 (option 2) million pounds or greater.
5) Move 1 percent from the non-tribal WA sport allocation and 2 percent from the non-tribal OR sport allocation to the CA sport sector when the 2A FCEY is 1.5 (option 1) or 1.3 (option 2) million pounds or greater.
6) Regulatory changes as recommended by the Enforcement Consultants (Agenda Item E.1.a, Supp EC Report 1, June 2023).

At its September 2023 meeting, the Council continued their discussion from the June 2023 scoping exercise on potential changes to the Pacific Halibut CSP and adopted for public review options for the 2024 Pacific halibut non-tribal directed commercial fishery season structure (see decision summary document). Final Catch Sharing Plan and regulation changes for implementation in 2024 are scheduled for 5-6 November 2023

Bureau of Ocean Energy Management (BOEM) offshore wind planning activities

On 15 August 2023, the Bureau of Ocean Energy Management (BOEM) announced a 60-day public comment period on two draft Wind Energy Areas located in the existing Call Areas offshore southern Oregon. The Call was published in early 2022 to assess commercial interest in -- and obtain public input on -- potential wind energy leasing activities in federal waters off the coast of Oregon. The currently proposed area would total 219,568 acres, a reduction of 81% from BOEM's original Call. The IPHC reviewed the revised area in relation to its overlap with FISS (see Fig. 3). While the original Call encompassed eight stations, the currently proposed area does not overlap with any FISS station. There were also no Pacific halibut catches recorded in this area between 2013 and 2022.

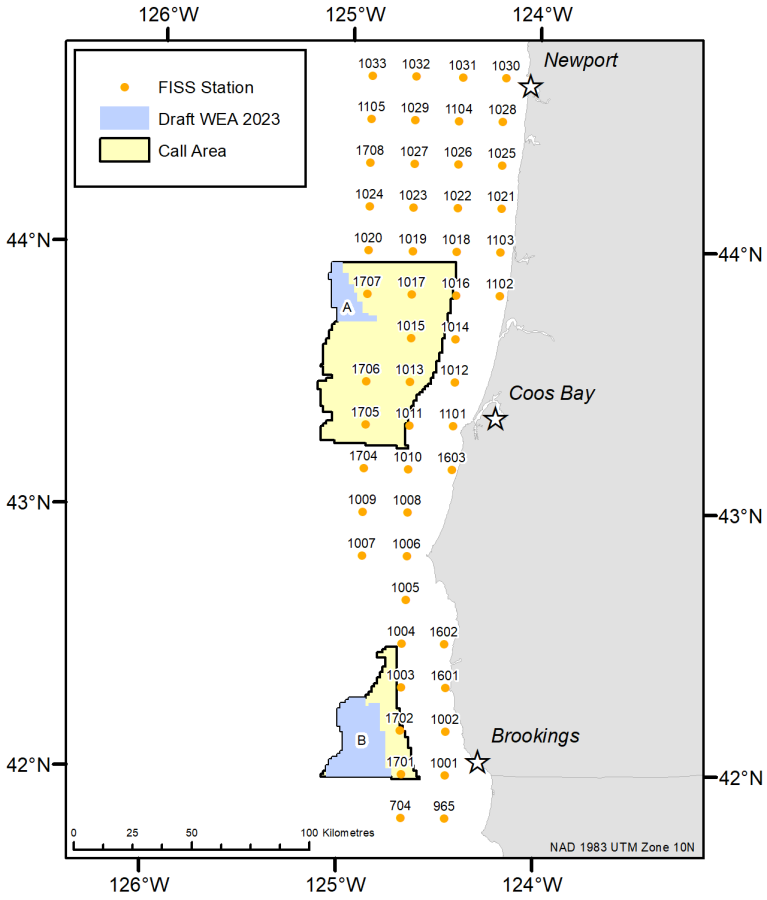

Figure 3. Overlap between locations of FISS stations and proposed area for offshore wind energy development off the Oregon Coast.

Alaska Fisheries Science Center (AFSC)

Pacific cod and Pacific spiny dogfish sampling agreement

NOAA Fisheries, through the Alaska Fisheries Science Center (AFSC), requested sex and length data from Pacific spiny dogfish and length data from Pacific cod from all FISS stations surveyed in 2023. The IPHC has been collecting these data from Pacific spiny dogfish since 2011, from Pacific cod in the Bering Sea since 2007 and from Pacific cod in the Gulf of Alaska (GOA) since 2017. In 2023, the IPHC FISS team collected so far 2,041 lengths of Pacific cod and 1,358 lengths/sex of Pacific spiny dogfish as a part of this agreement.

Data sharing agreement with the Fisheries Monitoring Division

The Secretariat has a standing data sharing agreement with the NOAA Alaska Fisheries Science Center Fisheries Monitoring Division to obtain confidential information from commercial fisheries observers and electronic monitoring systems, including haul information: fishing gear, location, date and time, lengths of specimens and species composition.

Northwest Fisheries Science Center (NWFSC)

The Secretariat has a standing data sharing agreement with the Northwest Fisheries Science Center to obtain confidential data from commercial fishing vessels observed by the West Coast

Groundfish Observer Program (WCGOP) or the At-sea Hake Observer Program (A-SHOP). This includes haul-level observer data: fishing vessel information, gear used, Pacific halibut catch, catch of other species, species biological data (e.g. length, weight, sex), mortality assessments, haul locations, tow or soak time duration, depth, date, and time.

State of Alaska Commercial Fisheries Entry Commission

The Secretariat has an active Memorandum of Understanding with the State of Alaska Commercial Fisheries Entry Commission (CFEC) which objective is to provide a framework in which the IPHC's commercial Pacific halibut landing record data may be utilized and published by CFEC.

Washington Department of Fish and Wildlife (WDFW)

Memorandum of Understanding – Rockfish

The objective of the Memorandum of Understanding with the WDFW is to 1) collect and utilize catch and biological sample data from species caught during FISS; 2) agree on how proceeds from the sale of Pacific halibut, rockfish and Pacific cod will be disbursed; and 3) lay forth the financial obligations associated with undertaking additional FISS stations, as requested by the WDFW, to survey rockfish populations off the Washington coastline.

In 2023, the IPHC sampled eight (8) additional stations at the request of the WDFW. The IPHC tagged 230 rockfish at sea, which were then sampled by WDFW staff during the offloads in Port Angeles, and Westport, WA. The costs incurred by these activities are 100% cost-recovered from the WDFW.

California Department of Fish and Wildlife (CDFW)

Data sharing agreement with California Department of Fish and Wildlife

The IPHC and the CDFW entered into a data sharing agreement for the purpose of tracking all Pacific halibut removals from within Convention waters. The agreement provides the Secretariat with access to commercial landing receipt data from California. The agreement, effective 16 June 2023, is valid for two years.

8 IPHC COMMUNICATIONS AND OUTREACH

8.1 IPHC Website

The IPHC Secretariat continues to develop new ways to display data and statistics for our stakeholders and other interested parties, focusing particularly on the addition of timely and useful visual displays such as those listed below.

1) **Directed commercial fisheries:**
   https://www.iphc.int/datatest/commercial-fisheries
2) **Fishery-independent setline survey (FISS):**
   https://www.iphc.int/data/datatest/fishery-independent-setline-survey-fiss
3) **Non-Directed Commercial Discard Mortality Fisheries:**
   https://www.iphc.int/data/datatest/non-directed-commercial-discard-mortality-fisheries

4) **Geospatial Data:**
   https://www.iphc.int/datatest/data/geospatial-data
5) **Recreational Fisheries:**
   https://www.iphc.int/data/datatest/pacific-halibut-recreational-fisheries-data
6) **Time Series Data Sets:**
   https://www.iphc.int/data/time-series-datasets
7) **Subsistence Fisheries:**
   https://www.iphc.int/datatest/subsistence-fisheries
8) **Water Column Profiler Data:**
   https://www.iphc.int/datatest/data/water-column-profiler-data

8.2 Annual Report

The 2022 Annual Report (1 January to 31 December 2022) was published on 28 March 2023 and is available for download from the IPHC website at the following link: https://www.iphc.int/uploads/pdf/ar/iphc-2023-ar2022-r.pdf

8.3 IPHC Circulars and Media Releases

2023 IPHC Circulars continue to serve as the formal inter-sessional communication mechanism for the Commission. Circulars are used to announce meetings of the Commission and its subsidiary bodies, as well as inter-sessional decisions made by the Commission. The following are those published in 2023, and a full list may be accessed via the following weblink: https://www.iphc.int/library/documents/category/circulars

Circular	Title/Subject	Date published
IPHC-2023-CR-001	Reports of the 99th Session of the IPHC Finance and Administration Committee (FAC099); 93rd Session of the IPHC Conference Board (CB093); 28th Session of the IPHC Processor Advisory Board (PAB028); and 99th Session of the IPHC Annual Meeting (AM099)	13 Feb 2022
IPHC-2023-CR-002	IPHC Rules of Procedure (2023)	13 Feb 2023
IPHC-2023-CR-003	Invitation to the 13th Special Session of the IPHC (SS013)	22 Feb 2023
IPHC-2023-CR-004	Invitation to the 18th Session of the IPHC Management Strategy Advisory Board (MSAB018)	11 Mar 2023
IPHC-2023-CR-005	Invitation to the 22nd Session of the IPHC Scientific Review Board (SRB022)	23 Mar 2023
IPHC-2023-CR-006	Publication of the IPHC Annual Report 2022 (IPHC-2023-AR2022-R)	28 Mar 2023
IPHC-2023-CR-007	Intersessional Decision & Report of the 13th Special Session of the Commission (SS013)	16 May 2023
IPHC-2023-CR-008	For Decision - 2023 FISS Design Amended	24 May 2023
IPHC-2023-CR-009	For Decision - Selection of Auditor for FY2023, FY2024 and FY2025 Statement Audits	25 May 2023
IPHC-2023-CR-010	Report of the 18th Session of the IPHC Management Strategy Advisory Board (MSAB018)	25 May 2023
IPHC-2023-CR-011	For Decision - Contracting Party Contributions for FY2024	26 May 2023
IPHC-2023-CR-012	Intersessional Decisions ID002-ID003 (For Information)	5 Jun 2023
IPHC-2023-CR-013	Intersessional Decisions ID004-ID006 (For Information)	5 Jun 2023
IPHC-2023-CR-014	Invitation to the 2023 Session of the IPHC Work Meeting (WM2023	21 Jun 2023

IPHC-2023-CR-015	Report of the 22nd Session of the IPHC Scientific Review Board (SRB022)	22 Jun 2023
IPHC-2023-CR-016	Invitation to the 23rd Session of the IPHC Scientific Review Board (SRB023)	26 Jun 2023
IPHC-2023-CR-017	Intersessional Decision ID007 (bait calibration study) (for information)	31 Jul 2023
IPHC-2023-CR-018	FOR DECISION – FY2024 Budget	4 Aug 2023
IPHC-2023-CR-019	Intersessional Decision ID008 – FY2024 Budget (For Information)	11 Aug 2023
IPHC-2023-CR-020	Invitation to the 24th Session of the IPHC Research Advisory Board (RAB024)	28 Aug 2023
IPHC-2023-CR-021	Invitation to the 99th Session of the IPHC Interim Meeting (IM099)	1 Sep 2023
IPHC-2023-CR-022	Report of the 23rd Session of the IPHC Scientific Review Board (SRB023)	26 Sep 2023
IPHC-2023-CR-023	IPHC Circular 2023-023 Invitation to the 100th Session of the IPHC Finance and Administrative Committee (FAC100), and the 100th Session of the IPHC Annual Meeting (AM100)	24 Oct 2023
IPHC-2023-CR-024	IPHC Circular 2023-024 Invitation to the 94th Session of the IPHC Conference Board (CB094), and the 29th Session of the IPHC Processor Advisory Board (PAB029)	25 Oct 2023
IPHC-2023-CR-025	For Decision – IPHC Rules of Procedure (2023)	26 Oct 2023

2023 IPHC Media Releases are the primary informal communication with all stakeholders. https://www.iphc.int/library/documents/category/media-releases

Circular	Title/Subject	Date published
IPHC-2023-MR-001	IPHC Media Release 2023-001 Call for Members to the IPHC Processor Advisory Board (PAB)	5 Jan 2023
IPHC-2023-MR-002	IPHC Media Release 2023-002 IPHC Regulatory Area 2A Pacific halibut fishery - new permit requirements for commercial and charter vessels from NOAA Fisheries	5 Jan 2023
IPHC-2023-MR-003	IPHC Media Release 2023-003 IPHC Requests Tenders for the 2023 Catch Protection Pilot Study (CPS)	11 Jan 2023
IPHC-2023-MR-004	IPHC Media Release 2023-004 Call for Members to the IPHC Processor Advisory Board (PAB) (In-person and remote electronic participation possible)	13 Jan 2023
IPHC-2023-MR-005	IPHC Media Release 2023-005 Completion of the 99th Session of the IPHC Annual Meeting (AM099)	9 Feb 2023
IPHC-2023-MR-006	IPHC Media Release 2023-006 IPHC Requests Tenders for the 2023 Catch Protection Pilot Study (CPS)	28 Feb 2023
IPHC-2023-MR-007	IPHC Media Release 2023-007 Notification of Potential Pacific Halibut Sales in 2023, Seeking Buyers Interested in Fish Sales from the IPHC Fishery-Independent Setline Survey (FISS)	9 Mar 2023
IPHC-2023-MR-008	IPHC Media Release 2023-008 Notification of IPHC Fishery-Independent Setline Survey (FISS) 2023 Contract Awards	13 Apr 2023
IPHC-2023-MR-009	IPHC Media Release 2023-009 Fishery-Independent Setline Survey (2023 FISS) Request for Tender	13 Apr 2023
IPHC-2023-MR-010	IPHC Media Release 2023-010 Fall 2023 Gear Comparison Study Request For Tender	9 Jun 2023

IPHC-2023-MR-011	IPHC Media Release 2023-011 First fishing period in the non-tribal directed commercial fishery in IPHC Regulatory Area 2A	26 Jun 2023
IPHC-2023-MR-012	IPHC Media Release 2023-012 Fall 2023 Bait Comparison Study Request for Tender	31 Jul 2023
IPHC-2023-MR-013	IPHC Media Release 2023-013 Call for proposals: IPHC 2023-24 Fishery Regulations process	25 Sep 2023
IPHC-2023-MR-014	IPHC Media Release 2023-014 Attention Salmon Processors - Chum and Pink Salmon Needed for the IPHC Fishery-Independent Setline Survey (FISS)	4 Oct 2023
IPHC-2023-MR-015	IPHC Media Release 2023-015 100th Year of the International Pacific Halibut Commission	24 Oct 2023

All interested persons are encouraged to request that their email addresses be added to IPHC distribution lists at the following link: https://www.iphc.int/form/media-and-news.

8.4 IPHC External engagement

There is a considerable amount of effort put into public outreach, attending conferences and meetings that enhance knowledge, contributing expertise to the broader scientific community through participation on boards and committees, and seeking further education and training. In 2023, much of this engagement continued to take place electronically due to the COVID-19 pandemic, but there were several meetings attended in-person.

Committees and external organisation appointments

North America:

1) *Technical Subcommittee (TSC) of the Canada-United States Groundfish Committee* - Dr. Josep Planas

Canada:

1) *Halibut Advisory Board* (Canada) - Dr. David Wilson (Dr. Basia Hutniczak – Alternate)

United States of America:

1) *Bering Sea/Aleutian Islands Plan Team* - Dr. Allan Hicks
2) *Bering Sea Fishery Ecosystem Plan Team* - Dr. Ian Stewart
3) *NPFMC Scientific and Statistical Committee* - Dr. Ian Stewart
4) *North Pacific Research Board Science Panel* - Dr. Josep Planas
5) *Pacific Council STAR Panel Review for Copper Rockfish in California, Rex Sole, and Shortspine Thornyhead - Dr. Allan Hicks*
6) *Fisheries Monitoring Science Committee (NOAA-Alaska)* – Dr. Ray Webster
7) *Interagency electronic reporting system for commercial fishery landings in Alaska (eLandings) Steering Committee – Dr. Basia Hutniczak*

Academic affiliations 2023

Affiliate Faculty:

1) Dr. Allan Hicks - University of Washington School of Aquatic and Fishery Sciences, Seattle, WA, USA
2) Dr. Ian Stewart - University of Washington School of Aquatic and Fishery Sciences, Seattle, WA, USA
3) Dr. Josep Planas - Alaska Pacific University, Anchorage, AK, USA

Graduate student committee member:

1) Dr. Allan Hicks - University of Massachusetts School for Marine Science & Technology, Dartmouth, MA, USA

2) Dr. Allan Hicks - University of Washington School of Aquatic & Fishery Sciences, Seattle, WA, USA
3) Dr. Ian Stewart - University of Washington School of Aquatic & Fishery Sciences, Seattle, WA, USA
4) Dr. Josep Planas - Alaska Pacific University, Anchorage, AK, USA

9 IPHC PUBLICATIONS IN 2023

9.1 Published peer-reviewed journal papers

Lomeli, M.J.M., Wakefield, W.W., Abele, M., **Dykstra, C.L.,** Herrmann, B., **Stewart, I.J.,** and G.C. Christie. 2023. Testing of hook sizes and appendages to reduce yelloweye rockfish bycatch in a Pacific halibut longline fishery. Ocean & Coastal Management 241. https://doi:10.1016/j.ocecoaman.2023.106664.

Planas, J.V., Rooper, C.N., Kruse, G.H. 2023. Integrating biological research, fisheries science and management of Pacific halibut (*Hippoglossus stenolepis*) across the North Pacific Ocean. Fisheries Research. 259: 106559. https://doi.org/10.1016/j.fishres.2022.106559.

9.2 In press peer-reviewed journal papers

Nil.

9.3 Submitted peer-review journal papers – In review

Dykstra, C., Wolf, N., Harris, B.P., **Stewart, I.J., Hicks, A.**, Restrepo. F., **Planas, J.V.** Letting Pacific halibut off the hook: relating capture and physiological conditions to viability and survival of fish discarded from commercial longline gear. Ocean & Coastal Management.

10 RECOMMENDATION

That the Commission:

1) **NOTE** paper IPHC-2023-IM099-04 which provides the Commission with a provisional update on activities of the IPHC Secretariat in 2023 not detailed in other papers before the Commission.

11 APPENDICES

Appendix I: IPHC Secretariat positions – Effective 1 October 2023

Appendix I
IPHC Secretariat positions – Effective 1 October 2023

(https://www.iphc.int/locations/map)

Branch	Sub-Section	Position	Current Employee
Executive	-	Executive Director	Dr Wilson, David
Executive	-	Assistant Director	Keikkala, Andrea
-	Port Operations Services	Port Operations Coordinator	Thom, Monica
-	Port Operations Services	Fisheries Data Specialist (Field)	Multiple Employees (9-10)
-	Fishery-Independent Setline Survey	Setline Survey Coordinator	Ualesi, Kayla
-	Fishery-Independent Setline Survey	Setline Survey Specialist	Rillera, Rachel
-	Fishery-Independent Setline Survey	Setline Survey Specialist	Jack, Tyler
-	Fishery-Independent Setline Survey	Setline Survey Specialist	Coll, Kevin
-	Fishery-Independent Setline Survey	Setline Survey Specialist (Field)	Multiple Employees (15-35)
Quantitative Sciences	-	Quantitative Scientist (Stock Assessment)	Dr Stewart, Ian
Quantitative Sciences	-	Quantitative Scientist (Management Strategy Evaluation)	Dr Hicks, Allan
Quantitative Sciences	-	Quantitative Scientist (Biometrician)	Dr Webster, Raymond
Finance and Personnel Services	Personnel Services	Administrative Specialist (Snr)	Chapman, Kelly
Finance and Personnel Services	Personnel Services	Administrative / Communications Specialist	Coluccio, Tara
Finance and Personnel Services	Personnel Services	Administrative Specialist	Wietecha, Ola
Finance and Personnel Services	Personnel Services	Administrative Specialist	Burkhalter, Lorissa
Finance and Personnel Services	Accounting Services	Accountants	Sommerville & Associates

Finance and Personnel Services	Technology Services	Systems Administrator	Tynes, Robert
Finance and Personnel Services	Technology Services	Information Technology Specialist (Application Developer)	Taheri, Afshin
Finance and Personnel Services	Technology Services	Information Technology Specialist (Application Developer)	Outsourced
Biological and Ecosystem Sciences	-	Branch Manager (BES)	Dr Planas, Josep
Biological and Ecosystem Sciences	-	Research Biologist (Mortality and Survivorship)	Dykstra, Claude
Biological and Ecosystem Sciences	-	Research Biologist Genetics	Jasonowicz, Andrew
Biological and Ecosystem Sciences	-	Research Biologist (Life History)	Jones, Colin
Biological and Ecosystem Sciences	-	Biological Science Laboratory Technician	Simchick, Crystal
Fisheries Regulations and Data Services	-	Branch Manager (FRDS)	Dr Hutniczak, Barbara
Fisheries Regulations and Data Services	Fisheries Data Services	Fisheries Data Coordinator	Tran, Huyen
Fisheries Regulations and Data Services	Fisheries Data Services	Fisheries Data Specialist (HQ-GIS)	Kong, Thomas
Fisheries Regulations and Data Services	Fisheries Data Services	Fisheries Data Specialist (HQ) & Otolith Technician	Sawyer Van Vleck, Kim
Fisheries Regulations and Data Services	Fisheries Data Services	Fisheries Data Specialist (HQ) & Otolith Technician	Magrane, Kelsey
Fisheries Regulations and Data Services	Otolith Aging Services	Otolith Laboratory Technician (Snr)	Forsberg, Joan
Fisheries Regulations and Data Services	Otolith Aging Services	Otolith Laboratory Technician	Johnston, Chris

Implementation of the Recommendations from the 2nd IPHC Performance Review (PRIPHC02)

PREPARED BY: IPHC SECRETARIAT (D. WILSON; 27 OCTOBER 2023)

To provide the Commission with an update on the implementation of the recommendations arising from the 2nd Performance Review of the IPHC (PRIPHC02).

BACKGROUND

The Report of the 2nd Performance Review of the IPHC (PRIPHC02), IPHC-2019-PRIPHC02-R (adopted on 11 October 2019) is available for download from the IPHC website: https://www.iphc.int/library/documents/post/iphc-2019-priphc02-r-report-of-the-2nd-performance-review-of-the-international-pacific-halibut-commission-priphc02

At the 96th Session of the IPHC Annual Meeting (AM096), the Commission:

> *(para. 137) "The Commission **NOTED** that the PRIPHC02 was carried out over the course of 2019 via three face-to-face meetings: one in Seattle, USA (4-6 June 2019), one in New York City, USA (25 August 2019) and one in Ottawa, Canada (7-11 October 2019). The Panel held several additional tele-conferences, both among themselves, and with stakeholders. The meeting was also supported by Independent Legal and Science Experts who each dedicated additional working days to providing technical reviews and reports on specific components of the review criteria relevant to their areas of expertise."*
>
> *(para 138) "The Commission **NOTED** para. 22 of the report which stated:*
>
> > *(para. 22) "The PRIPHC02 **CONGRATULATED** the Commission and Secretariat for the positive strides in response to the first performance review. Through the course of the consultations, document review and interviews, the panel saw consistent and significant improvements in transparency, availability and modernisation of documentation and background information, and heard resounding praise for this increased transparency and the movement away from previously "closed-door" and perceived "secretive" processes and decision-making."*
>
> *(para. 139) "The Commission **REQUESTED** that paper IPHC-2020-AM096-14 be reviewed intersessionally by each Contracting Party, with the intention of providing edits/additions, for endorsement. The IPHC Secretariat will facilitate this request by proposing intersessional meeting dates."*

During the 6th Special Session of the IPHC (SS06) held on 3 March 2020, the Commission:

> (para. 6) "*The Commission **ENDORSED** the recommendations, priorities, responsibilities, timelines and updates provided at Appendix B, and **AGREED** that these would be reported on at each IPHC meeting.*" (IPHC-2020-SS06-R)

DISCUSSION

The following is a summary of the status of each of the detailed updated provided in Appendix A.

PRIPHC02 Recommendation	Status
Completed and/or annually ongoing	18
In Progress	5
Pending (from Contracting Parties)	2
On-Hold (decision = no action to be taken)	1
Total	**26**

RECOMMENDATION

That the Commission **NOTE** paper IPHC-2023-IM099-05 that provides the Commission with an update on the implementation of the recommendations arising from the 2nd Performance Review of the IPHC (PRIPHC02).

APPENDICES

Appendix A: Table of recommendations arising from the PRIPHC02, including 1) priorities, 2) responsibilities, 3) timeline, and 4) any new updates on status.

Appendix A
RECOMMENDATIONS OF THE 2ND PERFORMANCE REVIEW OF THE INTERNATIONAL PACIFIC HALIBUT COMMISSION (PRIPHC02)

REF#	RECOMMENDATION	PRIORITY	RESPONSIBILITY	TIMELINE	UPDATE/STATUS
PRIPHC02 –Rec.01 (para. 32)	***Legal analysis of the IPHC Convention*** The PRIPHC02 **RECOMMENDED** that consideration be given to updating the Convention at the next opportunity, to become consistent with newer international legal instruments, and specifically consider including the following elements: a) – z)	N/A	N/A	N/A	**On-Hold:** At this time, the Contracting Parties have indicated that they do not wish to commence the process of updating the IPHC Convention. Thus, this Recommendation is on-hold until a decision is made to reopen it.
PRIPHC02 –Rec.02 (para. 33)	The PRIPHC02 **RECOMMENDED** to update the Convention, while in the interim period seek alternate mechanisms to implement international best practices and* legal principles. Commission directive: The Commission **RECOMMENDED** the exploration and implementation of alternate mechanisms to implement international best practices, such as revisions to the IPHC Rules of Procedure, IPHC Financial Regulations and IPHC Fishery Regulations.	N/A High	N/A Commission	N/A 2020-24	**N/A** **Completed** (2020, 2021, 2022, 2023): The IPHC Rules of Procedure (ROP) and the IPHC Financial Regulations (FR) will be periodically updated (at least once every 2 years) and where possible, should accommodate applicable improvements as recommended in the legal review of the IPHC Convention.
PRIPHC02 –Rec.03 (para. 44)	***Science: Status of living marine resources*** The PRIPHC02 **RECOMMENDED** that opportunities to engage with western Pacific halibut science and management agencies be sought, to strengthen science links and data exchange. Specifically, consider options to investigate pan-Pacific stock structure and migration of Pacific halibut.	High	IPHC Secretariat	2020-24	**Ongoing**: There are three non-Contracting Parties who exploit Pacific halibut: Russia, Japan, and Rep. of Korea. Most recently we have engaged Russian scientists working on Pacific halibut through PICES (https://meetings.pices.int/). We will continue to explore this avenue via PICES, noting that COVID-19 has hindered/delayed interactions to a certain degree.

REF#	RECOMMENDATION	PRIORITY	RESPONSIBILITY	TIMELINE	UPDATE/STATUS
PRIPHC02 –Rec.04 (para. 45)	The PRIPHC02 **RECOMMENDED** that: a) further efforts be made to lead and collaborate on research to assess the ecosystem impacts of Pacific halibut fisheries on incidentally caught species (retained and/or discarded); b) where feasible, this research be incorporated within the IPHC's 5-Year Research Plan (https://www.iphc.int/uploads/pdf/besrp/2019/iphc-2019-besrp-5yp.pdf); c) findings from the IPHC Secretariat research and that of the Contracting Parties be readily accessible via the IPHC website.	Medium	IPHC Secretariat	2020-24	**Completed & Ongoing**: The IPHC's work in this area has been limited to date. However, some efforts to incorporate ecosystem considerations into the MSE work has commenced.
PRIPHC02 –Rec.05 (para. 63)	***Science: Quality and provision of scientific advice*** The PRIPHC02 **RECOMMENDED** that simplified materials be developed for RAB and especially MSAB use, including training/induction materials.	High	IPHC Secretariat	2020-24	**Completed & Ongoing**: The IPHC Secretariat continues to seek ways to ensure broad stakeholder understanding of our work. For the MSAB and associated MSE work, an interactive web-based tool has been developed to provide a user friendly means to explore and understand the utility of MSE and the simulation results arising. See paper **IPHC-2023-AM099-13** for the latest iteration. MSE Explorer tool: https://www.iphc.int/management/science-and-research/management-strategy-evaluation
PRIPHC02 –Rec.06 (para. 64)	The PRIPHC02 **RECOMMENDED** that consideration be given to amending the Rules of Procedure to include appropriate fixed terms of service to ensure SRB peer review remains independent and fresh; a fixed term of three years seems appropriate, with no more than one renewal.	Medium	Commission; IPHC Secretariat	2020	**Completed**: The IPHC Secretariat provided the Commission with revised Rules of Procedure for consideration at AM096, which included a two-term limit. This was adopted by the Commission and is now in force. See **IPHC Rules of Procedure.**

REF#	RECOMMENDATION	PRIORITY	RESPONSIBILITY	TIMELINE	UPDATE/STATUS
PRIPHC02 –Rec.07 (para. 65)	The PRIPHC02 **RECOMMENDED** that the peer review process be strengthened through expanded subject specific independent reviews including data quality and standards, the FISS, MSE, and biological/ecological research; as well as conversion of "grey literature" to primary literature publications. The latter considered important to ongoing information outreach efforts given the cutting-edge nature of the Commission's scientific work.	High	Commission; IPHC Secretariat	2020-24	**Completed & Ongoing**: The Commission approved peer review of the IPHC stock assessment which was **concluded** in 2019, the IPHC MSE which was concluded on 25 September 2020. See **IPHC-2020-CR-022**. The Commission has indicated its strong support topic-based peer review moving forward.
PRIPHC02 –Rec.08 (para. 66)	The PRIPHC02 **RECOMMENDED** that the IPHC Secretariat develop options for simple graphical summaries (i.e. phase plot equivalents) of fishing intensity and spawning stock biomass for provision to the Commission.	High	IPHC Secretariat	2020	**Completed**: The IPHC Secretariat now includes both time-series' and phase plots of management-related quantities See paper **IPHC-2023-AM099-11** for the latest iteration.
PRIPHC02 –Rec.09 (para. 73)	***Conservation and Management: Data collection and sharing*** The PRIPHC02 **RECOMMENDED** that observer coverage be adjusted to be commensurate with the level of fishing intensity in each IPHC Regulatory Area. Commission directive: The Commission **RECOMMENDED** that the IPHC Secretariat, in consultation with the Commission, develop minimum data collection standards for Pacific halibut by scientific observer programs. The intention would be for the Commission to review and approve the minimum standards, and recommend them for implementation by domestic agencies.	N/A High	N/A Contracting Parties	N/A 2020-24	**N/A** **In progress**: The Contracting Parties have yet to engage on this recommendation. See paper: **IPHC-2023-AM099-16**.
PRIPHC02 –Rec.10 (para. 82)	***Conservation and Management: Consistency between scientific advice and fishery Regulations adopted*** The PRIPHC02 **RECOMMENDED** that the development of MSE to underpin multi-year (strategic) decision-making be continued, and as multi-year decision making is implemented, current Secretariat capacity usage for annual stock assessments should be refocused on research to investigate MSE operating model development (including consideration of biological and fishery uncertainties) for future MSE iterations and regularised multi-year stock assessments.	High	IPHC Secretariat; Commission	2021-24	**Completed**: MSE products, including the evaluation of multi-year (biennial and triennial) management procedures, were delivered to the MSAB017, and are to be presented at AM099 in January 2023. Evaluating multi-year stock assessments was a priority task in the MSE program of work for 2021-2023.

REF#	RECOMMENDATION	PRIORITY	RESPONSIBILITY	TIMELINE	UPDATE/STATUS
PRIPHC02 –Rec.11 (para. 83)	The PRIPHC02 **RECOMMENDED** that ongoing work on the MSE process be prioritised to ensure there is a management framework/procedure with minimal room for ambiguous interpretation, and robust pre-agreed mortality limit setting frameworks.	High	IPHC Secretariat; Commission	2020-21	**In progress**: ***Next steps***: The Commission to formally adopt a harvest strategy.
PRIPHC02 –Rec.12 (para. 88)	***Fishing allocations and opportunities*** The PRIPHC02 **STRONGLY URGED** the Commission to conclude its MSE process and **RECOMMENDED** it meet its 2021 deadline to adopt a harvest strategy.	High	Commission; IPHC Secretariat	2020-21	**In progress**: See paper IPHC-2023-AM099-13 for the latest update. ***Next steps***: The Commission to formally adopt a harvest strategy.
PRIPHC02 –Rec.13 (para. 96)	***Compliance and enforcement: Port State measures*** The PRIPHC02 **RECOMMENDED** that Contracting Party enforcement agencies adopt common standards for assessment of implementation of the principles of port State measures.	Medium	Contracting Parties	2020-24	**Pending**: To be incorporated into the Contracting Party National Reports at each Annual Meeting. Next National Report will be provided by each Contracting Party for the AM100.
PRIPHC02 –Rec.14 (para. 105)	***Compliance and enforcement: Monitoring, control and surveillance (MCS)*** The PRIPHC02 **RECOMMENDED** enhancement of coordination of MCS activities to result in a common, integrated enforcement report for each Contracting Party to facilitate assessment of compliance efforts, trends and input into management decisions.	Medium	Contracting Parties	2021-24	**Pending**: To be incorporated into the Contracting Party National Reports at each Annual Meeting. Next National Report will be provided by each Contracting Party for the AM100.
PRIPHC02 –Rec.15 (para. 106)	The PRIPHC02 **RECOMMENDED** that the Commission re-assess the 'derby-style' fisheries management concept in operation in IPHC Regulatory Area 2A in terms of available resources, impact on validity of monitoring results, and safety of fishers, and amend the management processes, if and as necessary.	High	IPHC Secretariat; NOAA-Fisheries	2022	**Completed**: The IPHC Secretariat passed management of the 2A fishery to NOAA-Fisheries at the end of 2022, following a movement to a longer fishing period. 2023 was the first year that IPHC has not managed the day-to-day operations of the fishery.
PRIPHC02 –Rec.16 (para. 108)	***Compliance and enforcement: Follow-up on infringements*** The PRIPHC02 **RECOMMENDED** that the IPHC request information regarding Contracting Party follow-up of infringements, to assist in determining the overall efficacy of MCS and enforcement activities. This would support best practices with respect to transparency.	High	IPHC Secretariat; Commission; Contracting Parties	2020	**Ongoing**: The IPHC Secretariat has requested this information be provided by domestic agencies via the Contracting Party National Reports to the Commission.

REF#	RECOMMENDATION	PRIORITY	RESPONSIBILITY	TIMELINE	UPDATE/STATUS
PRIPHC02 –Rec.17 (para. 109)	The PRIPHC02 **RECOMMENDED** that the Commission improve the process of Contracting Party reporting to the Commission by aggregating individual agency reports into a consolidated, standardised, Contracting Party report to the Commission.	Medium	IPHC Secretariat; Contracting Parties	2020	**Completed**: The IPHC Secretariat made this request in 2020. Consolidated Contracting Party National Reports are now the standard.
PRIPHC02 –Rec.18 (para. 124)	***Governance: Decision-making*** The PRIPHC02 **RECOMMENDED** that the IPHC Rules of Procedure be modified to include a clear category and recognition for observer organisations, which would be in addition to the general public.	Low	IPHC Secretariat	2020-21	**Completed**: IPHC Rules of Procedure (2020) published on 7 February 2020.
PRIPHC02 –Rec.19 (para. 128)	***Governance: Dispute settlement*** The PRIPHC02 **RECOMMENDED** updating the rules of procedure to reflect intersessional decision-making approaches.	Medium	IPHC Secretariat	2020-21	**Completed**: IPHC Rules of Procedure (2020) published on 7 February 2020. Further amendments were made in 2021.
PRIPHC02 –Rec.20 (para. 137)	***Governance: Transparency*** The PRIPHC02 **RECOMMENDED** that the significant level of transparency achieved across Commission business continue to be improved.	High	Commission; IPHC Secretariat;	2020-24	**Completed & Ongoing**: Monitor progress through the annual IPHC meeting cycle and improve as identified. In June of 2022, the SRB made the following noting and recommendation of relevance: SRB020–Rec.05 (para. 36) The SRB **NOTED** the exceptional level of transparency and commitment to the principles of open science represented by the Secretariat's data and code-sharing practices and, therefore, **RECOMMENDED** that the Secretariat consider producing peer-reviewed data report publications, which would (a) enhance outreach to potential external data users and (b) allow for tracking external use of IPHC data and resources.
PRIPHC02 –Rec.21 (para. 146)	***International cooperation: Relationship to non-Contracting Parties*** The PRIPHC02 **RECOMMENDED** that the Commission prioritise scientific work to confirm the full range of the Pacific halibut stock.	High	IPHC Secretariat;	2020-24	**In progress**: There are three non-Contracting Parties who exploit Pacific halibut: Russia, Japan, and Rep. of Korea. Most recently we have engaged Russian scientists working on Pacific halibut through PICES (https://meetings.pices.int/).

REF#	RECOMMENDATION	PRIORITY	RESPONSIBILITY	TIMELINE	UPDATE/STATUS
PRIPHC02 –Rec.22 (para. 147)	The PRIPHC02 **RECOMMENDED** that if the full range of the Pacific halibut stock extends outside the Convention Area, the Contracting Parties invite collaboration with all parties involved in the harvest of this stock, to ensure science and management includes accurate data regarding all removals from the stock.	Low/ Medium	IPHC Secretariat	2020-24	**In progress**: The IPHC Secretariat is engaging with other countries harvesting Pacific halibut via PICES as a first step. Known harvesters are Russia, Japan, and Rep. of Korea, with the latter two harvesting very minor levels at the extremity of Pacific halibut distribution in the western Pacific.
PRIPHC02 –Rec.23 (para. 156)	***Efficiency and transparency of financial and administrative management: Availability of resources for IPHC activities*** The PRIPHC02 **RECOMMENDED** the continued establishment of a Business Continuity Plan (BCP), which will serve to strengthen the long-term viability of IPHC Secretariat functioning and accountability, in line with best practices of an organisation of its size and breadth. Prioritising a financial and administrative BCP, with the ultimate goal of establishing a comprehensive BCP for the IPHC Secretariat as a whole.	High	IPHC Secretariat; FAC	2020	**Completed**: The IPHC Secretariat has developed and implemented a BCP. Periodic review will ensure BC is maintained.
PRIPHC02 –Rec.24 (para. 162)	***Efficiency and transparency of financial and administrative management: Efficiency and cost-effectiveness*** The PRIPHC02 **RECOMMENDED** the FAC produce a report detailing the actual FAC meeting and that the presentation of the report be incorporated into the Annual Meeting agenda and report, along with the final decisions of the Commission.	High	FAC; IPHC Secretariat	2020-24	**Completed**: The first report of the IPHC Finance and Administration Committee (FAC) was adopted on 4 February 2020, and presented to the Commission at its 96th Session for consideration.
PRIPHC02 –Rec.25 (para. 165)	***Efficiency and transparency of financial and administrative management: Advisory structure*** The PRIPHC02 **RECOMMENDED** that when revisiting PRIPHC01 Recommendation 3.1 on unifying subsidiary bodies, treat the CB and PAB as non-science process and maintain separated RAB and MSAB at least until the 2021 adoption and implementation of a new management strategy.	N/A	Commission	N/A	**Completed & Ongoing**: The Commission agreed to keep the two subsidiary bodies separate moving forward.
PRIPHC02 –Rec.26 (para. 166)	The PRIPHC02 **RECOMMENDED** that continued support for high quality stakeholder engagement through the science-focused subsidiary bodies (RAB and MSAB) or any future subsidiary bodies be maintained.	High	Commission; IPHC Secretariat	2020-24	**Completed & Ongoing**: The Commission agreed to keep the two subsidiary bodies separate moving forward, and for them to be enhanced wherever feasible.

INTERNATIONAL PACIFIC HALIBUT COMMISSION 5-YEAR PROGRAM OF INTEGRATED RESEARCH AND MONITORING (2022-26): UPDATES

PREPARED BY: IPHC SECRETARIAT (D. WILSON, J. PLANAS, I. STEWART, A. HICKS, B. HUTNICZAK, AND R. WEBSTER; 27 OCTOBER 2023)

PURPOSE

To provide the Commission with an annual opportunity to comment and amend the IPHC's 5-year Program of Integrated Research and Monitoring (2022-26) (the Plan).

BACKGROUND

Recalling that:

a) the IPHC Secretariat conducts activities to address key issues identified by the Commission, its subsidiary bodies, the broader stakeholder community, and the IPHC Secretariat;

b) the process of identifying, developing, and implementing the IPHC's science-based activities involves several steps that are circular and iterative in nature, but result in clear project activities and associated deliverables;

c) the process includes developing and proposing projects based on direct input from the Commission, the experience of the IPHC Secretariat given its broad understanding of the resource and its associated fisheries, and concurrent consideration by relevant IPHC subsidiary bodies, and where deemed necessary, including by the Commission, additional external peer review;

d) the IPHC Secretariat commenced implementation of the new Plan in 2022 and will keep the Plan under review on an ongoing basis.

Also recalling that an overarching goal of the IPHC 5-year Program of Integrated Research and Monitoring (2022-26) is to promote integration and synergies among the various research and monitoring activities of the IPHC Secretariat in order to improve knowledge of key inputs into the Pacific halibut stock assessment, and Management Strategy Evaluation (MSE) processes, thereby providing the best possible advice for management decision making processes.

The 1st iteration of the Plan was formally presented to the Commission at IM097 in November 2021 (IPHC-2021-IM097-12) for general awareness of the documents ongoing development. At the 98th Session of the IPHC Annual Meeting (AM098) in January 2022, the Commission requested a number of amendments which were subsequently incorporated.

The Plan had already been through two cycles of review and improvement with the Scientific Review Board (SRB).

In 2023, the plan went through two further cycles of review and improvement with the SRB, with amendments being suggested and incorporated accordingly. The current version will move to an annual comment and amendment process at each years' Interim and then Annual Meetings.

DISCUSSION

The Commission should note that:

a) the intention is to ensure that the new integrated plan is kept as a '*living plan*', and is reviewed and updated annually based on the resources available to undertake the work of the Commission (e.g. internal and external fiscal resources, collaborations, internal expertise);

b) the plan focuses on core responsibilities of the Commission; and any redirection provided by the Commission;

c) each year the SRB may choose to recommend modifications to the current Plan, and that any modifications subsequently made would be documented both in the Plan itself, and through reporting back to the SRB and then the Commission.

At the 22nd Session of the Scientific Review Board (SRB022) in June 2023, the SRB provided the following recommendation to the Commission.

> ***International Pacific Halibut Commission 5-year program of integrated research and monitoring (2022-26)***
>
> *SRB022–Rec.01 (para. 15) The SRB **NOTED** the reporting table draft provided by the Contracting Parties (Appendix A of paper IPHC-2023-SRB022-05) and **RECOMMENDED** further modification by adding the following and as shown in Table 1 below:*
>
> *a) New Column: Brief description of the project and how it relates to the core mandate of the Commission;*
>
> *b) Description of the problem being addressed;*
>
> *c) Objective: List of concise objectives (research and how the results will be incorporated);*
>
> *d) Impact scale and timing;*
>
> *e) Interim performance/evaluation metrics.*

At the 2023 Work Meeting of the Commission, the template (provided at Appendix V of the Plan attached) was considered and tentatively agreed to by the Commission. As we prepare for the Annual Meeting we have commenced populating the table which will be provide in full to the AM100.

Other Updates: Minor updates throughout.

5.2.3 Age composition data (both fishery-dependent and fishery-independent)

The annually collected biological samples from commercial fisheries and FISS include otoliths, a crystalline calcium carbonate structure found in the inner ear of fish which growth patterns can be analyzed to estimate the age of fish. Fish age is a key input to stock assessment models that inform management decisions related to fish exploitation. Since inception, the IPHC aged over 1.5 million otoliths manually by trained readers under the stereoscopic microscope.

6.2.3 Age composition data (both fishery-dependent and fishery-independent)

The IPHC Secretariat is looking at options for supplementing current Pacific halibut ageing protocol with automatized ageing that does not require extensive otolith-reader training. The IPHC is investigating the potential use of artificial intelligence (AI) for determining the age of Pacific halibut from images of collected otoliths. The Secretariat is in the process of initializing creation of a database of pictures with expert-provided labels, utilizing previously aged otoliths, and assessing the option for the development of a Convolutional Neural Network (CNN) model specifically designed for image classification to determine Pacific halibut age. The goal is to create an AI-based age determination system that complements traditional methods for reliable fish stock assessment and management advice.

RECOMMENDATION

That the Commission:

1) **NOTE** paper IPHC-2023-IM099-06 which provides the latest iteration of the IPHC 5-year program of Integrated Research and Monitoring (2022-26).

APPENDICES

Appendix A: Updated: IPHC 5-year program of Integrated Research and Monitoring (2022-26)

APPENDIX A

INTERNATIONAL PACIFIC HALIBUT COMMISSION

5-YEAR PROGRAM OF INTEGRATED RESEARCH AND MONITORING

(2022 - 2026)

INTERNATIONAL PACIFIC

HALIBUT COMMISSION

Commissioners

Canada	United States of America
Paul Ryall	Jon Kurland
Neil Davis	Robert Alverson
Peter DeGreef	Richard Yamada

Executive Director

David T. Wilson, Ph.D.

BIBLIOGRAPHIC ENTRY

IPHC 2023. International Pacific Halibut Commission 5-Year program of integrated research and monitoring (2022-26). Seattle, WA, U.S.A. *IPHC–2023-5YPIRM, 58 pp.*

INTERNATIONAL PACIFIC HALIBUT COMMISSION

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ACRONYMS

AM	Annual Meeting
CB	Conference Board
DMR	Discard Mortality Rate
FAC	Finance and Administration Committee
FISS	Fishery-Independent Setline Survey
FSC	First Nations Food, Social, and Ceremonial [fishery]
IM	Interim Meeting
IPHC	International Pacific Halibut Commission
MSAB	Management Strategy Advisory Board
MSE	Management Strategy Evaluation
OM	Operating Model
PAB	Processor Advisory Board
PDO	Pacific Decadal Oscillation
PHMEIA	Pacific halibut multiregional economic impact assessment [model]
QAQC	Quality assurance/quality control
RAB	Research Advisory Board
SHARC	Subsistence Halibut Registration Certificates
SRB	Scientific Review Board
TCEY	Total Constant Exploitation Yield
U.S.A.	United States of America
WM	Work Meeting

DEFINITIONS

A set of working definitions are provided in the IPHC Glossary of Terms and abbreviations: https://iphc.int/the-commission/glossary-of-terms-and-abbreviations

TABLE OF CONTENTS

EXECUTIVE SUMMARY

An overarching goal of the *IPHC 5-Year Program of Integrated Research and Monitoring (2022-26)* is to promote integration and synergies among the various research and support activities of the IPHC Secretariat in order to improve our knowledge of key inputs into the Pacific halibut stock assessment and Management Strategy Evaluation (MSE) processes, and to provide the best possible advice for management decision-making processes.

Along with the implementation of the short- and medium-term activities contemplated in this *IPHC 5-Year Program of Integrated Research and Monitoring (2022-26)*, and in pursuit of the overarching objective, the IPHC Secretariat will also aim to:

1) undertake cutting-edge research programs in fisheries research in support of Pacific halibut fisheries management;
2) undertake groundbreaking methodological research;
3) undertake applied research;
4) establish new collaborative agreements and interactions with research agencies and academic institutions;
5) promote the international involvement of the IPHC by continued and new participation in international scientific organizations and by leading international science and research collaborations;
6) effectively communicate IPHC research outcomes;
7) incorporate talented students and early researchers in research activities contemplated.

The research and monitoring activities conducted by the IPHC Secretariat are directed towards fulfilling the following four (4) objectives within areas of data collection, biological and ecological research, stock assessment, and Management Strategy Evaluation (MSE). In addition, the IPHC responds to Commission requests for additional inputs to management and policy development which are classified under management support.

The Secretariat's success in implementing the *IPHC 5-Year Program of Integrated Research and Monitoring (2022-26)* will be measured according to the following criteria relevant to the stock assessment, the MSE and for all inputs to IPHC management:

1) Timeliness – was the research conducted, analyzed, published, and provided to the Commission at the appropriate points to be included in annual management decisions?
2) Accessibility – was the research published and presented in such a way that it was available to other scientists, stakeholders, and decision-makers?
3) Relevance – did the research improve the perceived accuracy of the stock assessment, MSE, or decisions made by the Commission?
4) Impact – did the research allow for more precision or a better estimate of the uncertainty associated with information for use in management?
5) Reliability – has the research resulted in more consistent information provided to the Commission for decision-making?

1. Introduction

The International Pacific Halibut Commission (IPHC) is a public international organization so designated via Presidential Executive Order 11059 and established by a Convention between Canada and the United States of America. The IPHC Convention was signed on 2 March 1923, ratified on 21 July 1924, and came into effect on 21 October 1924 upon exchange. The Convention has been revised several times since, to extend the Commission's authority and meet new conditions in the fishery. The most recent change occurred in 1979 and involved an amendment to the 1953 Halibut Convention. The 1979 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 fisheries are conducted, and redefined the role of IPHC in the management of the fishery. Canada does not require specific enabling legislation to implement the protocol.

The basic texts of the Commission are available on the IPHC website: https://www.iphc.int/the-commission, and prescribe the mission of the organization as:

*"..... **to develop the stocks of [Pacific] 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**. ....." IPHC Convention*, Article I, sub-article I, para. 2). The IPHC Convention Area is detailed in Fig. 1.

The IPHC Secretariat, formed in support the Commission's activities, is based in Seattle, WA, U.S.A. As its shared vision, ***the IPHC Secretariat aims to deliver positive economic, environmental, and social outcomes for the Pacific halibut resource for Canada and the U.S.A. through the application of rigorous science, innovation, and the implementation of international best practice.***

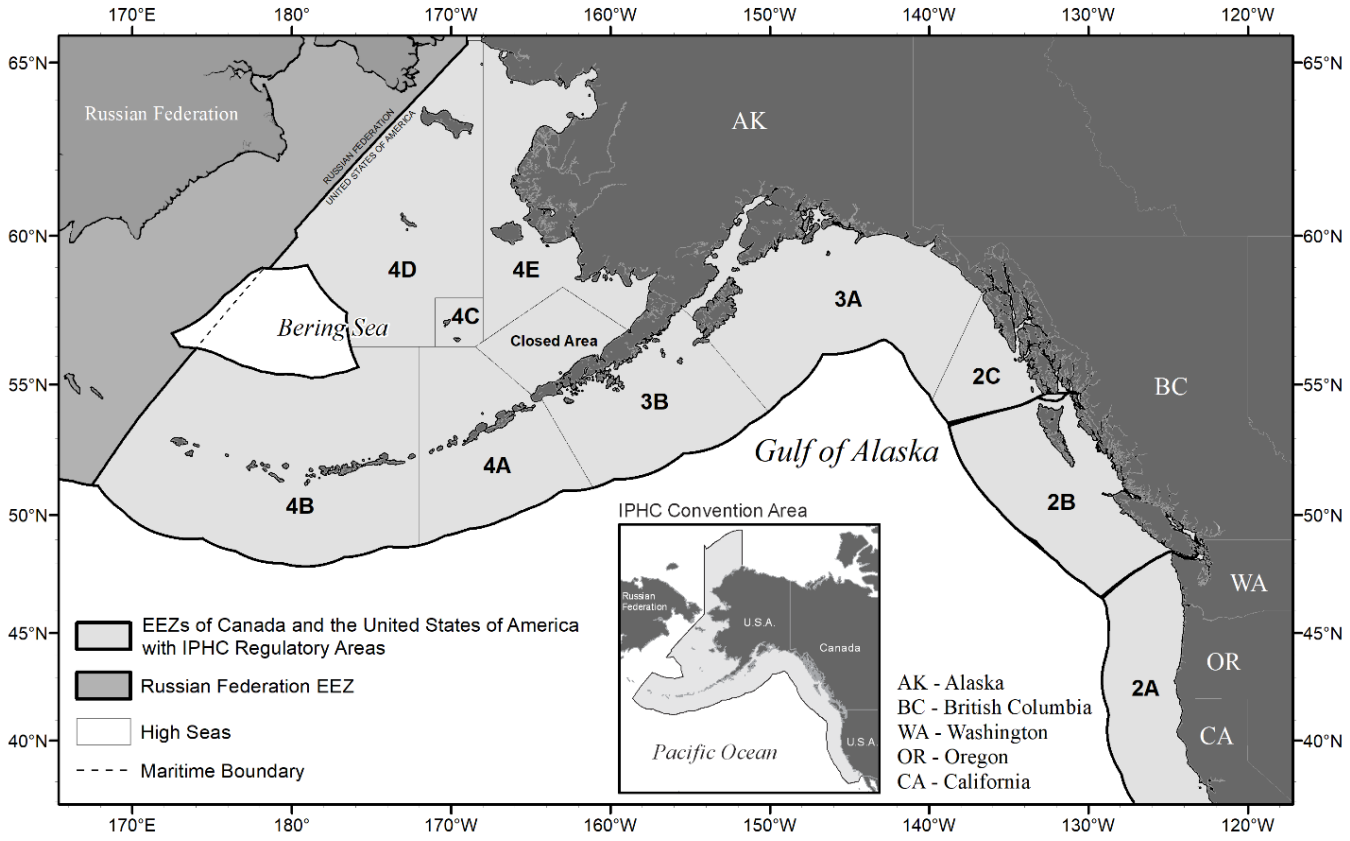

Figure 1. Map of the IPHC Convention Area (map insert) and IPHC Regulatory Areas.

2. Objectives

The IPHC has a long-standing history (since 1923) of collecting data, undertaking research, and stock assessment, devoted to describing and understanding the Pacific halibut (*Hippoglossus stenolepis*) stock and the fisheries that interact with it.

The IPHC Secretariat conducts activities to address key issues identified by the Commission, its subsidiary bodies, the broader stakeholder community, and of course, the IPHC Secretariat itself. The process of identifying, developing, and implementing our science-based activities involves several steps that are circular in nature, but result in clear research activities and associated deliverables. The process includes developing and proposing projects based on direct input from the Commission, the experience of the IPHC Secretariat given our broad understanding of the resource and its associated fisheries, and concurrent consideration by relevant IPHC subsidiary bodies, and where deemed necessary, additional external peer review.

Over the last five years (2017-2021), the research conducted by the IPHC Secretariat has been guided by a 5-Year Biological and Ecosystem Science Research Plan (IPHC–2019–BESRP-5YP) that aimed at improving knowledge on the biology of Pacific halibut in order to improve the accuracy of the stock assessment and in the management strategy evaluation (MSE) process. The IPHC-2019-BESRP-5YP contemplated research activities in five focal areas, namely Migration and Distribution, Reproduction, Growth and Physiological Condition, Discard Mortality Rates and Survival, and Genetics and Genomics. Research activities were highly integrated with the needs of stock assessment and MSE by their careful alignment with biological uncertainties and parameters, and the resulting prioritization (Appendix I). The outcomes of the IPHC-2019-BESRP-5YP have provided key inputs into stock assessment and the MSE process and, importantly, have provided foundational information for the successful pursuit of continuing and novel objectives within the new 5-Year Program of Integrated Research and Monitoring (2022-2026) (5YPIRM) (Appendix I).

The 2nd Performance Review of the IPHC (IPHC-2019-PRIPHC02-R), carried out over the course of 2019, also provided a range of recommendations to the Commission on ways in which it could continue to improve on the quality of scientific advice being provided to the Commission. There were nine (9) specific recommendations as provided below:

Science: Status of living marine resources

PRIPHC02–Rec.03 (para. 44) The PRIPHC02 ***RECOMMENDED*** *that opportunities to engage with western Pacific halibut science and management agencies be sought, to strengthen science links and data exchange. Specifically, consider options to investigate pan-Pacific stock structure and migration of Pacific halibut.*

PRIPHC02–Rec.04 (para. 45) The PRIPHC02 ***RECOMMENDED*** *that:*

a) further efforts be made to lead and collaborate on research to assess the ecosystem impacts of Pacific halibut fisheries on incidentally caught species (retained and/or discarded);
b) where feasible, this research be incorporated within the IPHC's 5-Year Research Plan (https://www.iphc.int/uploads/pdf/besrp/2019/iphc-2019-besrp-5yp.pdf);
c) findings from the IPHC Secretariat research and that of the Contracting Parties be readily accessible via the IPHC website.

Science: Quality and provision of scientific advice

PRIPHC02–Rec.05 (para. 63) The PRIPHC02 ***RECOMMENDED*** *that simplified materials be developed for RAB and especially MSAB use, including training/induction materials.*

PRIPHC02–Rec.06 (para. 64) The PRIPHC02 ***RECOMMENDED*** *that consideration be given to amending the Rules of Procedure to include appropriate fixed terms of service to ensure SRB peer review remains independent and fresh; a fixed term of three years seems appropriate, with no more than one renewal.*

PRIPHC02–Rec.07 (para. 65) The PRIPHC02 ***RECOMMENDED*** *that the peer review process be strengthened through expanded subject specific independent reviews including data quality and standards, the FISS, MSE, and biological/ecological research; as well as conversion of "grey literature" to primary literature publications. The latter considered important to ongoing information outreach efforts given the cutting-edge nature of the Commission's scientific work.*

PRIPHC02–Rec.08 (para. 66) The PRIPHC02 ***RECOMMENDED*** *that the IPHC Secretariat develop options for simple graphical summaries (i.e. phase plot equivalents) of fishing intensity and spawning stock biomass for provision to the Commission.*

Conservation and Management: Data collection and sharing

PRIPHC02–Rec.09 (para. 73) The PRIPHC02 ***RECOMMENDED*** *that observer coverage be adjusted to be commensurate with the level of fishing intensity in each IPHC Regulatory Area.*

Conservation and Management: Consistency between scientific advice and fishery Regulations adopted

PRIPHC02–Rec.10 (para. 82) The PRIPHC02 ***RECOMMENDED*** *that the development of MSE to underpin multi-year (strategic) decision-making be continued, and as multi-year decision making is implemented, current Secretariat capacity usage for annual stock assessments should be refocused on research to investigate MSE operating model development (including consideration of biological and fishery uncertainties) for future MSE iterations and regularised multi-year stock assessments.*

PRIPHC02–Rec.11 (para. 83) The PRIPHC02 ***RECOMMENDED*** *that ongoing work on the MSE process be prioritised to ensure there is a management framework/procedure with minimal room for ambiguous interpretation, and robust pre-agreed mortality limit setting frameworks.*

The work outlined in this document builds on the previous a 5-Year Biological and Ecosystem Science Research Plan (IPHC–2019–BESRP-5YP), closing completed projects, extending efforts where needed, and adding new avenues in response to new information. Appendix I provides a detailed summary of the previous plan and the status of the work specifically undertaken. Key highlights relevant to the stock assessment and MSE include:

- Completion of the genetic assay for determining sex from tissue samples, processing of commercial fishery samples collected during 2017-2020, inclusion of this information in the 2019 and subsequent stock assessments, and transfer of this effort from research to ongoing monitoring.
- Incremental progress toward population-level sampling and analysis of maturity and fecundity.
- Continued development of the understanding of physiological and environmental mechanisms determining growth for future field application.
- Published estimates of discard mortality rates for use in data processing and management accounting.
- Collection of genetic samples and genome sequencing to provide a basis for ongoing evaluation of stock structure at population-level and finer scales.

All previously described research areas continue to represent critical areas of uncertainty in the stock assessment and thus are closely linked to management performance. The previous 5-year plan was successful in either providing direct new information to the stock assessment or building the foundation for the collection/analysis

of such information in this updated plan. As noted below, some new priorities have emerged, and others have evolved based on the work completed to date. The incorporation of research objectives in the 5YPIRM that address climate change as a factor influencing Pacific halibut biology and ecology as well as fishery performance and dynamics constitutes a timely and relevant contribution towards advancing IPHC-led research to the forefront of fisheries science.

An **overarching goal** of the *IPHC 5-Year Program of integrated research and monitoring (2022-26)* is therefore to promote integration and synergies among the various research and support activities of the IPHC Secretariat in order to improve our knowledge of key inputs into the Pacific halibut stock assessment and MSE processes, in order to provide the best possible advice for management decision-making processes.

Along with the implementation of the short- and medium-term activities contemplated in this *IPHC 5-Year Program of Integrated Research and monitoring (2022-26)*, and in pursuit of the overarching objective, the IPHC Secretariat will also aim to:

1) undertake cutting-edge research programs in fisheries research in support of fisheries management of Pacific halibut;
2) undertake groundbreaking methodological research;
3) undertake applied research;
4) establish new collaborative agreements and interactions with research agencies and academic institutions;
5) promote the international involvement of the IPHC by continued and new participation in international scientific organizations and by leading international science and research collaborations.
6) effectively communicate IPHC research outcomes
7) incorporate talented students and early researchers in research activities contemplated.

The research and monitoring activities conducted by the IPHC Secretariat are directed towards fulfilling the following four (4) **objectives** within areas of data collection, biological and ecological research, stock assessment, and MSE. In addition, the IPHC responds to Commission requests for additional inputs to management and policy development which are classified under management support. The overall aim is to provide a program of integrated research and monitoring (Fig 2):

Research

1) **Stock assessment**: apply the resulting knowledge to improve the accuracy and reliability of the current stock assessment and the characterization of uncertainty in the resultant stock management advice provided to the Commission;
2) **Management Strategy Evaluation (MSE)**: to develop an accurate, reliable, and informative MSE process to appropriately characterize uncertainty and provide for the robust evaluation of the consequences of alternative management options, known as harvest strategies, using defined conservation and fishery objectives;
3) **Biology and Ecology**: identify and assess critical knowledge gaps in the biology and ecology of Pacific halibut within its known range, including the influence of environmental conditions on population and fishery dynamics;

Monitoring

4) **Monitoring**: collect representative fishery dependent and fishery-independent data on the distribution, abundance, biology, and demographics of Pacific halibut through ongoing monitoring activities;

Integrated management support

5) **Additional management-supporting inputs**: respond to Commission requests for any additional information supporting management and policy development.

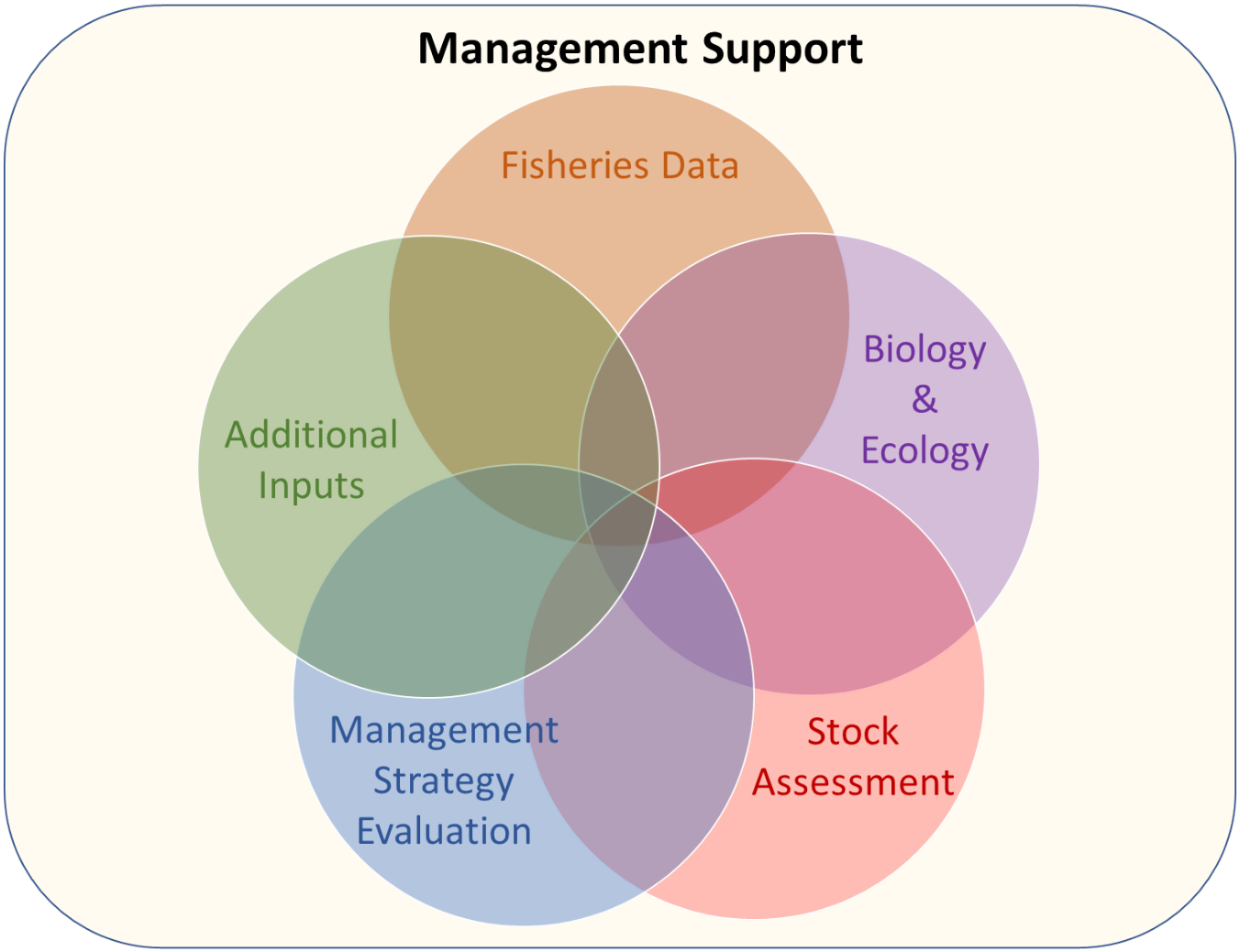

Figure 2. Core areas of the IPHC's program of integrated research and monitoring providing management support.

3. Strategy

The IPHC Secretariat has five (5) enduring strategic goals in executing our mission, including our overarching goal and associated science and research objectives, as articulated in our Strategic Plan (IPHC Strategic Plan (2019-23)): 1) To operate in accordance with international best practice; 2) Be a world leader in scientific excellence and science-based decision making; 3) To foster collaboration (within Contracting Parties and internationally) to enhance our science and management advice; 4) Create a vibrant IPHC culture; and 5) Set the

standard for fisheries commissions globally.

Although priorities and tasking will change over time in response to events and developments, the Strategic Plan provides a framework to standardise our approach when revising or setting new priorities and tasking. The Strategic goals as they apply to the science and research activities of the IPHC Secretariat, will be operationalised through a multi-year tactical activity matrix at the organisational and management unit (Branch) level (Fig. 3). The tactical activity matrix is described in the sections below and has been developed based on the core needs of the Commission, in developing and implementing robust, scientifically-based management decisions on an annual, and multi-year level. Relevant IPHC subsidiary bodies will be involved in project development and ongoing review.

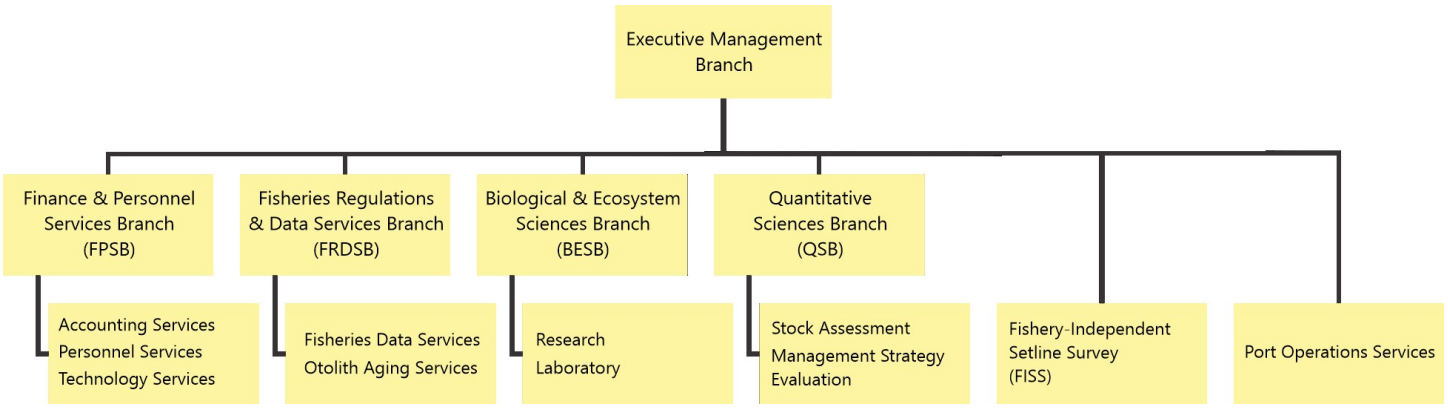

Figure 3. IPHC Secretariat organisation chart (2023).

4. Measures of Success

The Secretariat's success in implementing the *IPHC 5-Year Program of Integrated Research and Monitoring (2022-26)* will be measured according to the following criteria relevant to the stock assessment, the MSE and for all inputs to IPHC management:

1) Timeliness – was the research conducted, analyzed, published, and provided to the Commission at the appropriate points to be included in annual management decisions?
2) Accessibility – was the research published and presented in such a way that it was available to other scientists, stakeholders, and decision-makers?
3) Relevance - did the research improve the perceived accuracy of the stock assessment, MSE or decisions made by the commission?
4) Impact – did the research allow for more precision or a better estimate of the uncertainty associated with information for use in management?
5) Reliability - has research resulted in more consistent information provided to the Commission for decision-making.

4.1 Delivery of specified products

Each project line item will contain specific deliverables that constitute useful inputs into the stock assessment and the management strategy evaluation process, as well as support their implementation in the decision-making process at the level of the Commission.

4.2 Communication

The IPHC Secretariat will disseminate information about the activities contemplated in the IPHC 5-Year Program

of Integrated Research and Monitoring (2022-2026) and the resulting products to Contracting Parties, stakeholders, the scientific community, and the general public through a variety of channels:

1) IPHC website (www.iphc.int);
2) Formal documentation provided for IPHC meetings (Interim and Annual Meetings, Subsidiary Body meetings, etc.);
3) Presentations at national and international scientific conferences;
4) Published reports and peer-reviewed publications (section 4.4);
5) Outreach events;
6) Social media outlets (e.g. Facebook, Twitter, LinkedIn, etc.);
7) Informal presentations and interactions with partners, stakeholders, and decision-makers at varied times and venues when needed.

4.3 External research funding

The Secretariat has set a funding goal of at least 20% of the funds for this program to be sourced from external funding bodies on an annual basis. Continuing the successful funding-recruitment strategy adopted during the previous 5-yr research plan (IPHC–2019–BESRP-5YP) (Appendix I), the Secretariat will identify and select external funding opportunities that are timely and that aim at addressing key research objectives (as outlined in Appendix II and summarized in Appendix V) that have important implications for stock assessment and the MSE process. The IPHC Secretariat has the necessary expertise to propose novel and important research questions to funding agencies and to recruit external collaborators from research agencies and universities as deemed necessary. The IPHC Secretariat will continue to capitalize on the strong analytical contributions of quantitative scientists to the development of biological research questions within the framework of research projects funded by external as well as internal funding sources.

4.4 Peer-reviewed journal publication

Publication of research outcomes in peer-reviewed journals will be clearly documented and monitored as a measure of success. This may include single publications at the completion of a particular project, or a series of publications throughout the project as well as at its completion. Each sub-project shall be published in a timely manner and shall be submitted no later than 12 months after the end of the research. In the sections that follow, the expected publications from each research stream and cross-stream are defined.

5. Core focal areas – Background

The goals of the main activities of the *5-Year program of integrated research and monitoring (2022-26)* are integrated across the organisation, involving 1) monitoring (fisheries-dependent and –independent data collection), and 2) research (biological, ecological), modelling (FISS and stock assessment), and MSE, as outlined in the following sub-sections. These components are closely linked to one another, and all feed into management decision-making (Fig. 4). Additionally, management-supporting information constitute a range of additional decision-making drivers within and beyond IPHC's current research and monitoring programs. The current program builds on the outcomes and experiences of the Commission arising from the implementation of the 2017-21 5-Year Biological and Ecosystem Science Research Plan (IPHC–2019–BESRP-5YP), and which is summarized in Appendix I.

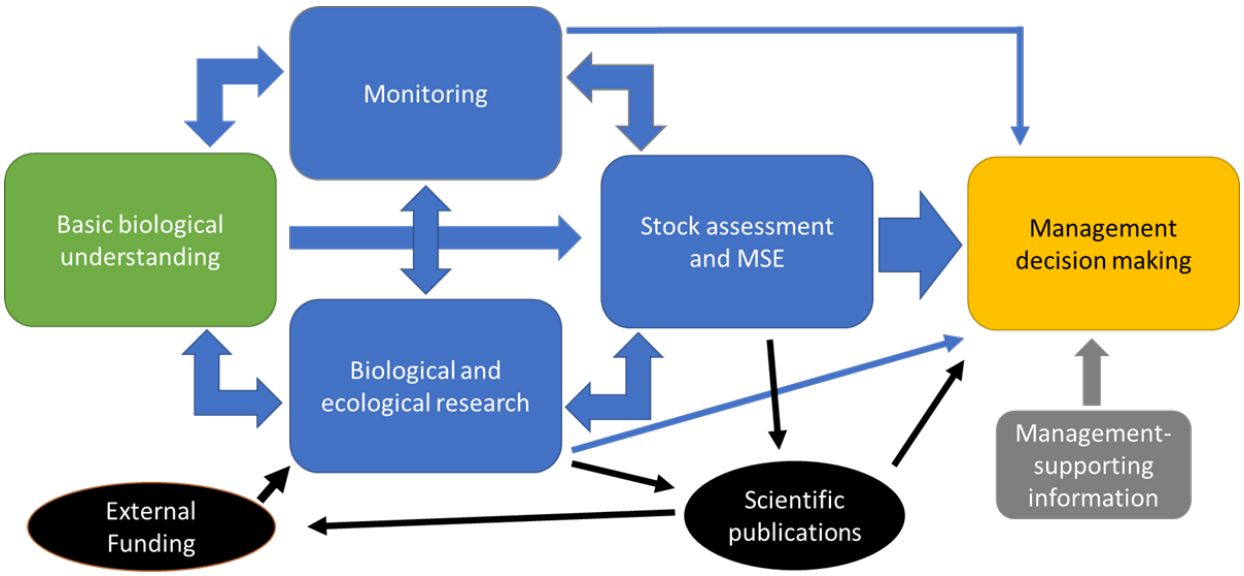

Figure 4. Flow of information from basic biological understanding of the Pacific halibut resource, through IPHC research components (monitoring, biological and ecological research, stock assessment, and MSE) to management decision-making. Management-supporting information (grey) constitute a range of additional decision-making drivers within and beyond IPHC's current research and monitoring programs. Arrows indicate the strength (size of the arrow) and direction of information exchange. Also identified (in black) are the external links from funding and scientific publications which supplement the IPHC's internal process.

5.1 Research

5.1.1 Stock Assessment

Focal Area Objective	To improve accuracy and reliability of the current stock assessment and the characterization of uncertainty in the resultant stock management advice provided to the Commission.
IPHC Website portal	https://www.iphc.int/management/science-and-research/stock-assessment

The IPHC conducts an annual stock assessment, using data from the fishery-independent setline survey (FISS), the commercial Pacific halibut and other fisheries, as well biological information from its research program. The assessment includes the Pacific halibut resource in the IPHC Convention Area, covering the Exclusive Economic Zones of Canada and the United States of America. Data sources are updated each year to reflect the most recent scientific information available for use in management decision-making.

The 2021 stock assessment relied on an ensemble of four population dynamics models to estimate the probability distributions describing the current stock size, trend, and demographics. The ensemble is designed to capture both uncertainty related to the data and stock dynamics (due to estimation) as well as uncertainty related to our understanding of the way in which the Pacific halibut stock functions and is best approximated by a statistical model (structural uncertainty).

Stock assessment results are used as inputs for harvest strategy calculations, including mortality projection tables for the upcoming year that reflect the IPHC's harvest strategy policy and other considerations, as well as the harvest decision table which provides a direct tool for the management process. The harvest decision table uses the probability distributions from short-term (three year) assessment projections to evaluate the trade-offs between

alternative levels of potential yield (catch) and the associated risks to the stock and fishery.

The stock assessment research priorities have been subdivided into four categories:

1) Assessment data collection and processing;
2) technical development;
3) biological inputs; and
4) fishery yield.

It is important to note that ongoing monitoring, including the annual FISS and directed commercial landings sampling programs is not considered research and is therefore not included in this research priority list despite the critical importance of these collections. These are described in the sections below.

5.1.2 Management Strategy Evaluation (MSE)

Focal Area Objective	To develop an accurate, reliable, and informative MSE process to appropriately characterize uncertainty and provide for the robust evaluation of the consequences of alternative management options, known as harvest strategies, using defined conservation and fishery objectives.
IPHC Website portal	https://www.iphc.int/management/science-and-research/management-strategy-evaluation

Management Strategy Evaluation (MSE) is a process to evaluate the consequences of alternative management options, known as harvest strategies. MSE uses a simulation tool to determine how alternative harvest strategies perform given a set of pre-defined fishery and conservation objectives, taking into account the uncertainties in the system and how likely candidate harvest strategies are to achieve the chosen management objectives.

MSE is a simulation technique based on modelling each part of a management cycle. The MSE uses an operating model to simulate the entire population and all fisheries, factoring in management decisions, the monitoring program, the estimation model, and potential ecosystem effects using a closed-loop simulation.

Undertaking an MSE has the advantage of being able to reveal the trade-offs among a range of possible management decisions. Specifically, to provide the information on which to base a rational decision, given harvest strategies, preferences, and attitudes to risk. The MSE is an essential part of the process of developing, evaluating and agreeing to a harvest strategy.

The MSE process involves:

- Defining fishery and conservation objectives with the involvement of stakeholders and managers;
- Identifying harvest strategies (a.k.a. management procedures) to evaluate;
- Simulating a Pacific halibut population using those harvest strategies;
- Evaluating and presenting the results in a way that examines trade-offs between objectives;
- Applying a chosen harvest strategy for the management of Pacific halibut;
- Repeating this process in the future in case of changes in objectives, assumptions, or expectations.

There are many tasks that would continue to improve the MSE framework and the presentation of future results to the Commission. The tasks can be divided into five general categories, which are common to MSE in general:

1. **Objectives**: The goals and objectives that are used in the evaluation.
2. **Management Procedures (MPs)**: Specific, well-defined management procedures that can be coded in the MSE framework to produce simulated Total Constant Exploitation Yields (TCEY) for each IPHC Regulatory Area.
3. **Framework**: The specifications and computer code for the closed-loop simulations including the operating model and how it interacts with the MP.
4. **Evaluation**: The performance metrics and presentation of results. This includes how the performance metrics are evaluated (e.g. tables, figures, and rankings), presented to the Commission and its subsidiary bodies, and disseminated for outreach.
5. **Application**: Specifications of how an MP may be applied in practice and re-evaluated in the future, including responses to exceptional circumstances.

All these categories provide inputs and outputs of the MSE process, but the Framework category benefits most from the integration of biological and ecosystem research because the operating model, the simulation of the monitoring program, the estimation model, and potential ecosystem effects are determined from this knowledge.

Outcomes of the MSE process will not only inform the Commission on trade-offs between harvest strategies and assist in choosing an optimal strategy for management of the Pacific halibut resource but will inform the prioritization of research activities related to fisheries monitoring, biological and ecological research, stock assessment, and fishery socioeconomics.

5.1.3 Biology and Ecology

Focal Area Objective	To identify and assess critical knowledge gaps in the biology and ecology of Pacific halibut within its known range, including the influence of environmental conditions on population and fishery dynamics.
IPHC Website portal	https://www.iphc.int/management/science-and-research/biological-and-ecosystem-science-research-program-bandesrp

Since its inception, the IPHC has had a long history of research activities devoted to describe and understand the biology of the Pacific halibut. At present, 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 in the biology of the Pacific halibut and its fishery; and 3) apply the resulting knowledge to reduce uncertainty in current stock assessment models.

The primary biological research activities at the IPHC that follow Commission objectives and that are selected for their important management implications are identified and described in the proposed IPHC 5-Year Program of Integrated Research and Monitoring (2022-2026). An overarching goal of the 5-Year Program of Integrated Research and Monitoring (2022-2026) is to promote integration and synergies among the various research activities led by the IPHC to improve our knowledge of key biological inputs that feed into the stock assessment and MSE process. The goals of the main research activities of the 5-Year Program of Integrated Research and Monitoring (2022-2026) are therefore aligned and integrated with the IPHC stock assessment and MSE processes. The IPHC Secretariat conducts research activities to address key biological issues based on the IPHC Secretariat's own input as well as input from the IPHC Commissioners, stakeholders and particularly from specific subsidiary bodies to the IPHC, including the Scientific Review Board (SRB) and the Research Advisory Board (RAB).

The biological research activities contemplated in the 5-Year Program of Integrated Research and Monitoring

(2022-2026) and their specific aims are detailed in Section 6. Overall, the biological research activities at the IPHC aim to provide information on 1) factors that influence the biomass of the Pacific halibut population (e.g. distribution and movement of fish among IPHC Regulatory Areas, growth patterns and environmental influences on growth in larval, juvenile and adult fish, drivers of changes in size-at-age); 2) the spawning (female) population (e.g. reproductive maturity, skipped spawning, reproductive migrations); and 3) resulting changes in population dynamics. Furthermore, the research activities of IPHC also aim to provide information on the survival of regulatory-discarded Pacific halibut in the directed fisheries with the objective to refine current estimates of discard mortality rates and develop best handling practices, and reduce whale depredation and Pacific halibut bycatch through gear modifications and through a better understanding of behavioral and physiological responses of Pacific halibut to fishing gear. The proposed timeline of activities and of staffing and funding indicators are provided in Appendix VI and Appendix VII, respectively.

5.2 Monitoring

Focal Area Objective	To collect fishery-dependent and fishery-independent data on the distribution, abundance, and demographics of Pacific halibut, as well as other key biological data, through ongoing monitoring activities.
IPHC Website portal	***Fishery-dependent data:*** • https://www.iphc.int/datatest/commercial-fisheries • https://www.iphc.int/data/datatest/pacific-halibut-recreational-fisheries-data • https://www.iphc.int/datatest/subsistence-fisheries • https://www.iphc.int/data/time-series-datasets ***Fishery-independent data:*** • https://www.iphc.int/management/science-and-research/fishery-independent-setline-survey-fiss • https://www.iphc.int/data/datatest/fishery-independent-setline-survey-fiss • https://www.iphc.int/datatest/data/water-column-profiler-data

5.2.1 Fishery-dependent data

The IPHC estimates all Pacific halibut removals taken in the IPHC Convention Area and uses this information in its yearly stock assessment and other analyses. The data are compiled by the IPHC Secretariat and include data from Federal and State agencies of each Contracting Party. Specific activities in this area are described below.

5.2.1.1 Directed commercial fisheries data

The IPHC Secretariat collects logbooks, otoliths, tissue samples, and associated sex-length-weight data from directed commercial landings coastwide (Fig. 5). A sampling rate is determined for each port by IPHC Regulatory Area. The applicable rate is calculated from the current year's mortality limits and estimated percentages of weight of fish landed, and estimated percentages of weight sampled in that port to allow for collection of the target number of biological samples by IPHC Regulatory Area. An example of the data collected and the methods used are provided in the annually updated directed commercial sampling manual (e.g. IPHC Directed Commercial Landings Sampling Manual 2022). Directed commercial fishery landings are recorded by the Federal and State agencies of each Contracting Party and summarized each year by the IPHC. Discard mortality for the directed commercial fishery is currently estimated using a combination of research survey (U.S.A.) and observer data (Canada).

5.2.1.2 Non-directed commercial discard mortality data

The IPHC accounts for non-directed commercial discard mortality by IPHC Regulatory Area and sector. Non-directed commercial discard mortality estimates are provided by State and Federal agencies of each Contracting Party and compiled annually for use in the stock assessment and other analyses.

Non-directed commercial discard mortality of Pacific halibut is estimated because not all fisheries have 100% monitoring and not all Pacific halibut that are discarded are assumed to die. The IPHC relies upon information supplied by observer programs run by Contracting Party agencies for non-directed commercial discard mortality estimates in most fisheries. Non-IPHC research survey information or other sources are used to generate estimates of non-directed commercial discard mortality in the few cases where fishery observations are unavailable. Non-directed fisheries off Canada British Columbia are monitored and discard mortality information is provided to IPHC by DFO. NOAA Fisheries operates observer programs off the USA West Coast and Alaska, which monitor the major groundfish fisheries. Data collected by those programs are used to estimate non-directed commercial discard mortality.

5.2.1.3 Subsistence fisheries data

Subsistence fisheries 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 (USA), the First Nations Food, Social, and Ceremonial (FSC) fishery in British Columbia (Canada), and the subsistence fishery by rural residents and federally recognized native tribes in Alaska (USA) documented via Subsistence Halibut Registration Certificates (SHARC). Subsistence fishery removals of Pacific halibut, including estimated subsistence discard mortality, are provided by State and Federal agencies of each Contracting Party, estimated, and compiled annually for use in the stock assessment and other analysis.

5.2.1.4 Recreational fisheries data

Recreational removals of Pacific halibut, including estimated recreational discard mortality, are provided by National/State agencies of each Contracting Party, estimated, and compiled annually for use in the stock assessment and other analysis.

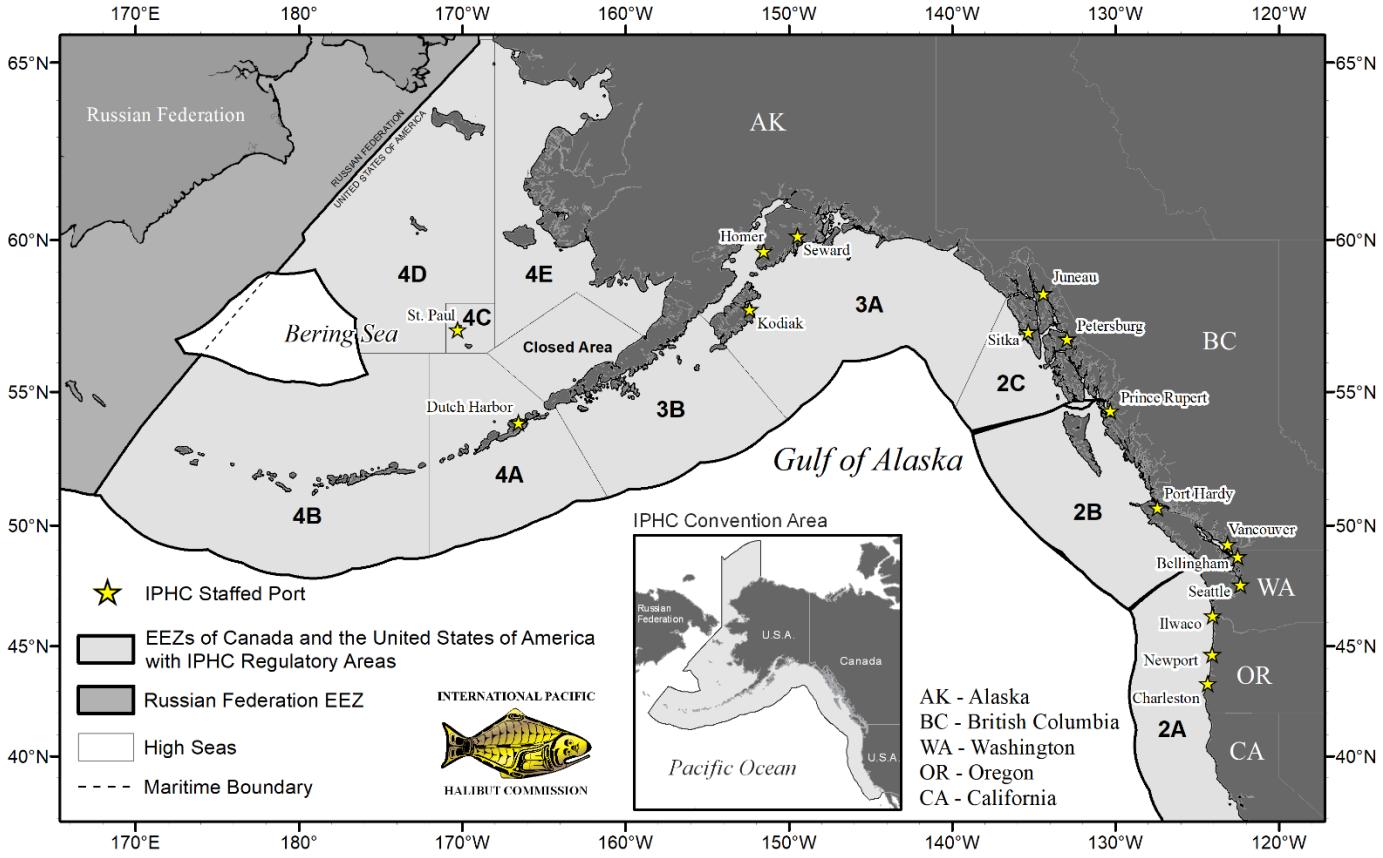

Figure 5. Ports where the IPHC has sampled directed commercial landings throughout the fishing period in recent years (note: ports sampled may change from year-to-year for operational reasons).

5.2.2 Fishery-independent data

Data collection and monitoring activities aimed at providing a standardised time-series of biological and ecological data that is independent of the fishing fleet.

5.2.2.1 Fishery-independent setline survey (FISS)

The IPHC Fishery-Independent Setline Survey (FISS) provides catch-rate information and biological data on Pacific halibut that are independent of the fishery. These data, collected using standardized methods, bait, and gear, are used to estimate the primary index of population abundance used in the stock assessment. The FISS is restricted to the summer months but encompasses the commercial fishing grounds in the Pacific halibut fishery, and almost all known Pacific halibut habitat in Convention waters outside the Bering Sea. The standard FISS grid totals 1,890 stations (Fig. 6). Biological data collected on the FISS (e.g. the length, weight, age, and sex of Pacific halibut) are used to monitor changes in biomass, growth, and mortality. In addition, records of non-target species caught during FISS operations provide insight into bait competition, and serve as an index of abundance over time, making them valuable to the potential management and avoidance of non-target species. Environmental data are also collected including water column temperature, salinity, dissolved oxygen, pH, and chlorophyll concentration to help identify the conditions in which the fish were caught, and these data can serve as co-variates in space-time modeling used in the stock assessment. An example of the data collected and the methods used are provided in the annually updated FISS sampling manual (e.g. IPHC FISS Sampling Manual 2022).

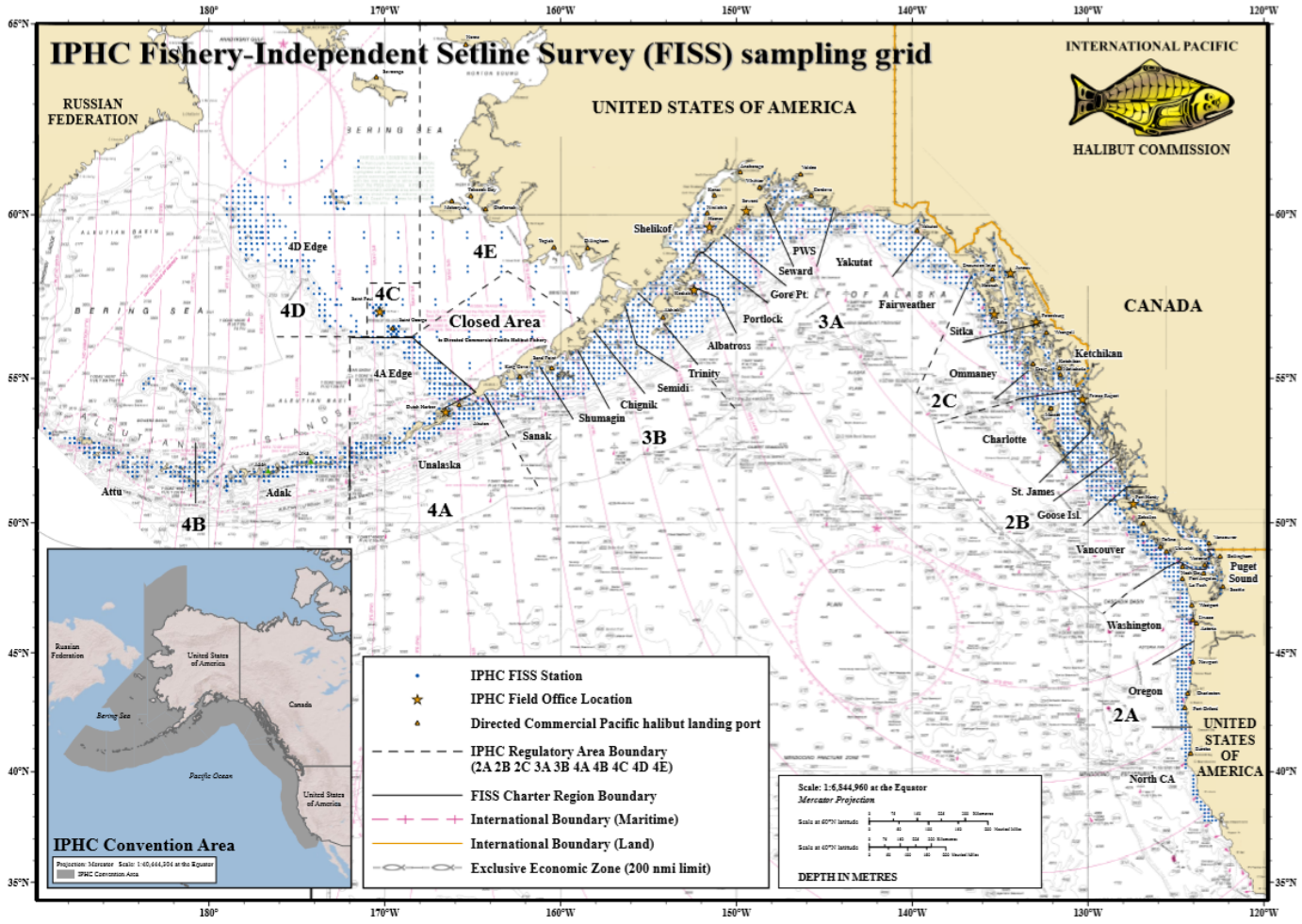

Figure 6. IPHC Fishery-Independent Setline Survey (FISS) with full sampling grid shown.

Quality control and sampling rate estimations: Following a program of planned FISS expansions from 2014-19, a process of rationialisation of the FISS was undertaken. The goal was to ensure that, given constraints on resources available for implementing the FISS, station selection was such that density indices would be estimated with high precision and low potential for bias. An annual design review process has been developed during which potential FISS designs for the subsequent three years are evaluated according to precision and bias criteria. The resulting proposed designs and their evaluation are presented for review at the June Scientific Review Board (SRB) meetings and potentially modified following SRB input before presentation to the Commissioners at the Work Meeting and Interim Meeting. Annual biological sampling rates for each IPHC Regulatory Area are calculated based on the previous year's catch rates and an annual target of 2000 sampled fish (with 100 additional archive samples).

5.2.2.2 Fishery-independent Trawl Survey (FITS)

The IPHC has participated routinely in the NOAA Fisheries trawl surveys operating in the Bering Sea (Fig. 7, annually since 1998), Aleutian Islands (intermittently since 1997) and Gulf of Alaska (since 1996). The information collected from Pacific halibut caught on these surveys, together with data from the IPHC Fishery-Independent Setline Survey (FISS) and commercial Pacific halibut data, are used directly in estimating indices of abundance and in the stock assessment and to monitor population trends, growth/size, and to supplement understanding of recruitment, distribution, and age composition of young Pacific halibut.

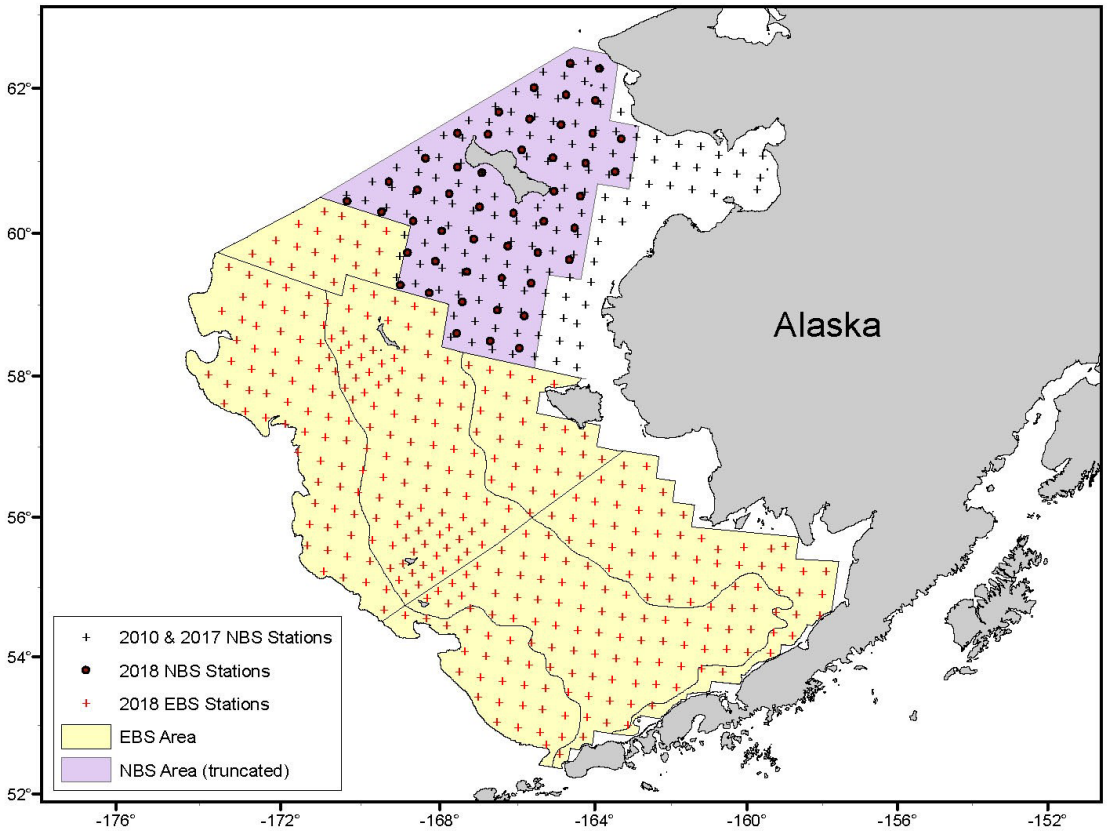

Figure 7. Sampling station design for the 2018 NOAA Bering Sea bottom trawl survey. Black dots are stations sampled in the 2018 "rapid-response" Northern Bering Sea trawl survey and black plus signs are stations sampled in standardized Northern Bering Sea trawl survey.

5.2.2.3 Norton Sound trawl survey

The Alaska Department of Fish and Game's annual Norton Sound trawl survey data contribute to the estimation of Pacific halibut indices of abundance in IPHC Regulatory Area 4E.

5.2.3 Age composition data (both fishery-dependent and fishery-independent)

The annually collected biological samples from commercial fisheries and FISS include otoliths, a crystalline calcium carbonate structure found in the inner ear of fish which growth patterns can be analyzed to estimate the age of fish. Fish age is a key input to stock assessment models that inform management decisions related to fish exploitation. Since inception, the IPHC aged over 1.5 million otoliths manually by trained readers under the stereoscopic microscope.

5.3 Management-supporting information

Successful fisheries management requires rigorous application of the scientific method of problem solving in the development of strategic alternatives and their evaluation on the basis of objectives that integrate ecosystem and human dynamics across space and time into management decision-making (Lane and Stephenson, 1995). This underscores the importance of a holistic understanding of a broad range of factors to deliver on the Commission's objective to develop the stocks of Pacific halibut to the levels that permit the optimum yield from the fishery over time. Management-supporting information beyond IPHC's current research and monitoring programs relate to,

among others, socioeconomic considerations, community development, political constraints, and operational limitations.

Responding to the Commission's "*desire for more comprehensive economic information to support the overall management of the Pacific halibut resource in fulfillment of its mandate*" (economic study terms of reference adopted at FAC095 and endorsed at AM095 in 2019), between 2019 and 2021 the IPHC conducted a socioeconomic study. The study's core product, Pacific halibut multiregional economic impact assessment (PHMEIA) model, describes economic interdependencies between sectors and regions to bring a better understanding of the role and importance of the Pacific halibut resource to regional economies of Canada and the United States of America (see project report). The model details the within-region production structure of the Pacific halibut sectors (fishing, processing, charter) and cross-regional flows of economic benefits. The model also accounts for economic activity generated through sectors that supply fishing vessels, processing plants, and charter businesses with inputs to production, by embedding Pacific halibut sectors into the model of the entire economy of Canada and the USA. The PHMEIA model fosters stakeholders' better understanding of a broad scope of regional impacts of the Pacific halibut resource. The results highlight that the harvest stage accounts for only a fraction of economic activity that would be forgone if the resource was not available to fishers in the Pacific Northwest. Moreover, the study informs on the vulnerability of communities to changes in the state of the Pacific halibut stock throughout its range, highlighting regions particularly dependent on economic activities that rely on Pacific halibut. Leveraging multiple sources of socioeconomic data, the project provides complementary input for designing policies with desired effects depending on regulators' priorities which may involve balancing multiple conflicting objectives. A good understanding of the localized effects is pivotal to policymakers who are often concerned about community impacts, particularly in terms of impact on employment opportunities and households' welfare.

The economic impact assessment is supplemented by an analysis of the formation of the price paid for Pacific halibut products by final consumers (end-users) that is intended to provide a better picture of Pacific halibut contribution to the gross domestic product (GDP) along the entire value chain, from the hook-to-plate. This supplemental material is available in IPHC's Pacific halibut market analysis.

6. Core focal areas – Planned and opportunistic activities (2022-2026)

Research at IPHC can be classified as "use-inspired basic research" (Stokes 1997) which combines knowledge building with the application of existing and emerging knowledge to provide for the management of Pacific halibut. The four core focal areas: stock assessment, management strategy evaluation, management supporting information, and biology & ecology, all interact with each other as well as with fisheries monitoring activities in the IPHC program of integrated research and monitoring. Progress and knowledge building in one focal area influences and informs application in other core focal areas, also providing insight into future research priorities. The circular feedback loop is similar to the scientific method of observing a problem, creating a hypothesis, testing that hypothesis through research and analysis, drawing conclusions, and refining the hypothesis.

The IPHC Secretariat has been working with IPHC advisory bodies, such as the Scientific Review Board (SRB), and the Commission to conduct scientific research in a way that utilizes the scientific method. Problems are often identified by an advisory body or Commission and hypotheses are developed by the IPHC Secretariat. Research is reviewed by the SRB and refined hypotheses are presented to advisory bodies and the Commission. This process occurs via an annual schedule of meetings, as shown in Fig. 8. In May, an MSE informational session may be held if there is significant progress in the MSE such that it would be useful to prepare stakeholders for the Management Strategy Advisory Board (MSAB) meeting in October. Recommendations related to the MSE, and development of a harvest strategy directed to the Commission are a result of the MSAB meeting. The SRB holds two meetings each year: one in June where requests are typically directed to IPHC Secretariat, and one in September where recommendations are made to the Commission. The June SRB meeting has a focus on research;

the September meeting represents a final check of science products to be presented to the Commission for use in management. The Research Advisory Board (RAB) meets in November to discuss ongoing research, provide guidance and recommend new research projects. The Work Meeting (WM) is held in September and is a working session with IPHC Secretariat and the Commission to prepare for the Interim Meeting (IM) held in November and the Annual Meeting (AM) held in January. Outcomes from the AM include mortality limits (coastwide and by IPHC Regulatory Area), directed fishery season dates, domestic regulations, and requests and recommendations for the IPHC Secretariat. In conjunction with the AM are meetings of the Finance and Administration Committee (FAC), the Conference Board (CB), and the Processor Advisory Board (PAB). The Commission may also hold Special Sessions (SS) throughout the year to take up and make decisions on specific topics.

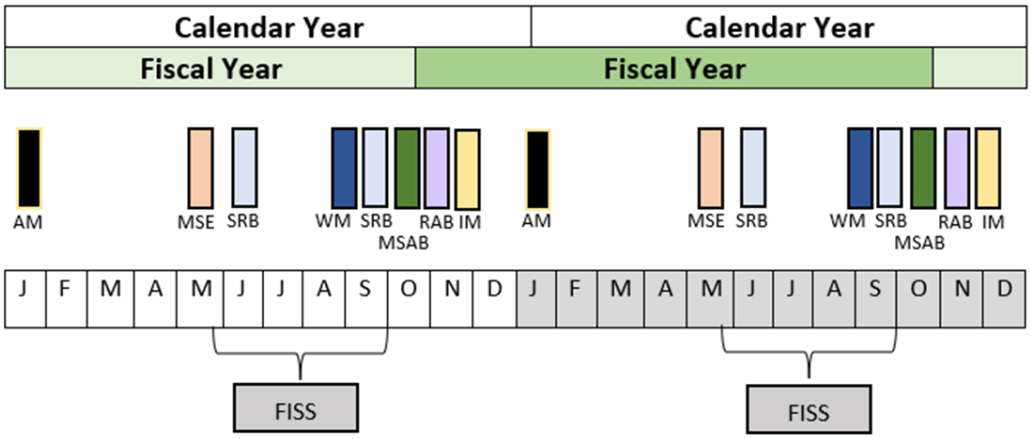

Figure 8. The typical IPHC annual meeting schedule with the calendar year and fiscal year shown. The meetings, shown in the middle row are: Annual Meeting where the Commission makes many final decisions for that year (AM), an MSE informational session (MSE), Scientific Review Board meetings (SRB), the Commission Work Meeting (WM), the Management Strategy Advisory Board meeting (MSAB), the Research Advisory Board Meeting (RAB), and the Interim Meeting (IM). The annual FISS schedule is also shown.

In addition to the annual meeting process at IPHC, individual core focal areas of research may identify and prioritize research for other core focal areas. For example, stock assessment research often identifies gaps in the knowledge of Pacific halibut biology and ecology, which then identifies priority research for the Biology and Ecology core area. Vice versa, basic biological and ecological research can identify concepts that could be better understood and result in improved implementation in any of the core areas. Furthermore, Management Strategy Evaluation can often be used to identify priority research topics for any core areas by simulation testing to identify research that may have the largest benefit to improving the management of Pacific halibut.

The top priorities of research for various categories in each of the core focal areas are provided below. The top priorities are a subset of the potential research topics in each core focal area. More exhaustive and up-to-date lists of research topics, that may extend beyond a five-year timeframe, can be found in recent meeting documents related to each core focal area.

6.1 Research

6.1.1 Stock Assessment

Within the four assessment research categories, the following topics have been identified as top priorities in order to focus attention on their importance for the stock assessment and management of Pacific halibut. A brief narrative is provided here to highlight the specific use of products from these studies in the stock assessment.

6.1.1.1 Stock Assessment data collection and processing

6.1.1.1.1 Commercial fishery sex-ratio-at-age via genetics

Commercial fishery sex-ratio information has been found to be closely correlated with the absolute scale of the population estimates in the stock assessment and has been identified as the greatest source of uncertainty since 2013. With only four years (2017-20) of commercial sex-ratio-at-age information available for the 2021 stock assessment, the annual genetic assay of fin clips sampled from the landings remains critically important. When the time series grows longer, it may be advantageous to determine the ideal frequency at which these assays need to be conducted. Development of approaches to use archived otoliths, scales or other samples to derive historical estimates (if possible) could provide valuable information on earlier time-periods (with differing fishery and biological properties), and therefore potentially reconcile some of the considerable historical uncertainty in the present stock assessment. This assessment priority directly informs *6.1.3.2 Reproduction* as described below.

6.1.1.1.2 Whale depredation accounting and tools for avoidance

Whale depredation currently represents a source of unobserved and unaccounted-for mortality in the assessment and management of Pacific halibut. A logbook program has been phased in over the last several years, in order to record whale interactions observed by commercial harvesters. Estimation of depredation mortality, from logbook records and supplemented with more detailed data and analysis from the FISS represents a first step in accounting for this source of mortality; however, such estimates will likely come with considerable uncertainty. Reduction of depredation mortality through improved fishery avoidance and/or catch protection would be a preferable extension and/or solution to basic estimation. As such, research to provide the fishery with tools to reduce depredation is considered a closely-related high priority. This assessment priority directly informs *6.1.3.4 Mortality and Survival Assessment* as described below.

6.1.1.2 Stock Assessment technical development

6.1.1.2.1 Maintaining coordination with the MSE

The stock assessment and MSE operating models have been developed in close coordination, in order to identify plausible hypotheses regarding the processes governing Pacific halibut population dynamics. Important aspects of Pacific halibut dynamics include recruitment (possibly related to extrinsic environmental factors in addition to spawning biomass), size-at-age, movement/migration and spatial patterns in fishery catchability and selectivity. Many approaches developed as part of the tactical stock assessment have been explored in the MSE operating model, and conversely, the MSE operating model has highlighted areas of data uncertainty or alternative hypotheses for exploration in the assessment (e.g. movement rates). Although these two modelling efforts target differing objectives (tactical vs. strategic) continued coordination is essential to ensure that the stock assessment and the MSE represent the Pacific halibut similarly and provide consistent and useful advice for tactical and strategic decision-making.

6.1.1.2.2 Data weighting

The stock assessment currently relies on iterative "Francis" weighting of the age compositional data using a multinomial likelihood formulation (Francis 2011) based on the number of samples available in each year. Exploration of a stronger basis for input sample sizes through analysis of sampling design, estimation of sample weighting and alternative likelihoods may all provide for a more stable approach and a better description of the associated uncertainty.

6.1.1.2.3 Environmental covariates to recruitment

The two long time-series models included in the stock assessment ensemble allow for the Pacific Decadal

Oscillation (PDO; Mantua et al. 1997) to be a binary covariate indicating periods of higher or lower average recruitment. This relationship has been observed to be consistent since its development over 20 years ago (Clark et al 1999) and is re-estimated in each year's stock assessment models. With additional years of data, evaluation of the strength of this relationship, as compared to other metrics of the PDO (e.g., annual deviations, running averages) or other indicators of NE Pacific Ocean productivity should be undertaken in order to provide the best estimates and projections of Pacific halibut recruitment and to provide for alternative hypotheses for use in the MSE. This assessment priority partially informs *6.1.3.2 Reproduction* as described below.

6.1.1.2.4 'Leading' parameter estimation

Stock assessments are generally very sensitive to the estimates of leading parameters (stock-recruitment parameters, natural mortality, sex-specific dynamics, etc.). For Pacific halibut some of these are fully integrated into the estimation uncertainty (average unexploited recruitment), or partially integrated (e.g. estimation of natural mortality in two of the four models). As time-series of critically informative data sources like the FISS and the sex-ratio of the commercial landings grow longer it may be possible to integrate additional leading parameters directly in the assessment models and/or include them as nested models within the ensemble.

6.1.1.3 Stock Assessment biological inputs

6.1.1.3.1 Maturity, skip-spawning, and fecundity

Management of Pacific halibut is currently based on reference points that rely on relative female spawning biomass. Therefore, any changes to the understanding of reproductive output – either across age/size (maturity), over time (skip spawning) or as a function of body mass (fecundity) are crucially important. Each of these components directly affects the annual reproductive output estimated in the assessment. Ideally, the IPHC would have a program in place to monitor each of these three reproductive processes over time and use that information in the estimation of the stock-recruitment relationship, and the annual reproductive output relative to reference points. This would reduce the potential for biased time-series estimates created by non-stationarity in these traits (illustrated via sensitivity analyses in several of the recent assessments). However, at present we have only historical time-aggregated estimates of maturity and fecundity schedules. Therefore, the current research priority is to first update our estimates for each of these traits to reflect current environmental and biological conditions. After current stock-wide estimates have been achieved, a program for extending this information to a time-series via transition from research to monitoring can be developed. This assessment priority directly informs *6.1.3.2 Reproduction* as described below.

6.1.1.3.2 Stock structure of IPHC Regulatory Area 4B relative to the rest of the convention area

The current stock assessment and management of Pacific halibut assume that IPHC Regulatory Area 4B is functionally connected with the rest of the stock, i.e., that recruitment from other areas can support harvest in Area 4B and that biomass in Area 4B can produce recruits that may contribute to other Areas. Tagging (Webster et al. 2013) and genetic (Drinan et al. 2016) analyses have indicated the potential for Area 4B to be demographically isolated. An alternative to current assessment and management structure would be to treat Area 4B separately from the rest of the coast. This would not likely have a large effect on the coastwide stock assessment as Area 4B represents only approximately 5% of the surveyed stock (Stewart and Webster 2022). However, it would imply that the specific mortality limits for Area 4B could be very important to local dynamics and should be separated from stock-wide trends. Therefore, information on the stock structure for Area 4B has been identified as a top priority. This assessment priority directly informs *6.1.3.1 Migration and Population Dynamics* as described below.

6.1.1.3.3 Meta-population dynamics (connectivity) of larvae, juveniles, and adults

The stock assessment and current management procedure treat spawning output, juvenile Pacific halibut abundance, and fish contributing to the fishery yield as equivalent across all parts of the Convention Area. Information on the connectivity of these life-history stages could be used for a variety of improvements to the assessment and current management procedure, including: investigating recruitment covariates, structuring spatial assessment models, identifying minimum or target spawning biomass levels in each Biological Region, refining the stock-recruitment relationship to better reflect source-sink dynamics and many others. Spatial dynamics have been highlighted as a major source of uncertainty in the Pacific halibut assessment for decades and will continue to be of high priority until they are better understood. This assessment priority directly informs *6.1.3.1 Migration and Population Dynamics* as described below.

6.1.1.4 Stock Assessment fishery yield

6.1.1.4.1 Biological interactions with fishing gear

In 2020, 16% of the total fishing mortality of Pacific halibut was discarded (Stewart et al. 2021). Discard mortality rates can vary from less than 5% to 100% depending on the fishery, treatment of the catch and other factors (Leaman and Stewart 2017). A better understanding of the biological underpinnings for discard mortality could lead to increased precision in these estimates, avoiding potential bias in the stock assessment. Further, improved biological understanding of discard mortality mechanisms could allow for reductions in this source of fishing mortality, and thereby increased yield available to the fisheries. This assessment priority directly informs *6.1.3.4 Mortality and Survival Assessment* as described below.

6.1.1.4.2 Guidelines for reducing discard mortality

Much is already known about methods to reduce discard mortality, in non-directed fisheries as well as the directed commercial and recreational sectors. Promotion and adoption of best handling practices could reduce discard mortality, lead to greater retained yield, and reduce the potential uncertainty associated with large quantities of estimated mortality due to discarding. This assessment priority directly informs *6.1.3.4 Mortality and Survival Assessment* as described below.

Outside of the four general assessment categories, the IPHC has recently considered adding close-kin genetics (e.g., Bravington et al. 2016) to its ongoing research program (see section 6.1.3.1). Close-kin mark-recapture can potentially provide estimates of the absolute scale of the spawning output from the Pacific halibut population. This type of information can be fit directly into the stock assessment, and if estimated with a reasonable amount of precision, even a single data point could substantially reduce the uncertainty in the scale of total population estimates. Further, close-kin genetics may provide independent estimates of total mortality (and therefore natural mortality conditioned on catch-at-age), relative fecundity-at-age, and the spatial dynamics of spawning and recruitment. All of these quantities could substantially improve the structure of the current assessment and reduce uncertainty. Data collection of genetic samples from 100% of the sampled commercial landings has been in place since 2017 (as part of the sex-ratio monitoring) and from the FISS since 2021. The genetic analysis required to produce data allowing the estimation of reproductive output and other population parameters from close-kin mark-recapture modelling is both complex and expensive, and it could take several years for this project to get fully underway. This five-year plan should consider a pilot evaluation, such that a broader study could be undertaken in the future, providing the likely results would meet the Commission's objectives and prove possible given financial constraints. Research related to close-kin genetics would be pursued under *6.1.3.1 Migration and Population Dynamics* as described below.

6.1.2 Management Strategy Evaluation

MSE priorities have been subdivided into three categories: 1) biological parameterisation, 2) fishery parameterization, and 3) technical development. Research provides specifications for the MSE simulations, such as inputs to the Operating Model (OM), but another important outcome of the research is to define the range of plausibility to include in the MSE simulations as a measure of uncertainty. The following topics have been identified as top priorities.

6.1.2.1 MSE Biological and population parameterization

6.1.2.1.1 Distribution of life stages and stock connectivity

Research topics in this category will mainly inform parameterization of movement in the OM, but will also provide further understanding of Pacific halibut movement, connectivity, and the temporal variability. This knowledge may also be used to refine specific MSE objectives to reflect reality and plausible outcomes. Research under Section 6.1.3.1 will inform this MSE priority.

This research includes examining larval and juvenile distribution which is a main source of uncertainty in the OM that is currently not fully incorporated. Outcomes will assist with conditioning the OM, verify patterns simulated from the OM, and provide information to develop reasonable sensitivity scenarios to test the robustness of MPs.

Also included in this number one priority is stock structure research, especially regarding IPHC Regulatory Area 4B. The dynamics of this IPHC Regulatory Area are not fully understood and it is useful to continue research on the connectivity of IPHC Regulatory Area 4B with other IPHC Regulatory Areas.

Finally, genomic analysis of population size is also included in this ranked category because that would help inform development of the OM as well as the biological sustainability objective related to maintaining a minimum spawning biomass in each IPHC Regulatory Area. An understanding of the spatial distribution of population size will help to inform this objective as well as the OM conditioning process.

6.1.2.1.2 Spatial spawning patterns and connectivity between spawning populations

An important parameter that can influence simulation outcomes is the distribution of recruitment across Biological Regions. Continued research in this area will improve the OM and provide justification for parameterising temporal variability. Research includes assigning individuals to spawning areas and establishing temporal and spatial spawning patterns. Outcomes may also provide information on recruitment strength and the relationship with environmental factors. For example, recent work by Sadorus et al (2020) used a biophysical and spatio-temporal models to examine connectivity across the Bering Sea and Gulf of Alaska. Furthermore, close-kin mark-recapture (Bravington et al. 2016) may provide insights into spatial relationships between juveniles and adults as well as abundance in specific regions. Research under Sections 6.1.3.1 and 6.1.3.2 will inform this MSE priority.

6.1.2.1.3 Understanding growth variation

Changes in the average weight-at-age of Pacific halibut is one of the major drivers of changes in biomass over time. The OM currently simulates temporal changes in weight-at-age via a random autocorrelated process which is unrelated to population size or environmental factors. Ongoing research in drivers related to growth in Pacific halibut will help to improve the simulation of weight-at-age. Research under Section 6.1.3.3 will inform this MSE priority.

6.1.2.1.4 MSE fishery parameterization

The specifications of fisheries and their parameterizations involved consultation with Pacific halibut stakeholders but some aspects of those parameterizations benefit from targeted research. One specific example is knowledge of discarding and discard mortality rates in directed and non-directed fisheries. Discard mortality can be a significant source of fishing mortality in some IPHC Regulatory Areas and appropriately modelling that mortality will provide a more robust evaluation of MPs. Research under Sections 6.1.3.4 and 6.1.3.5 will inform this MSE priority.

6.1.2.2 MSE technical development

Technical improvements to the MSE framework will allow for rapid development of alternative operating models and efficient simulation of management strategies for future evaluation. Coordination with the technical development of the stock assessment (Section 6.1.1.2.1) is necessary to ensure consistent assumptions and hypotheses for tactical (i.e. stock assessment) and strategic (i.e. MSE) models. Investigations done in the stock assessment will inform the stock assessment, which will then be informed by investigations using the closed-loop simulation framework. Multi-year assessments may allow for additional opportunity to coordinate between stock assessment and MSE.

6.1.2.2.1 Alternative migration scenarios

Including alternative migration hypotheses in the MSE simulations will assist in identifying management procedures that are robust to this uncertainty. This exploration will draw on general research on the movement and migration of Pacific halibut, observations from FISS and fisheries data, and outcomes of the stock assessment. Identification of reasonable hypotheses for the movement of Pacific halibut is essential to the robust investigation of management procedures. Research under Section 6.1.3.1 will inform this MSE priority.

6.1.2.2.2 Realistic simulations of estimation error

Closed loop simulation uses feedback from the management procedure to update the population in the projections. The management procedure consists of data collection, an estimation model, and harvest rules; currently IPHC uses a stock assessment as the estimation model. Future development of an efficient simulation process to mimic the stock assessment will more realistically represent the current management process. This involves using multiple estimation models to represent the ensemble and appropriately adding data and updating those models in the simulated projections. Improvements to the current MSE framework include adding additional estimation models to better represent the ensemble stock assessment, ensuring that the simulated estimation accurately represent the stock assessment now and, in the future, and speeding up the simulation process.

6.1.2.2.3 Incorporate additional sources of implementation uncertainty

Implementation uncertainty consists of three subcategories: 1) decision-making uncertainty, 2) realized uncertainty, and 3) perceived uncertainty. Decision-making uncertainty is the difference between mortality limits determined from the management procedure and those adopted by the Commission. This uncertainty is currently not implemented in the MSE framework but has been requested by the SRB and the independent peer review of the MSE. Realized uncertainty is the difference between the mortality limit set by the Commission and the actual mortality realized by the various fisheries. This type of uncertainty is currently partially implemented in the MSE framework. Finally, perceived uncertainty is the difference between the realized mortality and the estimated mortality limits from the various fisheries, which would be used in the estimation model. This third type of implementation uncertainty has not been implemented in the MSE framework. Implementing decision-making uncertainty is a priority for the MSE and will assist in understanding the performance of management procedures when they may not be followed exactly.

6.1.2.3 MSE Program of Work for 2021–2023

Following the 11th Special Session of the IPHC, an MSE program of work for 2021–2023 was developed. Seven tasks were identified that pertained to further developments of the MSE framework, evaluation of alternative MPs, and improvements in evaluation and presentation of results. Table 1 lists these tasks and provides a brief description. Additional details can be found in the program of work available on the MSE webpage.

Table 1. Tasks recommended by the Commission at SS011 (IPHC-2021-SS011-R para 7) for inclusion in the IPHC Secretariat MSE Program of Work for 2021–23.

ID	Category	Task	Deliverable
F.1	Framework	Develop migration scenarios	Develop OMs with alternative migration scenarios
F.2	Framework	Implementation variability	Incorporate additional sources of implementation variability in the framework
F.3	Framework	Develop more realistic simulations of estimation error	Improve the estimation model to more adequately mimic the ensemble stock assessment
F.5	Framework	Develop alternative OMs	Code alternative OMs in addition to the one already under evaluation.
M.1	MPs	Size limits	Identification, evaluation of size limits
M.3	MPs	Multi-year assessments	Evaluation of multi-year assessments
E.3	Evaluation	Presentation of results	Develop methods and outputs that are useful for presenting outcomes to stakeholders and Commissioners

6.1.2.4 Potential Future MSE projects

Management Strategy Evaluation is an iterative process where new management procedures may be evaluated, current management procedures may be re-evaluated under different assumptions, and the understanding of the population, environment, and fisheries may be updated with new information stemming from the stock assessment and biological/ecological research. The current Program of Work (Table 1) focuses on two elements of Management Procedures, but in the future other elements may be of interest, such as distribution procedures. The research being done now will inform the development of the MSE in the future to ensure a robust evaluation of any management procedure.

6.1.3 Biology and Ecology

Capitalizing on the outcomes of the previous 5-year plan (IPHC–2019–BESRP-5YP) (Appendix I), the IPHC Secretariat has identified five research areas that will provide key inputs for stock assessment and the MSE process. In addition to linking genetics and genomics with migration and distribution studies in the newly coined area of Migration and Population Dynamics, the IPHC Secretariat has incorporated a novel research area on Fishing Technology. A series of key objectives for each of the five research areas have been identified that integrate with specific needs for stock assessment and MSE processes and that are ranked according to their relevance (Appendix II). To further describe the IPHC Secretariat's rationale for establishing research priorities, a ranked list of biological uncertainties and parameters for stock assessment and the MSE process and their links to research activities and outcomes derived from the IPHC 5-Year Program of Integrated Research and Monitoring (2022-2026) are provided in Appendix III and Appendix IV.

6.1.3.1 Migration and Population Dynamics

Genetic and genomic studies aimed at improving current knowledge of Pacific halibut migration and population dynamics throughout all life stages in order to achieve a complete understanding of stock structure and distribution across the entire distribution range of Pacific halibut in the North Pacific Ocean and the biotic and abiotic factors that influence it (specifically excluding satellite tagging). Specific objectives in this area include:

- Improve current knowledge of the genetic structure of the Pacific halibut population through the use of state-of-the-art low-coverage whole genome resequencing approaches. Establishment of genetic signatures of spawning sites.
- Improve our understanding of the mechanisms and magnitude of larval connectivity in the North Pacific Ocean. Identification of environmental and biological predictors of larval abundance and recruitment.
- Improve our understanding of spawning site contributions to nursery/settlement areas in relation to year-class, recruit survival and strength, and environmental conditions in the North Pacific Ocean. Measure of genetic diversity of Pacific halibut juveniles from the eastern Bering Sea and the Gulf of Alaska.
- Improve our understanding of the relationship between nursery/settlement origin and adult distribution and abundance over temporal and spatial scales. Genomic assignment of individuals to source populations and assessment of distribution changes.
- Integrate analyses of Pacific halibut connectivity and distribution changes by incorporating genomic approaches.
- Improve estimates of population size, migration rates among geographical regions, and demographic parameters (e.g. fecundity-at-age, survival rate), through the application of close-kin mark-recapture-based approaches.
- Improve our understanding of the influences of oceanographic and environmental variation on connectivity, population structure and adaptation at a genomic level using seascape genomics approaches.
- Exploration and development of alternative methods for aging Pacific halibut based on genetic analyses of DNA methylation patterns in tissues (fin clips).
- Exploration of methods for individual identification based on computer-assisted tail image matching systems as an alternative for traditional mark and recapture tagging.

6.1.3.2 Reproduction

Studies aimed primarily at addressing two critical issues for stock assessment analysis based on estimates of female spawning biomass: 1) the sex ratio of the commercial catch and 2) maturity estimations. Specific objectives in this area include:

- Continued improvement of genetic methods for accurate sex identification of commercial landings from fin clips and otoliths in order to incorporate recent and historical sex-at-age information into the stock assessment process.
- Improve our understanding of the temporal progression of reproductive development and gamete production during an entire annual reproductive cycle in female and male Pacific halibut.
- Update current maturity-at-age estimates.
- Provide estimates of fecundity-at-age and fecundity-at-size.
- Investigate the possible presence of skip spawning in Pacific halibut females.

- Improve accuracy in current staging criteria of maturity status used in the field.
- Investigate possible environmental effects on the ontogenetic establishment of the phenotypic sex and their influence on sex ratios in the adult Pacific halibut population.
- Improve our understanding of potential temporal and spatial changes in maturity schedules and spawning patterns in female Pacific halibut and possible environmental influences.
- Improve our understanding of the genetic basis of variation in age and/or size-at-maturity, fecundity, and spawning timing, by conducting genome-wide association studies.

6.1.3.3 Growth

Studies aimed at describing the role of factors responsible for the observed changes in size-at-age and at evaluating growth and physiological condition in Pacific halibut. Specific objectives in this area include:

- Evaluate possible variation in somatic growth patterns in Pacific halibut as informed by physiological growth markers, physiological condition, energy content and dietary influences.
- Investigate the effects of environmental and ecological conditions that may influence somatic growth in Pacific halibut. Evaluate the relationship between somatic growth and temperature and trophic histories in Pacific halibut through the integrated use of physiological growth markers.
- Improve our understanding of the genetic basis of variation in somatic growth and size-at-age by conducting genome-wide association studies.

6.1.3.4 Mortality and Survival Assessment

Studies aimed at providing updated estimates of discard mortality rates (DMRs) for Pacific halibut in the guided recreational fisheries and at evaluating methods for reducing mortality of Pacific halibut. Specific objectives in this area include:

- Provide information on the types of fishing gear and fish handling practices used in the Pacific halibut recreational (charter) fishery as well as on the number and size composition of discarded Pacific halibut in this fishery.
- Establish best handling practices for reducing discard mortality of Pacific halibut in recreational fisheries.
- Investigate new methods for improved estimation of depredation mortality from marine mammals.

6.1.3.5 Fishing Technology

Studies aimed at developing methods that involve modifications of fishing gear with the purpose of reducing Pacific halibut depredation and bycatch. Specific objectives in this area include:

- Investigate new methods for whale avoidance and/or deterrence for the reduction of Pacific halibut depredation by whales (e.g. catch protection methods).
- Investigate physiological and behavioral responses of Pacific halibut to fishing gear in order to reduce bycatch.

6.2 Monitoring

The Commission's extensive monitoring programs include both direct data collection and coordination with domestic agencies to produce both fishery-dependent and fishery-independent information on the stock and fishery trends, and other information. These critical sources include estimates of fishing mortality from all

fisheries encountering Pacific halibut, biological sampling from these fisheries as well as catch-rates and biological sampling from longline and trawl surveys. Monitoring data provide the basis for stock assessment and MSE analysis, many biological research studies, and some inputs directly to the decision-making process (Figure 4). While not the primary focus of this 5-year plan, a basic summary of the components led by the IPHC and those that are provided by domestic agencies is provided below.

6.2.1 Fishery-dependent data

Data collection and monitoring activities aimed at providing standardised time-series of mortality, fishery, and biological data from both direct target fisheries as well as fisheries that incidentally catch Pacific halibut. Directed commercial fisheries data are managed by IPHC. Non-directed commercial discard mortality data, subsistence fisheries data, and recreational fisheries data are managed by Contracting Party domestic agencies.

6.2.1.1 Directed commercial fisheries data

6.2.1.2 Annually review the spatial distribution of sampling effort among ports, data collection methods, sampling rates, and quality assurance/quality control (QAQC) processes, including in-season review of port sampling activities

Ensure current data collection efforts meet current and future needs of stock assessment, MSE and management. Collaborate and coordinate with other Secretariat functions to develop methods and procedures for incorporating promising research results into long-term monitoring program. The IPHC relies on domestic and Tribal agency programs to report annual mortality from incidental catches in non-directed commercial fisheries, catches from subsistence fisheries, and catches from recreational fisheries. Non-directed commercial discard mortality data

Annually collaborate with observer programs and other partners to ensure robust data collection and sampling, QAQC processes, and reporting of incidental catch and mortality, as well as biological sampling.

6.2.1.3 Subsistence fisheries data

Annually collaborate with Tribal, State and Federal agencies of each Contracting Party to ensure high quality data collection, sampling, and reporting in the subsistence fisheries in Canada and the United States of America.

6.2.1.4 Recreational fisheries data

Annually collaborate with National/State agencies of each Contracting Party to ensure and validate high quality data and reporting of recreational fishery mortality estimates and biological data.

6.2.2 Fishery-independent data

Data collection and monitoring activities aimed at providing a standardised time-series of biological and ecological data that is independent of the fishing fleet.

6.2.2.1 Fishery-independent setline survey (FISS)

An annual review process for the FISS station design has been developed (Fig. 9) and is expected to continue in coming years. This process involves scientific review of proposed FISS designs by the Scientific Review Board and includes input from stakeholders prior to review and approval of designs by the Commissioners.

Direct weighing of Pacific halibut has been integrated into the annual FISS sampling since 2019 and will continue into the future to ensure accurate estimation of WPUE and other weight-derived quantities. Sample rates for genetic monitoring will need to be determined for future sampling. Sampling rates of otoliths for aging, archive otoliths and tagged fish will continue to be reviewed annually to ensure the data needs of the IPHC stock assessment and research program are met. Annual FISS sampler training and data QAQC (including at point of

data collection and during post-sampling review) will ensure high quality data from the FISS program. Procedures are reviewed annually.

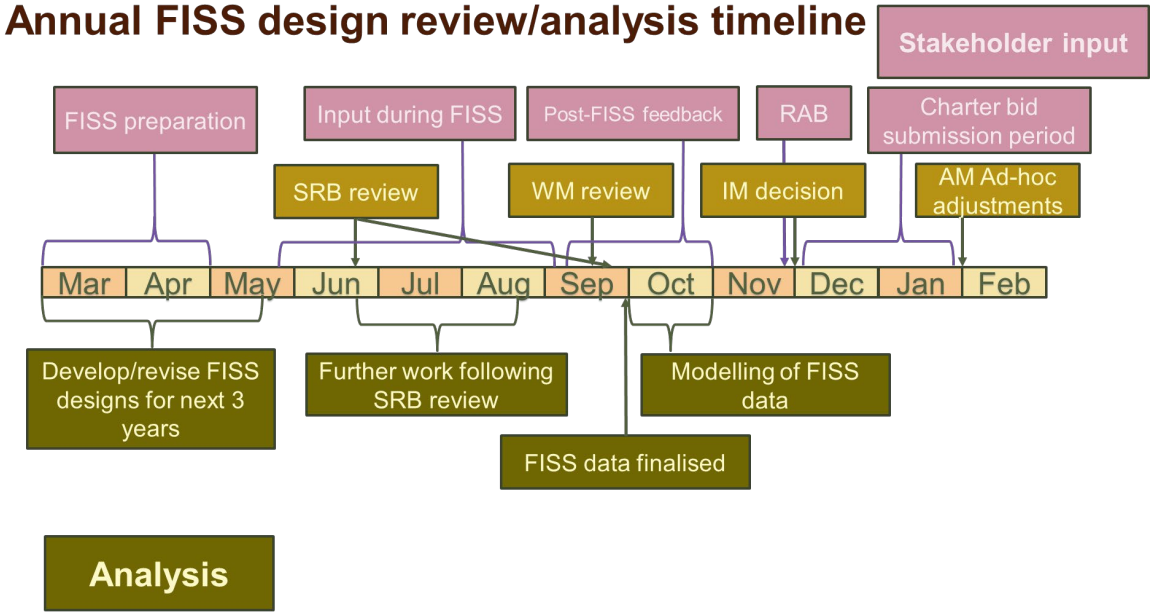

Figure 9. Timeline of annual FISS design review process.

6.2.2.2 Fishery-independent Trawl Survey (FITS)

The IPHC will continue to collaborate with NMFS on sampling procedures for Pacific halibut on the placement of an IPHC sampler onboard a survey vessel for the collection of biological data.

6.2.3 Age composition data (both fishery-dependent and fishery-independent)

The IPHC Secretariat is looking at options for supplementing current Pacific halibut ageing protocol with automatized ageing that does not require extensive otolith-reader training. The IPHC is investigating the potential use of artificial intelligence (AI) for determining the age of Pacific halibut from images of collected otoliths. The Secretariat is in the process of initializing creation of a database of pictures with expert-provided labels, utilizing previously aged otoliths, and assessing the option for the development of a Convolutional Neural Network (CNN) model specifically designed for image classification to determine Pacific halibut age. The goal is to create an AI-based age determination system that complements traditional methods for reliable fish stock assessment and management advice.

6.3 Potential of integrating human dynamics into management decision-making

The evolution of modern fisheries management is taking a transformative turn, emphasizing the integration of human dynamics into decision-making processes. As our world becomes more interconnected through globalization, understanding the intricate human dimension of the fisheries sector is emerging as a critical aspect of sustainable resource management. This forward-looking approach seeks to proactively address challenges while capitalizing on new opportunities.

In a global marketplace where local and imported products compete for consumer attention, vulnerability to disruptions, as evidenced by the COVID-19 pandemic (OECD 2020), has highlighted the need for adaptable strategies embracing the broader picture encompassing external influences. Recent IPHC's socioeconomic study underlines the far-reaching impacts of such dynamics, showcasing the income fluctuations experienced by

households dependent on Pacific halibut during the pandemic. Acknowledging these complexities, there is a growing realization of the need for expanding the scope of management-supporting information the IPHC provides beyond stock condition.

The question of how small remote communities can capitalize on the high prices that the final customers are paying for premium seafood products demands innovative thinking. In 2021, fresh Alaskan Pacific halibut fillets routinely sold for USD 24-28 a pound, and often more, in downtown Seattle (e.g. USD 38 at Pike Place Market). Pacific halibut dishes at the restaurants typically sell for USD 37-43 for a dish including a 6oz fish portion. The IPHC's socioeconomic study detailed the geography of impacts of the Pacific halibut fisheries, providing a coherent picture of the exposure of fisheries-dependent households by location to changes in resource availability, but paying closer attention to quantifying leakage of economic benefits from communities strongly involved in fisheries, highlighted that the local earnings often do not align with how much fishing occurs within the community. This suggests the need for research focused on how to operationalize social equity in the context of the globalized market dynamics and the pursuit of stock sustainability.

In parallel, the accelerating impacts of climate change is placing fisheries at the forefront of environmental challenges. The rapid increase in water temperature off the coast of Alaska in 2014-16, termed *the blob*, exemplifies the changes that disrupt ecosystems and fisheries (Cheung and Frölicher 2020), and may have a long-term impact on Pacific halibut distribution. The consequences may include shifts in the distribution of benefits, but possibly go further, affecting the stability of agreements over allocation of a shared resource. Research on decision quality under fast-progressing climate-induced changes to stock distribution emerges as an avenue for impactful work.

Conflicting objectives among stakeholders regarding the use of limited resource in the context of globalization, calls for social equity and climate change are a major challenge of decision-making in fisheries management. Integrating approaches aimed at understanding the human dynamics and external factors with stock assessment and MSE can assist fisheries in bridging the gap between the current and the optimal performance without compromising the stock biological sustainability. For example, socioeconomic performance metrics presented alongside already developed biological/ecological performance metrics would supplement IPHC's portfolio of tools for assessing policy-oriented issues (as requested by the Commission, IPHC-2021-AM097-R, AM097-Req.02) and support decision-making. Moreover, continuing investment in understanding the human dimension of Pacific halibut fishing can also inform on other drivers such as human behavior or human organization that affect the dynamics of fisheries, and thus contribute to improved accuracy of the stock assessment and the MSE (Lynch et al.2018). As such, it can contribute to research integration at the IPHC and provide a complementary resource for the development of harvest control rules.

Lastly, Pacific halibut value is also in its contribution to the diet through subsistence fisheries and importance to the traditional users of the resource. To native people, traditional fisheries constitute a vital aspect of local identity and a major factor in cohesion. One can also consider the Pacific halibut's existence value as an iconic fish of the Pacific Northwest. Recognizing and adopting such an all-encompassing definition of the Pacific halibut resource contribution, the IPHC echoes a broader call to include the human dimension into the research on the impact of management decisions, as well as changes in environmental or stock conditions.

7. Amendment

The intention is to ensure the plan is kept as a '*living plan'*, that is reviewed and updated annually based on the resources available to undertake the work of the Commission (e.g. internal and external fiscal resources, collaborations, internal expertise). The IPHC Secretariat is committed to ensuring an exceptional level of transparency and commitment to the principles of open science.

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APPENDICES

Appendix I: Outcomes of the IPHC 5-Year Biological and Ecosystem Science Research Plan (2017-21)

Appendix II: Biological research areas in the 5-Year Program of Integrated Research and Monitoring (2022-2026) and ranked relevance for stock assessment and management strategy evaluation

Appendix III: List of ranked research priorities for stock assessment

Appendix IV: List of ranked research priorities for management strategy evaluation

Appendix V: Proposed schedule of outputs

Appendix VI: Proposed schedule with funding and staffing indicators

APPENDIX I

Outcomes of the IPHC 5-Year Biological and Ecosystem Science Research Plan (2017-21) (IPHC–2019–BESRP-5YP)

A. Outcomes by Research Area:

1. Migration and Distribution.

1.1. Larval and juvenile connectivity and early life history studies. Planned research outcomes: improved understanding of larval and juvenile distribution.

Main results:

- Larval connectivity between the Gulf of Alaska and the Bering Sea occurs through large island passes across the Aleutian Island chain.
- The degree of larval connectivity between the Gulf of Alaska and the Bering Sea is influenced by spawning location.
- Spawning locations in the western Gulf of Alaska significantly contribute Pacific halibut larvae to the Bering Sea.
- Pacific halibut juveniles counter-migrate from inshore settlement areas in the eastern Bering Sea into the Gulf of Alaska through Unimak Pass.
- Elemental signatures of otoliths from juvenile Pacific halibut vary geographically at a scale equivalent to IPHC regulatory areas.

Publications:

Sadorus, L.; Goldstein, E.; Webster, R.; Stockhausen, W.; Planas, J.V.; Duffy-Anderson, J. Multiple life-stage connectivity of Pacific halibut (*Hippoglossus stenolepis*) across the Bering Sea and Gulf of Alaska. *Fisheries Oceanography*. 2021. 30:174-193. doi: https://doi.org/10.1111/fog.12512.

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Links to 5-Year Research Plan (2022-2026):

- Evaluate the level of genetic diversity among juvenile Pacific halibut in the Gulf of Alaska and the Bering sea due to admixture.
- Assignment of individual juvenile Pacific halibut to source populations.

Integration with Stock Assessment and MSE: The relevance of research outcomes from activities in this research area for stock assessment is in the improvement of estimates of productivity. Research outcomes will be used to generate potential recruitment covariates and to inform minimum spawning biomass targets by Biological Region and represent one of the top three biological inputs into stock assessment. The relevance of these research outcomes for MSE is in the improvement of the parametrization of the Operating Model and represent the top ranked biological input into the MSE.

2. Reproduction.

2.1 Sex ratio of commercial landings. Planned research outcomes: sex ratio information.

Main results:

- Establishment of TaqMan-based genetic assays for genotyping Pacific halibut in the IPHC Biological Laboratory.
- Sex ratio information for the 2017-2020 commercial landings.
- Transfer of genotyping efforts for sex identification to IPHC monitoring program.

Links to 5-Year Research Plan (2022-2026):

- Monitoring effort.

2.2 Histological maturity assessment. Planned research outcomes: updated maturity schedule.

Main results:

- Oocyte developmental stages have been characterized and fully described in female Pacific halibut for the first time.
- Oocyte developmental stages have been used for the classification of female developmental stages and to be able to characterize female Pacific halibut as group synchronous with determinate fecundity.
- Female developmental stages have been used for the classification of female reproductive phases and to be able to characterize female Pacific halibut as following an annual reproductive cycle with spawning in January and February.
- Female developmental stages and reproductive phases of females collected in the central Gulf of Alaska have been used to identify the month of August as the time of the transition between the Vtg2 and Vtg3 developmental stages marking the beginning of the spawning capable reproductive phase.
- Future gonad collections for revising maturity schedules and estimating fecundity can be conducted in August during the FISS.

Publications:

Fish, T., Wolf, N., Harris, B.P., Planas, J.V. A comprehensive description of oocyte developmental stages in Pacific halibut, *Hippoglossus stenolepis*. *Journal of Fish Biology* 2020. 97: 1880-1885. doi: 10.1111/jfb.14551.

Fish, T., Wolf, N., Smeltz, T. S., Harris, B. P., and Planas, J. V. Reproductive Biology of Female Pacific Halibut (*Hippoglossus stenolepis*) in the Gulf of Alaska. *Frontiers in Marine Science* 2022. 9:801759. doi: 10.3389/fmars.2022.801759.

Links to 5-Year Research Plan (2022-2026):

- Revision of maturity schedule by gonad collection during the FISS, as informed by previous studies on reproductive development.

- Estimation of fecundity by age and size, as informed by previous studies demonstrating determinate fecundity.

Integration with Stock Assessment and MSE: Research activities in this Research Area aim at providing information on key biological processes related to reproduction in Pacific halibut (maturity and fecundity) and to provide sex ratio information of Pacific halibut commercial landings. The relevance of research outcomes from these activities for stock assessment is in the scaling of Pacific halibut biomass and in the estimation of reference points and fishing intensity. These research outputs will result in a revision of current maturity schedules and will be included as inputs into the stock assessment and represent the most important biological inputs for stock assessment. The relevance of these research outcomes for MSE is in the improvement of the simulation of spawning biomass in the Operating Model.

3. Growth.

3.1 Identification of physiological growth markers and their application for growth pattern evaluation. Planned research outcomes: informative physiological growth markers.

Main results:

- Transcriptomic profiling by RNAseq of white skeletal muscle from juvenile Pacific halibut subjected to growth suppression and to growth stimulation resulted in the identification of a number of genes that change their expression levels in response to growth manipulations.
- Proteomic profiling by LC-MS/MS of white skeletal muscle from juvenile Pacific halibut subjected to growth suppression and to growth stimulation resulted in the identification of a number of proteins that change their abundance in response to growth manipulations.
- Genes and proteins that changed their expression levels in accordance to changes in the growth rate in juvenile Pacific halibut were selected as putative growth markers for future studies on growth pattern evaluation.

Publications:

Planas et al. 2022. In Preparation.

Links to 5-Year Research Plan (2022-2026):

- Application of identified growth markers in studies aiming at investigating environmental influences on growth patterns and at investigating dietary influences on growth patterns and physiological condition.

3.2 Environmental influences on growth patterns. Planned research outcomes: information on growth responses to temperature variation.

Main results:

- Laboratory experiments under controlled temperature conditions have shown that temperature affects the growth rate of juvenile Pacific halibut through changes in the expression of genes that regulate growth processes.

Publications:

Planas et al. 2022. In Preparation.

Links to 5-Year Research Plan (2022-2026):

- Identification of temperature-specific responses in skeletal muscle through comparison between transcriptomic responses to temperature-induced growth changes and to density- and stress-induced growth changes.
- Application of growth markers for additional studies investigating the link between environmental variability and growth patterns and the effects of diet (prey quality and abundance) on growth and physiological condition.

Integration with Stock Assessment and MSE: Research activities conducted in this Research Area aim at providing information on somatic growth processes driving size-at-age in Pacific halibut. The relevance of research outcomes from these activities for stock assessment resides, first, in their ability to inform yield-per-recruit and other spatial evaluations for productivity that support mortality limit-setting, and second, in that they may provide covariates for projecting short-term size-at-age and may help delineate between fishery and environmental effects, thereby informing appropriate management responses. The relevance of these research outcomes for MSE is in the improvement of the simulation of variability and to allow for scenarios investigating climate change.

4. Mortality and Survival Assessment.

4.1 Discard mortality rate estimation in the longline Pacific halibut fishery. Planned research outcomes: experimentally-derived DMR.

Main results:

- Different hook release methods used in the longline fishery result in specific injury profiles and viability classification.
- Plasma lactate levels are high in Pacific halibut with the lowest viability classification.
- Mortality of discarded fish with the highest viability classification is estimated to be between 4.2 and 8.4%.

Publications:

Kroska, A.C., Wolf, N., Planas, J.V., Baker, M.R., Smeltz, T.S., Harris, B.P. Controlled experiments to explore the use of a multi-tissue approach to characterizing stress in wild-caught Pacific halibut (*Hippoglossus stenolepis*). *Conservation Physiology* 2021. 9(1):coab001; doi:10.1093/conphys/coab001.

Loher, T., Dykstra, C.L., Hicks, A., Stewart, I.J., Wolf, N., Harris, B.P., Planas, J.V. Estimation of postrelease longline mortality in Pacific halibut using acceleration-logging tags. *North American Journal of Fisheries Management*. 2022. 42: 37-49. DOI: https://doi.org/10.1002/nafm.10711.

Links to 5-Year Research Plan (2022-2026):

- Integration of information on capture and handling conditions, injury and viability assessment and physiological condition will lead to establishing a set of best handling practices in the longline fishery.

4.2 Discard mortality rate estimation in the guided recreational Pacific halibut fishery. Planned research outcomes: experimentally-derived DMR.

Main results:

- Field experiments testing two different types of gear types (i.e. 12/0 and 16/0 circle hooks) resulted in the capture, sampling and tagging of 243 Pacific halibut in IPHC Regulatory Area 2C (Sitka, AK) and 118 in IPHC Regulatory Area 3A (Seward, AK).
- The distributions of fish lengths by regulatory area and by hook size were similar.

Links to 5-Year Research Plan (2022-2026):

- Estimation of discard mortality rate in the guided recreational fishery.
- Integration of information on capture and handling conditions, injury and viability assessment and physiological condition linked to survival.
- Establishment of a set of best handling practices in the guided recreational fishery.

Integration with Stock Assessment and MSE: The relevance of research outcomes from these activities for stock assessment resides in their ability to improve trends in unobserved mortality in order to improve estimates of stock productivity and represent the most important inputs in fishery yield for stock assessment. The relevance of these research outcomes for MSE is in fishery parametrization

5. Genetics and genomics.

5.1 Generation of genomic resources for Pacific halibut. Planned research outcomes: sequenced genome and reference transcriptome.

Main results:

- A first draft of the chromosome-level assembly of the Pacific halibut genome has been generated.
- The Pacific halibut genome has a size of 602 Mb and contains 24 chromosome-size scaffolds covering 99.8% of the complete assembly with a N50 scaffold length of 27 Mb at a coverage of 91x.
- The Pacific halibut genome has been annotated by NCBI and is available as NCBI Hippoglossus stenolepis Annotation Release 101 (https://www.ncbi.nlm.nih.gov/assembly/GCA_022539355.2/).
- Transcriptome (i.e. RNA) sequencing has been conducted in twelve tissues in Pacific halibut and the raw sequence data have been deposited in NCBI's Sequence Read Archive (SRA) under the bioproject number PRJNA634339 (https://www.ncbi.nlm.nih.gov/bioproject/PRJNA634339) and with SRA accession numbers SAMN14989915 - SAMN14989926.

Publications:

Jasonowicz, A.C., Simeon, A., Zahm, M., Cabau, C., Klopp, C., Roques, C., Iampietro, C., Lluch, J., Donnadieu, C., Parrinello, H., Drinan, D.P., Hauser, L., Guiguen, Y., Planas, J.V. Generation of a chromosome-level genome assembly for Pacific halibut (*Hippoglossus stenolepis*) and characterization of its sex-determining genomic region. *Molecular Ecology Resources. 2022. In Press*. doi: https://doi.org/10.1111/1755-0998.13641.

Jasonowicz et al. 2022. In Preparation.

Links to 5-Year Research Plan (2022-2026):

- Genome-wide analysis of stock structure and composition.

5.2 Determine the genetic structure of the Pacific halibut population in the Convention Area. Planned research outcomes: genetic population structure.

Main results:

- The collection of winter genetic samples in the Aleutian Islands completed the winter sample collection needed to conduct studies on the genetic population structure of Pacific halibut in the Convention Area.
- Initial results of low coverage whole genome resequencing of winter samples indicate that an average of 26.5 million raw sequencing reads per obtained per sample that provided average individual genomic coverages for quality filtered alignments of 3.2x.

Links to 5-Year Research Plan (2022-2026):

- Fine-scale delineation of population structure, with particular emphasis on IPHC Regulatory 4B structure.

Integration with Stock Assessment and MSE: The relevance of research outcomes from these activities for stock assessment resides in the introduction of possible changes in the structure of future stock assessments, as separate assessments may be constructed if functionally isolated components of the population are found (e.g. IPHC Regulatory Area 4B), and in the improvement of productivity estimates, as this information may be used to define management targets for minimum spawning biomass by Biological Region. These research outcomes provide the second and third top ranked biological inputs into stock assessment. Furthermore, the relevance of these research outcomes for MSE is in biological parametization and validation of movement estimates and of recruitment distribution.

B. List of ranked biological uncertainties and parameters for stock assessment (SA) and their links to research areas and activities contemplated in the IPHC 5-Year Biological and Ecosystem Science Research Plan (2017-21)

SA Rank	Research outcomes	Relevance for stock assessment	Specific analysis input	Research Area	Research activities
1. Biological input	Updated maturity schedule	Scale biomass and reference point estimates	Will be included in the stock assessment, replacing the current schedule last updated in 2006	Reproduction	Histological maturity assessment
	Incidence of skip spawning		Will be used to adjust the asymptote of the maturity schedule, if/when a time-series is available this will be used as a direct input to the stock assessment		Examination of potential skip spawning
	Fecundity-at-age and -size information		Will be used to move from spawning biomass to egg-output as the metric of reproductive capability in the stock assessment and management reference points		Fecundity assessment
	Revised field maturity classification		Revised time-series of historical (and future) maturity for input to the stock assessment		Examination of accuracy of current field macroscopic maturity classification
2. Biological input	Stock structure of IPHC Regulatory Area 4B relative to the rest of the Convention Area	Altered structure of future stock assessments	If 4B is found to be functionally isolated, a separate assessment may be constructed for that IPHC Regulatory Area	Genetics and Genomics	Population structure
3. Biological input	Assignment of individuals to source populations and assessment of distribution changes	Improve estimates of productivity	Will be used to define management targets for minimum spawning biomass by Biological Region		Distribution
	Improved understanding of larval and juvenile distribution		Will be used to generate potential recruitment covariates and to inform minimum spawning biomass targets by Biological Region	Migration	Larval and juvenile connectivity studies
1. Assessment data collection and processing	Sex ratio-at-age	Scale biomass and fishing intensity	Annual sex-ratio at age for the commercial fishery fit by the stock assessment	Reproduction	Sex ratio of current commercial landings
	Historical sex ratio-at-age		Annual sex-ratio at age for the commercial fishery fit by the stock assessment		Historical sex ratios based on archived otolith DNA analyses
2. Assessment data collection and processing	New tools for fishery avoidance/deterence; improved estimation of depredation mortality	Improve mortality accounting	May reduce depredation mortality, thereby increasing available yield for directed fisheries. May also be included as another explicit source of mortality in the stock assessment and mortality limit setting process depending on the estimated magnitude	Mortality and survival assessment	Whale depredation accounting and tools for avoidance
1. Fishery yield	Physiological and behavioral responses to fishing gear	Reduce incidental mortality	May increase yield available to directed fisheries	Mortality and survival assessment	Biological interactions with fishing gear
2. Fishery yield	Guidelines for reducing discard mortality	Improve estimates of unobserved mortality	May reduce discard mortality, thereby increasing available yield for directed fisheries	Mortality and survival assessment	Best handling practices: recreational fishery

C. List of ranked biological uncertainties and parameters for management strategy evaluation (MSE) and their links to research areas and activities contemplated in the IPHC 5-Year Biological and Ecosystem Science Research Plan (2017-21)

MSE Rank	Research outcomes	Relevance for MSE	Research Area	Research activities
1. Biological parameterization and validation of movement estimates	Improved understanding of larval and juvenile distribution	Improve parametization of the Operating Model	Migration	Larval and juvenile connectivity studies
	Stock structure of IPHC Regulatory Area 4B relative to the rest of the Convention Area		Genetics and Genomics	Population structure
2. Biological parameterization and validation of recruitment variability and distribution	Assignment of individuals to source populations and assessment of distribution changes	Improve simulation of recruitment variability and parametization of recruitment distribution in the Operating Model		Distribution
	Establishment of temporal and spatial maturity and spawning patterns	Improve simulation of recruitment variability and parametization of recruitment distribution in the Operating Model	Reproduction	Recruitment strength and variability
3. Biological parameterization and validation for growth projections	Identification and application of markers for growth pattern evaluation	Improve simulation of variability and allow for scenarios investigating climate change	Growth	Evaluation of somatic growth variation as a driver for changes in size-at-age
	Environmental influences on growth patterns			
	Dietary influences on growth patterns and physiological condition			
1. Fishery parameterization	Experimentally-derived DMRs	Improve estimates of stock productivity	Mortality and survival assessment	Discard mortality rate estimate: recreational fishery

D. External funding received during the IPHC 5-Year Biological and Ecosystem Science Research Plan (2017-21):

Project #	Grant agency	Project name	PI	Partners	IPHC Budget ($US)	Management implications	Grant period
1	**Saltonstall-Kennedy NOAA**	Improving discard mortality rate estimates in the Pacific halibut by integrating handling practices, physiological condition and post-release survival (NOAA Award No. NA17NMF4270240)	IPHC	Alaska Pacific University	$286,121	Bycatch estimates	September 2017 – August 2020
2	**North Pacific Research Board**	Somatic growth processes in the Pacific halibut (*Hippoglossus stenolepis*) and their response to temperature, density and stress manipulation effects (NPRB Award No. 1704)	IPHC	AFSC-NOAA-Newport, OR	$131,891	Changes in biomass/size-at-age	September 2017 – February 2020
3	**Bycatch Reduction Engineering Program - NOAA**	Adapting Towed Array Hydrophones to Support Information Sharing Networks to Reduce Interactions Between Sperm Whales and Longline Gear in Alaska	Alaska Longline Fishing Association	IPHC, University of Alaska Southeast, AFSC-NOAA	-	Whale Depredation	September 2018 – August 2019
4	**Bycatch Reduction Engineering Program - NOAA**	Use of LEDs to reduce Pacific halibut catches before trawl entrainment	Pacific States Marine Fisheries Commission	IPHC, NMFS	-	Bycatch reduction	September 2018 – August 2019
5	**National Fish & Wildlife Foundation**	Improving the characterization of discard mortality of Pacific halibut in the recreational fisheries (NFWF Award No. 61484)	IPHC	Alaska Pacific University, U of A Fairbanks, charter industry	$98,902	Bycatch estimates	April 2019 – November 2021
6	**North Pacific Research Board**	Pacific halibut discard mortality rates (NPRB Award No. 2009)	IPHC	Alaska Pacific University,	$210,502	Bycatch estimates	January 2021 –March 2022
7	**Bycatch Reduction Engineering Program - NOAA**	Gear-based approaches to catch protection as a means for minimizing whale depredation in longline fisheries (NA21NMF4720534)	IPHC	Deep Sea Fishermen's Union, Alaska Fisheries Science Center-NOAA, industry representatives	$99,700	Mortality estimations due to whale depredation	November 2021 – October 2022
8	**North Pacific Research Board**	Pacific halibut population genomics (NPRB Award No. 2110)	IPHC	Alaska Fisheries Science Center-NOAA	$193,685	Stock structure	December 2021- January 2024
				Total awarded ($)	**$1,020,801**		

E. Publications in the peer-reviewed literature resulting from the IPHC 5-Year Biological and Ecosystem Science Research Plan (2017-21):

2020:

Fish, T., Wolf, N., Harris, B.P., Planas, J.V. A comprehensive description of oocyte developmental stages in Pacific halibut, *Hippoglossus stenolepis*. *Journal of Fish Biology*. 2020. 97: 1880-1885. https://doi: 10.1111/jfb.14551.

2021:

Carpi, P., Loher, T., Sadorus, L., Forsberg, J., Webster, R., Planas, J.V., Jasonowicz, A., Stewart, I. J., Hicks, A. C. Ontogenetic and spawning migration of Pacific halibut: a review. *Rev Fish Biol Fisheries*. 2021. https://doi.org/10.1007/s11160-021-09672-w.

Kroska, A.C., Wolf, N., Planas, J.V., Baker, M.R., Smeltz, T.S., Harris, B.P. Controlled experiments to explore the use of a multi-tissue approach to characterizing stress in wild-caught Pacific halibut (*Hippoglossus stenolepis*). *Conservation Physiology* 2021. 9(1):coab001. https://doi:10.1093/conphys/coab001.

Loher, T., Bath, G. E., Wischniowsky, S. The potential utility of otolith microchemistry as an indicator of nursery origins in Pacific halibut (*Hippoglossus stenolepis*) in the eastern Pacific: the importance of scale and geographic trending. *Fisheries Research*. 2021. 243: 106072. https://doi.org/10.1016/j.fishres.2021.106072.

Lomeli, M.J.M., Wakefield, W.W., Herrmann, B., Dykstra, C.L., Simeon, A., Rudy, D.M., Planas, J.V. Use of Artificial Illumination to Reduce Pacific Halibut Bycatch in a U.S. West Coast Groundfish Bottom Trawl. *Fisheries Research*. 2021. 233: 105737. doi: 10.1016/j.fishres.2020.105737.

Sadorus, L., Goldstein, E., Webster, R., Stockhausen, W., Planas, J.V., Duffy-Anderson, J. Multiple life-stage connectivity of Pacific halibut (*Hippoglossus stenolepis*) across the Bering Sea and Gulf of Alaska. *Fisheries Oceanography*. 2021. 30:174-193. doi: https://doi.org/10.1111/fog.12512.

2022:

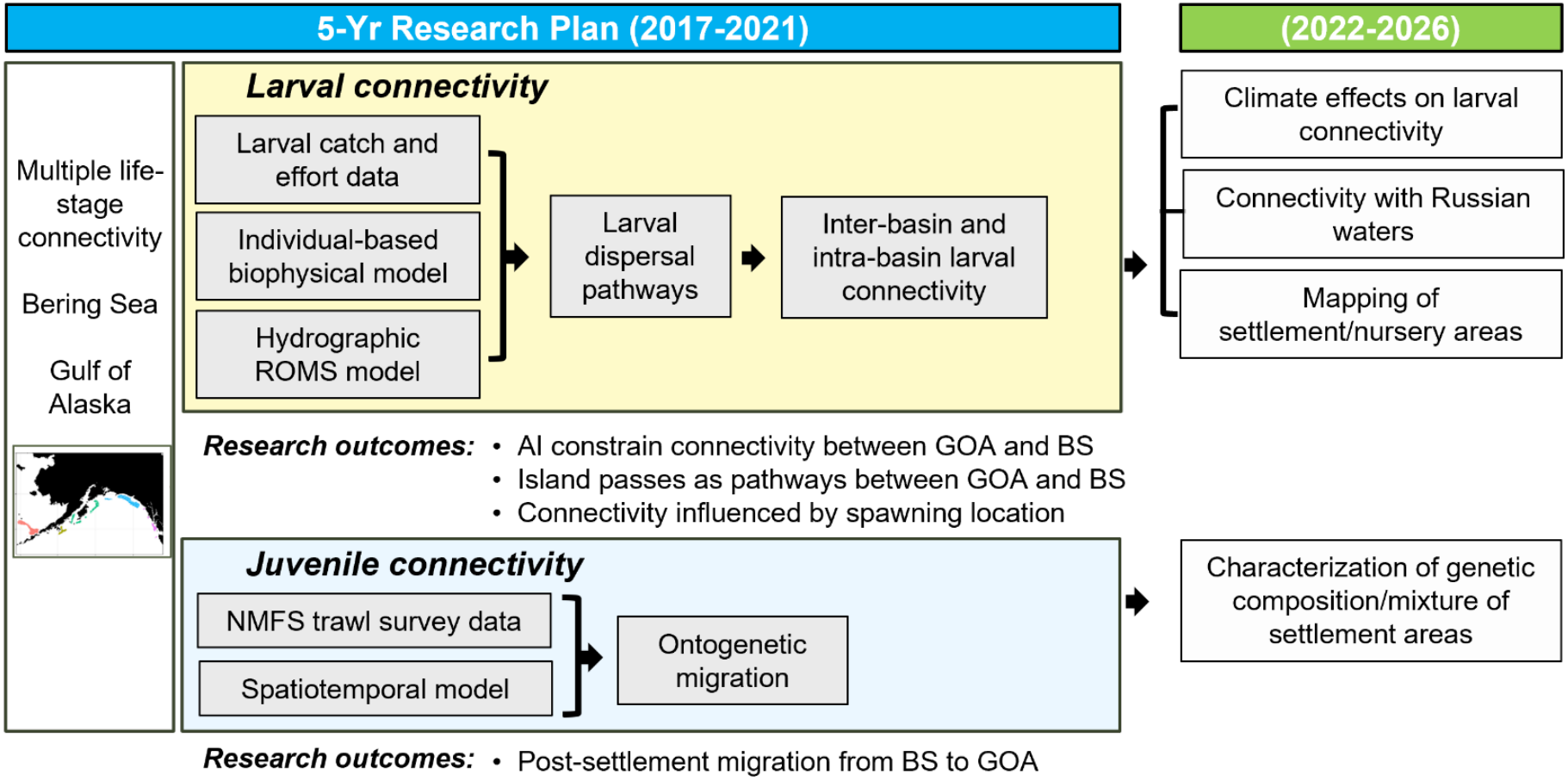
Fish, T., Wolf, N., Smeltz, T. S., Harris, B. P., and Planas, J. V. Reproductive Biology of Female Pacific Halibut (*Hippoglossus stenolepis*) in the Gulf of Alaska. *Frontiers in Marine Science* 2022. 9:801759. doi: 10.3389/fmars.2022.801759.

Jasonowicz, A.C., Simeon, A., Zahm, M., Cabau, C., Klopp, C., Roques, C., Iampietro, C., Lluch, J., Donnadieu, C., Parrinello, H., Drinan, D.P., Hauser, L., Guiguen, Y., Planas, J.V. Generation of a chromosome-level genome assembly for Pacific halibut (*Hippoglossus stenolepis*) and characterization of its sex-determining genomic region. *Molecular Ecology Resources.* 2022. In Press. doi: https://doi.org/10.1111/1755-0998.13641.

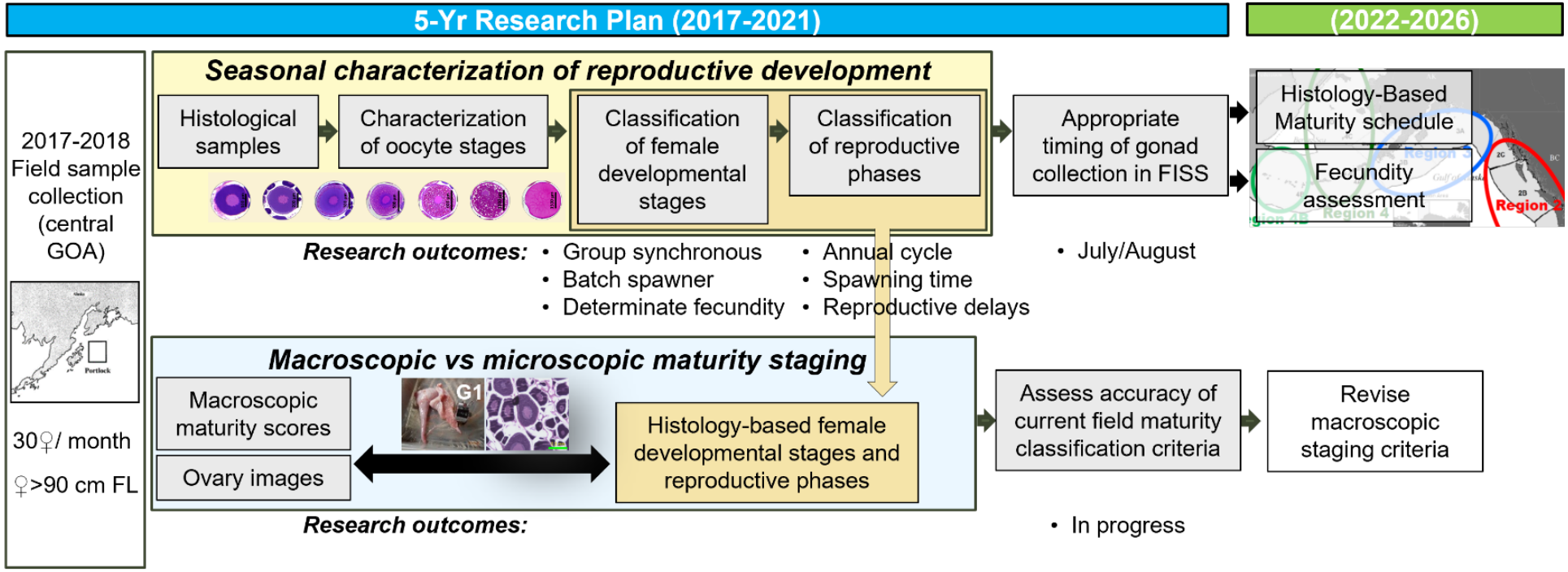
Loher, T., Dykstra, C.L., Hicks, A., Stewart, I.J., Wolf, N., Harris, B.P., Planas, J.V. Estimation of postrelease longline mortality in Pacific halibut using acceleration-logging tags. *North American Journal of Fisheries Management*. 2022. 42: 37-49. DOI: http://dx.doi.org/10.1002/nafm.10711.

F. Flow chart of progress resulting from the IPHC 5-Year Biological and Ecosystem Science Research Plan (2017-21) by research area leading to the IPHC 5-Year Program of Integrated Research and Monitoring (2022-2026)

1. Migration and Distribution

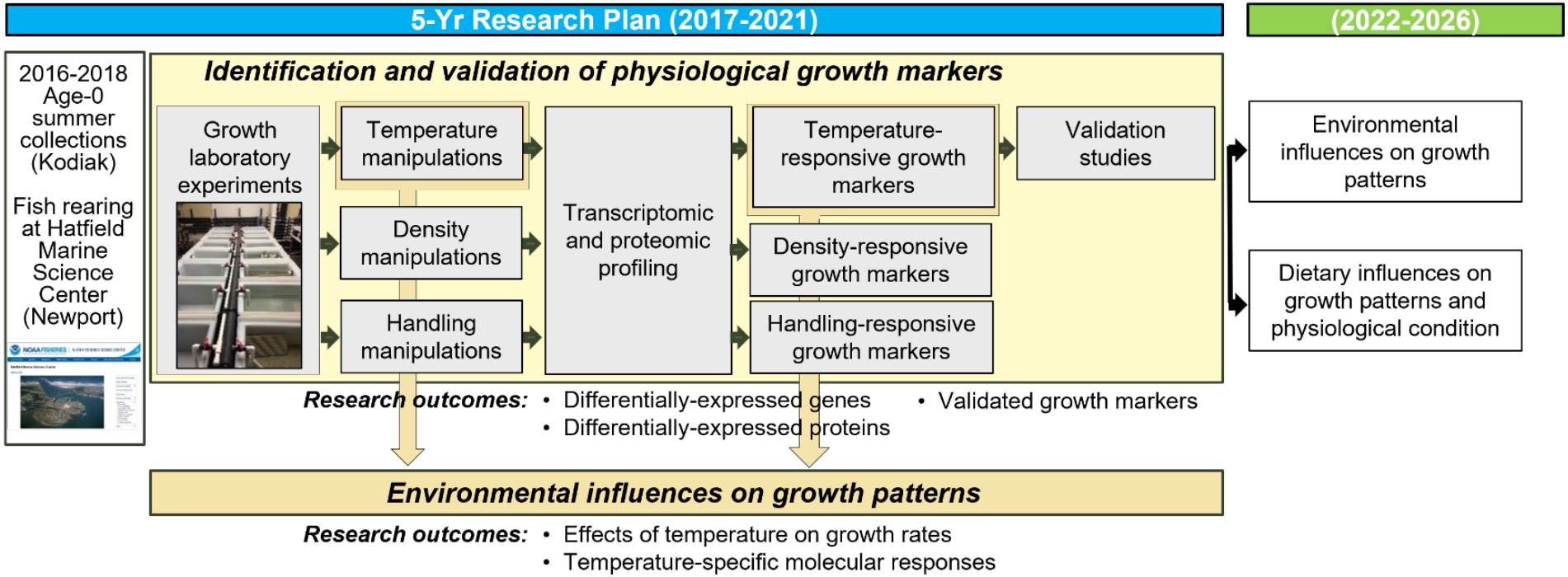


2. Reproduction



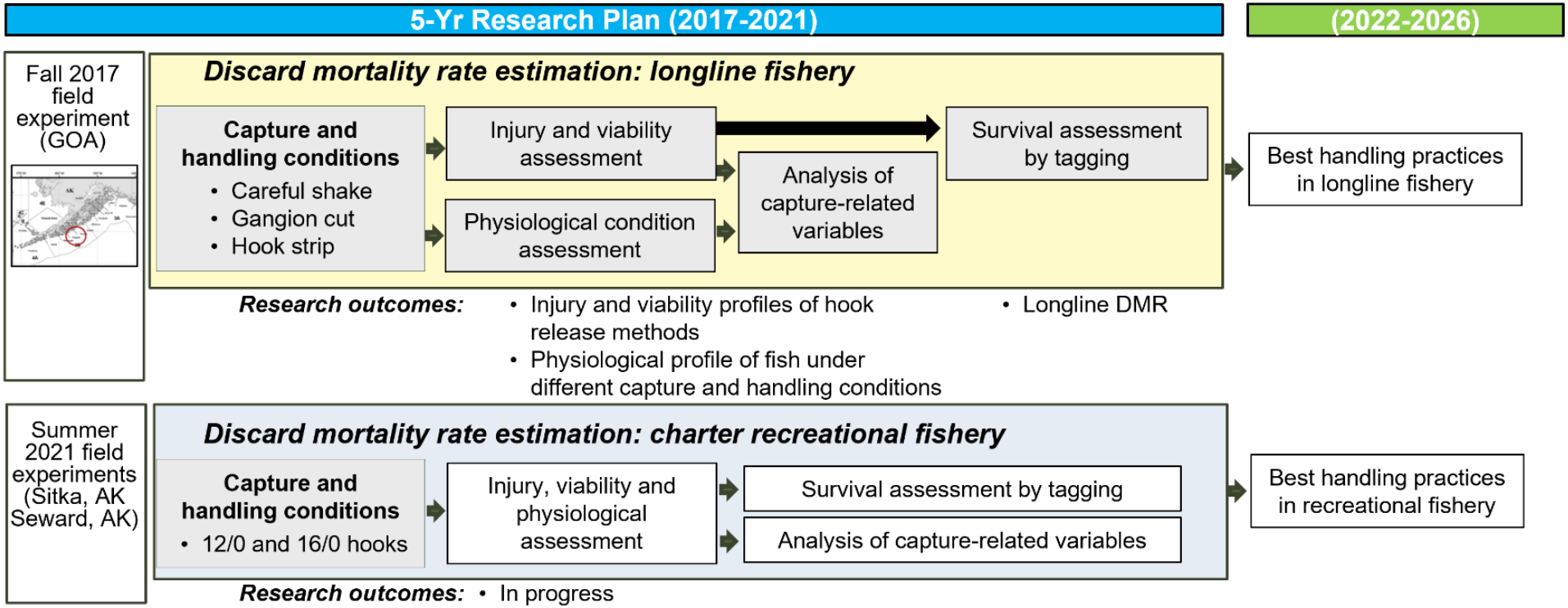
Staff involved: Teresa Fish, MSc APU (2018-2020), Crystal Simchick, Ian Stewart, Allan Hicks, Josep Planas
Funding: IPHC (2018-2020)
Publications (2): Fish et al. (2020) *J. Fish Biol*. **97**: 1880–1885 ; Fish et al. (2022) Front. Mar. Sci. 9:801759

3. Growth



Staff involved: Andy Jasonowicz, Crystal Simchick, Josep Planas
Funding: NPRB Grant#1704 (Sept. 2017-Feb. 2020)
Publications: Planas et al. (in preparation)

4. Mortality and Survival Assessment



Staff involved: Claude Dykstra, Allan Hicks, Ian Stewart, Josep Planas
Funding (3): Saltonstall-Kennedy NOAA (Sept. 2017-Aug. 2020); NFWF (Apr. 2019-Nov. 2021); NPRB#2009 (Jan. 2021-Mar. 2022)
Publications (2): Kroska et al. (2021) *Conserv. Physiol.*; Loher et al. (2022) *North Amer. J. Fish. Manag. 42: 37-49*

5. Genetics and Genomics

5-Yr Research Plan (2017-2021)

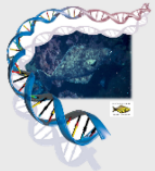
(2022-2026)

Collection of genetic samples of spawning aggregations spanning the Gulf of Alaska, Bering Sea and Aleutian Islands

(1999-2020)

Development and application of genomic approaches

Chromosome-level genome assembly



Development of methods based on low-coverage whole genome resequencing

Establishment of a bioinformatic pipeline in the cloud (Microsoft Azure)

Population structure analyses

Establishment of a baseline of genetic diversity

Delineation of fine-scale stock structure

Research outcomes:

- Sequenced genome (size=602 Mbp)
- Full annotation (NCBI) (27,944 genes)
- 24 chromosome-length scaffolds
- SNP detection and genotyping

Staff involved: Andy Jasonowicz, Josep Planas
Funding: IPHC, NPRB#2110
Publications: Jasonowicz et al. (2022) *Mol. Ecol. Resour. (In Review)*

APPENDIX II

Biological research areas in the 5-Year Program of Integrated Research and Monitoring (2022-2026) and ranked relevance for stock assessment and management strategy evaluation (MSE)

Research areas	Research activities	Research outcomes	Relevance for stock assessment	Relevance for MSE	Specific analysis input	SA Rank	MSE Rank	Research priorization
Migration and population dynamics	Population structure	Population structure in the Convention Area	Altered structure of future stock assessments	Improve parametization of the Operating Model	If 4B is found to be functionally isolated, a separate assessment may be constructed for that IPHC Regulatory Area	2. Biological input	1. Biological parameterization and validation of movement estimates and recruitment distribution	2
	Distribution	Assignment of individuals to source populations and assessment of distribution changes	Improve estimates of productivity		Will be used to define management targets for minimum spawning biomass by Biological Region	3. Biological input		2
	Larval and juvenile connectivity studies	Improved understanding of larval and juvenile distribution	Improve estimates of productivity		Will be used to generate potential recruitment covariates and to inform minimum spawning biomass targets by Biological Region	3. Biological input	1. Biological parameterization and validation of movement estimates	2
Reproduction	Histological maturity assessment	Updated maturity schedule	Scale biomass and reference point estimates	Improve simulation of spawning biomass in the Operating Model	Will be included in the stock assessment, replacing the current schedule last updated in 2006	1. Biological input		1
	Examination of potential skip spawning	Incidence of skip spawning			Will be used to adjust the asymptote of the maturity schedule, if/when a time-series is available this will be used as a direct input to the stock assessment			1
	Fecundity assessment	Fecundity-at-age and -size information			Will be used to move from spawning biomass to egg-output as the metric of reproductive capability in the stock assessment and management reference points			1
	Examination of accuracy of current field macroscopic maturity classification	Revised field maturity classification			Revised time-series of historical (and future) maturity for input to the stock assessment			1
Growth	Evaluation of somatic growth variation as a driver for changes in size-at-age	Identification and application of markers for growth pattern evaluation	Scale stock productivity and reference point estimates	Improve simulation of variability and allow for scenarios investigating climate change	May inform yield-per-recruit and other spatial evaluations of productivity that support mortality limit-setting		3. Biological parameterization and validation for growth projections	5
		Environmental influences on growth patterns			May provide covariates for projecting short-term size-at-age. May help to delineate between effects due to fishing and those due to environment, thereby informing appropriate management response			5
		Dietary influences on growth patterns and physiological condition			May provide covariates for projecting short-term size-at-age. May help to deleineate between effects due to fishing and those due to environment, thereby informing appropriate management response			5
Mortality and survival assessment	Discard mortality rate estimate: longline fishery	Experimentally-derived DMR	Improve trends in unobserved mortality	Improve estimates of stock productivity	Will improve estimates of discard mortality, reducing potential bias in stock assessment results and management of mortality limits	1. Fishery yield	1. Fishery parameterization	4
	Discard mortality rate estimate: recreational fishery				Will improve estimates of discard mortality, reducing potential bias in stock assessment results and management of mortality limits			4
	Best handling and release practices	Guidelines for reducing discard mortality			May reduce discard mortality, thereby increasing available yield for directed fisheries	2. Fishery yield		4
Fishing technology	Whale depredation accounting and tools for avoidance	New tools for fishery avoidance/deterence; improved estimation of depredation mortality	Improve mortality accounting	Improve estimates of stock productivity	May reduce depredation mortality, thereby increasing available yield for directed fisheries. May also be included as another explicit source of mortality in the stock assessment and mortality limit setting process depending on the estimated magnitude	1. Assessment data collection and processing		3

APPENDIX III

List of ranked research priorities for stock assessment

SA Rank	Research outcomes	Relevance for stock assessment	Specific analysis input	Research Area	Research activities
1. Biological input	Updated maturity schedule	Scale biomass and reference point estimates	Will be included in the stock assessment, replacing the current schedule last updated in 2006	Reproduction	Histological maturity assessment
	Incidence of skip spawning		Will be used to adjust the asymptote of the maturity schedule, if/when a time-series is available this will be used as a direct input to the stock assessment		Examination of potential skip spawning
	Fecundity-at-age and -size information		Will be used to move from spawning biomass to egg-output as the metric of reproductive capability in the stock assessment and management reference points		Fecundity assessment
	Revised field maturity classification		Revised time-series of historical (and future) maturity for input to the stock assessment		Examination of accuracy of current field macroscopic maturity classification
2. Biological input	Stock structure of IPHC Regulatory Area 4B relative to the rest of the Convention Area	Altered structure of future stock assessments	If 4B is found to be functionally isolated, a separate assessment may be constructed for that IPHC Regulatory Area	Migration and population dynamics	Population structure
3. Biological input	Assignment of individuals to source populations and assessment of distribution changes	Improve estimates of productivity	Will be used to define management targets for minimum spawning biomass by Biological Region		Distribution
	Improved understanding of larval and juvenile distribution		Will be used to generate potential recruitment covariates and to inform minimum spawning biomass targets by Biological Region		Larval and juvenile connectivity studies
1. Assessment data collection and processing	Sex ratio-at-age	Scale biomass and fishing intensity	Annual sex-ratio at age for the commercial fishery fit by the stock assessment	Reproduction	Sex ratio of current commercial landings
	Historical sex ratio-at-age		Annual sex-ratio at age for the commercial fishery fit by the stock assessment		Historical sex ratios based on archived otolith DNA analyses
2. Assessment data collection and processing	New tools for fishery avoidance/deterence; improved estimation of depredation mortality	Improve mortality accounting	May reduce depredation mortality, thereby increasing available yield for directed fisheries. May also be included as another explicit source of mortality in the stock assessment and mortality limit setting process depending on the estimated magnitude	Fishing technology	Whale depredation accounting and tools for avoidance
1. Fishery yield	Physiological and behavioral responses to fishing gear	Reduce incidental mortality	May increase yield available to directed fisheries	Fishing technology	Biological interactions with fishing gear
2. Fishery yield	Guidelines for reducing discard mortality	Improve estimates of unobserved mortality	May reduce discard mortality, thereby increasing available yield for directed fisheries	Mortality and survival assessment	Best handling practices: recreational fishery

APPENDIX IV

List of ranked research priorities for management strategy evaluation (MSE)

MSE Rank	Research outcomes	Relevance for MSE	Research Area	Research activities
1. Biological parameterization and validation of movement estimates	Improved understanding of larval and juvenile distribution	Improve parametization of the Operating Model	Migration and population dynamics	Larval and juvenile connectivity studies
	Stock structure of IPHC Regulatory Area 4B relative to the rest of the Convention Area			Population structure
2. Biological parameterization and validation of recruitment variability and distribution	Assignment of individuals to source populations and assessment of distribution changes	Improve simulation of recruitment variability and parametization of recruitment distribution in the Operating Model		Distribution
	Establishment of temporal and spatial maturity and spawning patterns	Improve simulation of recruitment variability and parametization of recruitment distribution in the Operating Model	Reproduction	Recruitment strength and variability
3. Biological parameterization and validation for growth projections	Identification and application of markers for growth pattern evaluation	Improve simulation of variability and allow for scenarios investigating climate change	Growth	Evaluation of somatic growth variation as a driver for changes in size-at-age
	Environmental influences on growth patterns			
	Dietary influences on growth patterns and physiological condition			
1. Fishery parameterization	Experimentally-derived DMRs	Improve estimates of stock productivity	Mortality and survival assessment	Discard mortality rate estimate: recreational fishery

APPENDIX V

List of ongoing and planned research projects (Will be linked to the website)

Biological Research Projects

Ongoing Research Projects

Research Project #	Project Title	Abstract	Objectives	Deliverables	Progress report	5YPRIM Research area	Management implications	Specific inputs into management	Period of Performance	PI	Funding source	Budget	Research prioritization for SA/MSE
1	Leveraging multiple genomic approaches to investigate population structure and dynamics of Pacific halibut	The Pacific halibut (Hippoglossus stenolepis) is a key flatfish species in the North Pacific Ocean ecosystem that supports important commercial, recreational and subsistence fisheries and that is managed as a single stock by the International Pacific Halibut Commission. The overarching goal of the present study is to advance our understanding of Pacific halibut population structure and dynamics in a changing climate through the use of genomic approaches to inform fishery management. In particular, we seek to improve our current understanding of stock structure among spawning groups of Pacific halibut in the northeast Pacific Ocean by conducting low coverage whole genome resequencing, a method that allows the characterization of genomic variation at the highest resolution possible and with which we will establish a baseline of Pacific halibut genetic diversity. Subsequently, we will leverage the obtained genomic data to identify markers that display high differentiation among the different genetic baseline datasets. The results from this study will inform on the delimitation of management units and provide preliminary information on stock composition in the Pacific halibut fishery, as well as provide a tool to monitor changes in distribution associated with climate change.	1. Investigate fine scale Pacific halibut population structure in the northeast Pacific Ocean using low coverage whole genome resequencing: characterization of neutral and adaptive variation at very high resolution among spawning groups leading to the identification of millions of genome-derived genetic markers. 2. Develop a high-throughput genetic marker panel consisting of a selection of genome-derived, high resolution markers	1.Establishment of a baseline of Pacific halibut genetic diversity. The genomic data produced will represent a detailed baseline of Pacific halibut genetic structure and diversity at neutral and adaptive markers over a large geographical scale (Gulf of Alaska, Aleutian Islands and Bering Sea) and over a broad temporal scale (last 30 years). 2.Delineation of fine-scale Pacific halibut stock structure. 3. Assignment of individuals to source populations and assessment of distribution changes.	IPHC-2023-SRB022-09/NPRB Interim Report July 2023/IPHC-2023-WM2023-12	Migration and Population Dynamics	1. Altered structure of future stock assessments. 2. Improve estimates of productivity	If IPHC Regulatory Area 4B is found to be functionally isolated, a separate assessment may be constructed for that IPHC Regulatory Area. Research outcomes will be used to define management targets for minimum spawning biomass by Biological Region.	12/01/2021-1/31/2024	Josep Planas	External (North Pacific Research Board; Project No. 2110)	$193,685	Priority Rank #2
2	Mapping of Pacific halibut juvenile habitat	The IPHC Secretariat recently completed a study to investigate the connectivity between spawning grounds and possible settlement areas based on a biophysical larval transport model (Sadorus et al., 2021; https://doi.org/10.1111/fog.12512). Although it is known that Pacific halibut, following the pelagic larval phase, begin their demersal stage as roughly 6-month-old juveniles, settling in shallow nursery (settlement) areas, near or outside the mouths of bays (Carpi et al., 2021; https://doi.org/10.1007/s11160-021-09672-w), very little information is available on the geographic location and physical characteristics of these areas. In order to fill this knowledge gap, the IPHC Secretariat has initiated studies to identify potential settlement areas for juvenile Pacific halibut throughout IPHC Convention Waters.	1. Collect data sources on juvenile Pacific halibut presence. 2. Create a map of suitable settlement habitat by combining available bathymetry information (e.g. benthic sediment composition and shoreline morphological data) and information on recorded presence of age-0, age-1 and age-2 Pacific halibut juveniles as well as absence of young Pacific halibut noted by various nursery habitat projects focused on other flatfish species.	Map of juvenile Pacific halibut habitat.	IPHC-2023-SRB022-09/IPHC-2023-WM2023-12	Migration and Population Dynamics	Improve estimates of productivity	Will be used to generate potential recruitment covariates and to inform minimum spawning biomass targets by Biological Region	1/1/2023-12/31/2025	Josep Planas	Internal	$0	Priority Rank #2
3	Female reproductive assessment	In fisheries, understanding the reproductive biology of a species is important for estimating the reproductive potential and spawning biomass of the stock and, consequently, for optimizing management of the species. Recent sensitivity analyses have shown the importance of changes in spawning output in female Pacific halibut due to changes in maturity schedules, in fecundity estimations and/or in skip spawning for stock assessment (Stewart and Hicks, 2020). These results highlight the need for a better understanding of factors influencing reproductive biology and spawning success in Pacific halibut. In order to fill existing knowledge gaps related to the reproductive biology of female Pacific halibut, research efforts are being conducted to characterize female reproductive capacity in this species. Improved knowledge on key aspects of the reproductive physiology of Pacific halibut (e.g., maturity schedules, fecundity, etc.) will provide an updated and more comprehensive description of reproductive capacity and success in this important species.	1.Produce an accurate description of oocyte developmental stages in female Pacific halibut that can be used to classify female maturity stages. 2.Describe changes in female and male maturity stages throughout an entire annual reproductive cycle based on histological assessment and physiological parameters that will be used to revise current estimates of female and male age-at-maturity. 3.Compare macroscopic (based on field observations) and microscopic (based on histological assessment) female and male maturity stages and revise maturity criteria used in FISS. 4.Update maturity schedules based on histological classification of female maturity. 5. Conduct investigations on fecundity and on the incidence of skip-spawning in female Pacific halibut. 5.Conduct investigations on possible temporal and spatial changes in reproductive performance (maturity, fecundity, skip-spawning) in female Pacific halibut.	1. Updated maturity schedule coastwide. 2. Fecundity-at-age and -size estimates. 3. Revised field maturity classification. 4. Information on skip-spawning.	IPHC-2023-SRB022-09/IPHC-2023-WM2023-12	Reproduction	Scale biomass and reference point estimates. Improve simulation of spawning biomass in the Operating Model.	Research outcomes will be included in the stock assessment, replacing the current maturity schedule last updated in 2006. Research outcomes will be used to adjust the asymptote of the maturity schedule, if/when a time-series is available this will be used as a direct input to the stock assessment. Research outcomes will be used to move from spawning biomass to egg-output as the metric of reproductive capability in the stock assessment and management reference points. Research outcomes will result in revised time-series of historical (and future) maturity for input to the stock assessment.	1/1/2017-12/31/2026	Josep Planas	Internal	$51,834 (FY2024)	Priority Rank #1
4	Gear-based approaches to catch protection as a means for minimizing whale depredation in longline fisheries	In the north Pacific, both Killer (Orcinus orca) and Sperm (Physeter macrocephalus) whales are involved in depredation behavior in Pacific halibut (Hippoglossus stenolepis). In 2011 and 2012 fisheries observers estimated that 6.9% of Pacific halibut sets were affected by whale depredation in the Bering Sea. Reductions in catch per unit effort (CPUE) when whales were present ranged across geographic regions from 5 15-57% for Pacific halibut. These impacts also incur significant time, fuel, and personnel costs to fishing operations. From a fisheries management perspective, depredation creates an additional and highly uncertain source of mortality, loss of data (e.g. compromised survey activity), and reduces fishery efficiency. Stock assessments of both Pacific halibut (Stewart et al. 2020) and sablefish (Goethel et al. 2020) have adjusted their analysis of fishery independent data to account for the effects of whale depredation on catch rates. In the sablefish assessment, fishery limits are also adjusted downward to reflect expected depredation during the commercial fishery. Meanwhile, potential risks to the whales include physical injury due to being near vessels and gear, disruption of social structure , and developing an artificial reliance on food items that can be affected by fishery dynamics. Many efforts have been made over the years to mitigate this problem, with fishers generally limited to simple methods that can be constructed, deployed, or enacted without significantly disrupting normal fishing operations, or without violating gear regulations. Existing approaches include catch protection, physical and auditory deterrents, and spatial or temporal avoidance. These approaches have had variable degrees of success and ease of adoption in each fishery but none have provided a long-term solution. There are increasing data sources supporting the notion that technologies which reduce initial contact between gear and depredators will reduce the likelihood of foraging attempts around the gear, thereby sustaining levels of target catch while simultaneously reducing risk of depredator mortality and gear damage. Recent studies using physical catch protection methods include the development of underwater shuttles that unhook, and transport catch to the surface (Patagonian toothfish), light and expandable 'slinky' pots (sablefish), and flashers or mesh panels attached to the gear to obscure catch	1. Identify potential methods for protecting hook captured fish from whale depredation. 2. Develop and field-test several simple low-cost catch-protection designs that can be deployed effectively using current longline fishing techniques.	1. Cost effective prospective terminal gear modifications designed to protect longline catch from whale depredation. 2. Demonstration of the functionality of these proof-of-concept catch protection devices in field tests and provide direction for further modifications and larger scale experimental testing.	IPHC-2023-SRB022-09/IPHC-2023-WM2023-12/BREP Interim Report May 2023	Fishing technology	Improve mortality accounting. Improve estimates of stock productivity.	Research outcomes may reduce depredation mortality, thereby increasing available yield for directed fisheries. May also be included as another explicit source of mortality in the stock assessment and mortality limit setting process depending on the estimated magnitude.	11/1/2021-10/30/2023	Claude Dykstra/Ian Stewart	External (Bycatch Reduction Engineering Program - NOAA: Project NA21NMF4720534)	$99,700	Priority Rank #3

Proposed Research Projects

Research Project #	Project Title	Abstract	Objectives	Deliverables	Progress report	5YPRIM Research area	Management implications	Specific inputs into management	Requested period of performance	PI	Targeted funding source	Requested budget	Research prioritization for SA/MSE
1	Genomic analyses of Pacific halibut in Washington State waters to inform population structure and dynamics affecting coastal communities	Current studies at the IPHC, with funding from a grant from the North Pacific Research Board (Project #2110; 2022-2024), are devoted to the application of genome-based approaches (i.e. low coverage whole genome resequencing, lcWGR) to investigate stock structure among known spawning groups of Pacific halibut in the Gulf of Alaska (as far South as Haida Gwaii), Bering Sea and Aleutian Islands. By leveraging the recently sequenced and annotated reference Pacific halibut genome (Jasonowicz et al., 2022; GCF_022539355.2), the IPHC has conducted lcWGR for a total of 600 individual samples from the above-mentioned spawning groups at a coverage of 3X. This effort has so far resulted in the identification of 11.5 million autosomal single nucleotide polymorphisms (SNPs), of which 4 million SNPs have a minor allele frequency higher than 0.05. Considerable progress is currently being made towards using genome approaches to establish a genetic baseline for the available spawning groups, and towards the development of genomic tools aimed at addressing important ecological, environmental, and management-related issues with respect to Pacific halibut in the Gulf of Alaska, Bering Sea and Aleutian Islands. However, the lack of genetic samples from spawning groups off the WA coast limits the application of the above-mentioned genomic tools to advance our understanding of population structure, movement, connectivity, adaptive characteristics, and environmental responses of Pacific halibut in Convention waters. Although no major spawning ground has been mapped south of Cape St. James in the southern tip of Haida Gwaii (St. Pierre, 1984), archeological records along with traditional and ecological knowledge from Indian Tribes (e.g., Makah tribe, etc.) that fished Pacific halibut in the winter off the WA coast indicate that Pacific halibut, at least historically, spawned in what is now IPHC Regulatory Area 2A (Salmen-Hartley, 2018). Additionally, contemporary reports of spawning Pacific halibut south of Cape Flattery and the existence of suitable spawning habitat for Pacific halibut (i.e., deep areas off the continental slope, 200-600 m) are strongly indicative of the presence of spawning grounds for Pacific halibut off the WA coast. Therefore, the identification of potential winter spawning groups of Pacific halibut in WA waters and their biological (i.e., genetic and reproductive) characterization are	1. To identify winter spawning groups of Pacific halibut off the WA coast with the use of traditional and ecological knowledge and collect biological samples. 2. To characterize the reproductive condition of female and male Pacific halibut off the WA coast during the winter spawning season. 3. To generate and incorporate genomic data from winter spawning groups off the WA coast to existing data from winter spawning groups in other geographic areas in the northeastern Pacific Ocean to establish an expanded baseline of Pacific halibut genetic diversity.	1. Information on Pacific halibut spawning groups off the WA coast: location information, spawning time and collection of biological (genetic and reproductive) samples. 2. Extended baseline of Pacific halibut genetic diversity and delineation of fine-scale Pacific halibut stock structure in WA waters and coastwide.	N/A	Migration and Population Dynamics	Altered structure of future stock assessments. Improved estimates of productivity coastwide.	Information of stock structure of the Pacific halibut population in Convention waters will inform management actions by validating management units. Research outcomes will be used to define management targets for minimum spawning biomass by Biological Region.	02/01/2024-1/31/2026	Josep Planas	External (Washington Sea Grant). Full proposal submitted in May 2023. Decision expected September 2023. Not selected for funding.	$288,652	Priority Rank #2
2	Full scale testing of devices to minimize whale depredation in longline fisheries	In the north Pacific, both Killer (Orcinus orca) and Sperm (Physeter macrocephalus) whales are involved in depredation behavior in Pacific halibut (Hippoglossus stenolepis). In 2011 and 2012 fisheries observers estimated that 6.9% of Pacific halibut sets were affected by whale depredation in the Bering Sea (Peterson et al. 2014). Reductions in catch per unit effort (CPUE) when whales were present ranged across geographic regions from 5 15-57% for Pacific halibut (Peterson et al. 2014). These impacts also incur significant time, fuel, and personnel costs to fishing operations. From a fisheries management perspective, depredation creates an additional and highly uncertain source of mortality, loss of data (e.g. compromised survey activity), and reduces fishery efficiency. Stock assessments of both Pacific halibut (Stewart et al. 2020) and sablefish (Goethel et al. 2020) have adjusted their analysis of fishery independent data to account for the effects of whale depredation on catch rates. In the sablefish assessment, fishery limits are also adjusted downward to reflect expected depredation during the commercial fishery. Meanwhile, potential risks to the whales include physical injury due to being near vessels and gear, disruption of social structure (e.g., Chilvers and Corkeron 2001), and developing an artificial reliance on food items that can be affected by fishery dynamics. Many efforts have been made over the years to mitigate this problem, with fishers generally limited to simple methods that can be constructed, deployed, or enacted without significantly disrupting normal fishing operations, or without violating gear regulations. Existing approaches include catch protection, physical and auditory deterrents, and spatial or temporal avoidance. These approaches have had variable degrees of success and ease of adoption in each fishery (Werner et al. 2015) but none have provided a long-term solution. There are increasing data sources supporting the notion that technologies which reduce initial contact between gear and depredators will reduce the likelihood of foraging attempts around the gear, thereby sustaining levels of target catch while simultaneously reducing risk of depredator mortality and gear damage. Recent studies using physical catch protection methods include the development of underwater shuttles that unhook and transfer catch to the surface (Peterson	1. Assess the performance of catch protection devices to effectively reduce depredation of longline captured fish in the presence of toothed whales. 2. Assess the performance metrics of catch protection devices on the size, number, and condition of fish successfully entrained in the devices	1. Further define and develop previously identified high priority work that can break the reward cycle of depredation behavior and thereby suppress its prevalence. 2. Build on strategies to protect already captured fish in cost effective manners that are compatible with currently employed hook and line fishing practices in the North Pacific halibut fishery.	N/A	Fishing technology	Improved accuracy of mortality estimates. Improve estimates of productivity	Will be used to generate potential recruitment covariates and to inform minimum spawning biomass targets by Biological Region	11/1/2023-04/30/2025	Claude Dykstra/Ian Stewart	External (Bycatch Reduction Engineering Program - NOAA). Award NA23NMF4720414.	$199,870	Priority Rank #3
3	Development of a non-lethal genetic-based method for aging Pacific halibut	Robust methods to estimate the ages of commercially exploited fish species are critical for stock assessment. Furthermore, when combined with data on other biological characteristics; such as length/weight, maturity, movement, and distribution; the age distribution or age structure of a fish population provides essential information on population dynamics related to age, predicted reproductive status, life history stage, etc. For Pacific halibut; an ecologically, economically and culturally important fish species in Alaska; age estimations are critical to our understanding of the composition of the stock for sustainable management, of historical changes in size-at-age, maturity-at-age, year class strength, mortality, etc., as well as of the response of the Pacific halibut stock to current and future climate variability. For many managed groundfish species, such as Pacific halibut, age has been traditionally estimated by manually counting the number of annuli or concentric lamellae present in sagittal otoliths (i.e. calcified structures located in the head that are used for balance and hearing) under a compound microscope. The International Pacific Halibut Commission (IPHC) has used sagittal otoliths for aging Pacific halibut since 1914, employing a method referred to as "surface aging" until 2002 and switching to a methodological variation known as "break-and-burn" thereafter (Forsberg, 2001). However, for various reasons, alternative methods to traditional otolith age estimations are being explored, developed and applied in fisheries. One of these is a genetic method for aging based on the known observation that the methylation patterns on genomic DNA change predictably with age. DNA methylation (DNAm) is an epigenetic modification of the DNA that consists in the covalent modification of cytosine, one of the four nucleobases found in DNA, and that regulates the expression of genes. Therefore, age-associated DNA methylation patterns can be modelled to generate molecular (i.e., epigenetic) age predictors capable of estimating chronological age with high accuracy. These are referred to as "epigenetic clocks" and can be developed from DNA isolated from any tissue, including non-lethal biological samples, such as a fin clip. Epigenetic clocks have been developed for many vertebrate species, including fish, with high accuracy (r between 0.84 and 0.99) and an average MAE of 0.87 years, that corresponds to 3.5% of the total	1. To identify DNA methylation signals in Pacific halibut fin tissue. 2. To develop an age prediction model based on DNA methylation patterns: an epigenetic clock for Pacific halibut. 3. To develop a targeted DNA methylation assay for larger scale age estimations.	1. Reduced representation genome-wide map of DNA methylation at single base-pair resolution for Pacific halibut fin tissue. 2. Age predicting model for Pacific halibut using fin tissue.	N/A	Migration and Population Dynamics/Female Reproductive Assessment/Growth	Age is a critical input for stock assessment.	Age is a key biological input into stock assessment as it is used for estimating fish growth, fish maturity and fecundity-at-age, and mortality rates as well as population structure. Age distribution of Pacific halibut captured in the different fisheries and surveys is used in stock assessment.	02/01/2024-1/31/2026	Josep Planas	External (Alaska Sea Grant). Full proposal submitted in May 2023. Decision expected October 2023.	$60,374	Priority Rank #1

APPENDIX VI

Proposed schedule of outputs

	2022		2023		2024		2025		2026	
Biology and Ecology										
Migration and population dynamics										
Reproduction										
Growth										
Mortality and survival assessment										
Fishing technology										
Stock Assessment										
Management Strategy Evaluation										
Monitoring										

APPENDIX VII

Proposed schedule of funding and staffing indicators: Biology and Ecology

Research areas	Research activities	Required FTEs/Year	IPHC FTEs/Year	2022	2023	2024	2025	2026	IPHC Funds	Grant Funds
Migration and Population Dynamics	Larval and juvenile connectivity and early life history studies	0.45	0.45		RB1	RB2			Yes	NPRB #2100
	Population structure	0.4	0.8		RB1				No	NPRB #2110
	Adult migration and distribution	0.4							No	NPRB #2110
	Close-kin mark-recapture studies	1	0						No	Planned
	Seascape genomics	1	0						No	Planned
	Genome-wide association analyses	1	0						No	Planned
	Genomic-based aging methods	1	1		RS 1				Yes	No
Reproduction	Maturity-at-age estimations	0.75	0						Yes	No
	Fecundity assessment	0.5	0.25			RB4	RS 2		Yes	No
	Examination of accuracy of current field macroscopic maturity classification	0.25							Yes	No
	Sex ratio of current commercial landings	0.5	0.75	LT					Yes	No
	Recruitment strength and variability	0.5	0				RS 2		Yes	Planned
Growth	Environmental influences on growth patterns	0.5	0.5		MSc student				No	Planned
	Dietary influences on growth patterns and physiological condition	0.5	0.2		RB3				No	Planned
Mortality and survival assessment	Discard mortality rate estimate: recreational fishery	0.5	1						No	NPRB #2009
	Best handling practices: recreational fishery	0.5		RB 3					No	NPRB #2009
	Whale depredation accounting and tools for avoidance	0.5							No	BREP
	Biological interactions with fishing gear	0.5							No	BREP

IPHC staff (Planned):

RS1: Research Scientist 1(PhD; Life History Modeler I). Full time temporary position (100% research;
RS2: Research Scientist 1(PhD; Life History Modeler II). Full time temporary position (100% research;
RB1: Research Biologist 1 (Geneticist; MSc). Full time temporary position (until April 2022; 1 FTE). 55% of salary covered by Grant NPRB#2110.
RB2: Research Biologist 2 (Early Life History; MSc). Full time permanent position (40% research; 0.4 FTE)
RB3: Research Biologist 3 (DMR; MSc). Full time permanent position (100% research; 1 FTE)
RB4: Research Biologist 4 (Maturity and Fecundity; MSc). Full time permanent position (100% research; 1 FTE)
LT: Laboratory Technician (MSc). Full time temporary position (100% research; 1 FTE)

Fisheries Data Overview (2023): Preliminary

PREPARED BY: IPHC SECRETARIAT (B. HUTNICZAK, H. TRAN, T. KONG, K. SAWYER VAN VLECK, K. MAGRANE; 30 OCTOBER, 10 NOVEMBER & 29 NOVEMBER 2023)

PURPOSE

To provide a preliminary overview of the 2023 Pacific halibut removals, including the status of mortality reported against fishery limits adopted by the Commission and outlined in the IPHC Fishery Regulations (2023). Data provided in this paper include current and projected values as of 1 November 2023.

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-2023-IM099-10) and other analyses. The data are compiled by the IPHC Secretariat and include data from federal and state agencies of each Contracting Party. All 2023 data are in net weight (head-off, dressed, ice and slime deducted) and considered preliminary at this time. The IPHC Regulatory Areas are provided in Figure 1.

The report provides a preliminary summary of removals in Tables 1 and 2. Table 2 provides estimates of mortality reported against the fishery limits (FCEY) resulting from the IPHC-adopted distributed mortality (TCEY) limits and the existing Contracting Party catch sharing arrangements, as well as non-FCEY mortality projections, by IPHC Regulatory Area. Figure 2 provides cumulative percentage of directed commercial Pacific halibut limit landed by week.

DEFINITIONS

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

Recreational fisheries include recreational landings (including landings from commercial leasing) and discard mortality.

Subsistence fisheries 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 IPHC 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 for personal use by the Community Development Quota (CDQ) fishery in IPHC Regulatory Areas 4D and 4E.

Non-directed commercial discard mortality includes incidentally caught Pacific halibut by fisheries targeting other species and that cannot legally be retained, e.g., by the trawl fleet. This category refers only to those Pacific halibut that subsequently die due to capture.

IPHC FISS and Research includes Pacific halibut landings and removals as a result of the IPHC Fishery-Independent Setline Survey (FISS) and other research.

Table 1. Projected 2023 mortality reported against mortality limits (TCEYs) by IPHC Regulatory Area and U26 non-directed discards.

IPHC Regulatory Area	Mortality limits (TCEY) (net weight)		Mortality to date (net weight)		Percent attained
	Tonnes (t)	Pounds (lb)	Tonnes (t)	Pounds (lb)	(%)
IPHC Regulatory Area 2A	748	1,650,000	712	1,570,083	95
IPHC Regulatory Area 2B	3,075	6,780,000	3,097	6,828,214	101
IPHC Regulatory Area 2C	2,654	5,850,000	2,683	5,915,574	101
IPHC Regulatory Area 3A	5,479	12,080,000	5,186	11,432,994	95
IPHC Regulatory Area 3B	1,665	3,670,000	1,586	3,495,657	95
IPHC Regulatory Area 4A	785	1,730,000	598	1,318,212	76
IPHC Regulatory Area 4B	617	1,360,000	285	629,183	46
IPHC Regulatory Area 4CDE and Closed Area	1,746	3,850,000	1,361	3,001,546	78
Subtotal (TCEY)	**16,769**	**36,970,000**	**15,509**	**34,191,463**	**92**
Non-directed commercial discard mortality (U26)	621	1,370,000	781	1,721,000	126
Total	**17,391**	**38,340,000**	**16,290**	**35,912,463**	**94**

Table 2. 2023 estimates of mortality reported against fishery limits (FCEY) and mortality projections by IPHC Regulatory Area.

IPHC Regulatory Area	Fishery limit/mortality projection (net weight)[1]		Mortality to date (net weight)		Percent attained
	Tonnes (t)	Pounds (lb)	Tonnes (t)	Pounds (lb)	(%)
USA – 2A (California, Oregon, and Washington)	**748.43**	**1,650,000**	**712.18**	**1,570,083**	**95**
Non-treaty directed commercial	116.94	257,819	117.58	259,226	101
Non-treaty incidental to salmon troll fishery	20.64	45,497	12.52	27,600	61
Non-treaty incidental to sablefish fishery[2]	31.75	70,000	18.18	40,090	57
Treaty Indian directed commercial	227.93	502,500	224.50	494,933	98
Directed commercial discard mortality[3]	22.68	50,000	45.36	100,000	200
Recreational – Washington	127.79	281,728	117.94	260,023	92
Recreational – Oregon	133.10	293,436	104.54	230,469	79
Recreational – California	17.93	39,520	17.39	38,337	97
Recreational discard mortality	--	--	1.02	2,239	--
Treaty Indian ceremonial and subsistence	13.38	29,500	13.38	29,500	100
Non-directed commercial discard mortality (O26)[3]	36.29	80,000	34.47	76,000	95
IPHC fishery-independent setline survey and research[4]	--	--	5.29	11,666	--
Non-directed commercial discard mortality (U26)	--	--	1.36	3,000	--
Canada – Area 2B (British Columbia)	**3,075.36**	**6,780,000**	**3,097.23**	**6,828,214**	**101**
Directed commercial fishery landings	2,281.57	5,030,000	2,192.76	4,834,201	96
Directed commercial discard mortality[3]	81.65	180,000	87.09	192,000	107
Recreational fishery[8]	403.70	890,000	403.64	889,881	100
Recreational discard mortality[3]	18.14	40,000	12.40	27,330	68
Recreational fishery (XRQ - Experimental Quota)[5]	--	--	6.81	15,013	--
Subsistence[3]	185.97	410,000	183.70	405,000[6]	99
Non-directed commercial discard mortality (O26)[3]	108.86	240,000	152.86	337,000	140
IPHC fishery-independent setline survey and research[4]	--	--	57.96	127,789	--
Non-directed commercial discard mortality (U26)	13.61	30,000	21.77	48,000	160

continued…

IPHC Regulatory Area	Fishery limit/mortality projection (net weight)[1]		Mortality to date (net weight)		Percent attained
	Tonnes (t)	Pounds (lb)	Tonnes (t)	Pounds (lb)	(%)
USA – Area 2C (southeastern Alaska)	**2,653.51**	**5,850,000**	**2,683.26**	**5,915,574**	**101**
Directed commercial fishery landings	1,546.75	3,410,000	1402.62	3,092,258	91
Directed commercial discard mortality	68.04	150,000	51.26	113,000	75
Metlakatla (Annette Island Reserve)	--	--	17.30	38,140	--
Guided recreational fishery	362.87	800,000	356.52	786,000	98
Guided recreational discard mortality[7]	--	--	11.79	26,000	--
Guided recreational fishery (GAF – guided angler fish)[5]	--	--	49.86	109,927	--
Unguided recreational fishery[3]	517.10	1,140,000	476.27	1,050,000	92
Unguided recreational discard mortality[7]	--	--	6.80	15,000	--
Subsistence[3]	131.54	290,000	114.53	252,492	87
Non-directed commercial discard mortality (O26)[3]	27.22	60,000	28.12	62,000	103
IPHC fishery-independent setline survey and research[4]	--	--	*168.17*	*370,757*	--
Non-directed commercial discard mortality (U26)	--	--	0.00	0	--
USA – Area 3A (central Gulf of Alaska)	**5,479.39**	**12,080,000**	**5,185.92**	**11,432,994**	**95**
Directed commercial fishery landings	3,556.16	7,840,000	3,556.16	7,840,000	100
Directed commercial discard mortality	263.08	580,000	258.55	570,000	98
Guided recreational fishery	857.29	1,890,000	701.25	1,546,000	82
Guided recreational discard mortality[7]	--	--	4.08	9,000	--
Guided recreational fishery (GAF)[5]	--	--	3.81	8,395	--
Unguided recreational fishery[3]	544.31	1,200,000	439.08	968,000	81
Unguided recreational discard mortality[7]	--	--	8.62	19,000	--
Subsistence[3]	81.65	180,000	55.18	121,642	68
Non-directed commercial discard mortality (O26)[3]	176.90	390,000	125.65	277,000	71
IPHC fishery-independent setline survey and research[4]	--	--	33.55	73,957	--
Non-directed commercial discard mortality (U26)	108.86	240,000	88.90	196,000	82
USA – Area 3B (western Gulf of Alaska)	**1,664.68**	**3,670,000**	**1,585.60**	**3,495,657**	**95**
Directed commercial fishery landings	1,401.60	3,090,000	1,300.67	2,867,497	93
Directed commercial discard mortality[3]	131.54	290,000	108.86	240,000	83
Recreational fishery[3]	4.54	10,000	2.72	6,000	60
Recreational discard mortality	--	--	0.00	0	--
Subsistence[3]	4.54	10,000	4.75	10,475	105
Non-directed commercial discard mortality (O26)[3]	122.47	270,000	102.06	225,000	83
IPHC fishery-independent setline survey and research[4]	--	--	66.54	146,685	--
Non-directed commercial discard mortality (U26)	45.36	100,000	37.19	82,000	82
USA – Area 4A (eastern Aleutians)	**784.71**	**1,730,000**	**597.93**	**1,318,212**	**76**
Directed commercial fishery landings	639.57	1,410,000	440.46	971,048	69
Directed commercial discard mortality[3]	22.68	50,000	15.42	34,000	68
Recreational fishery[3]	4.54	10,000	2.27	5,000	50
Recreational discard mortality	--	--	0.00	0	--
Subsistence[3]	4.54	10,000	1.89	4,164	42
Non-directed commercial discard mortality (O26)[3]	113.40	250,000	137.89	304,000	122
IPHC fishery-independent setline survey and research[4]	--	--	--	--	--
Non-directed commercial discard mortality (U26)	45.36	100,000	65.77	145,000	145

continued….

IPHC Regulatory Area	Fishery limit/mortality projection (net weight)[1]		Mortality to date (net weight)		Percent attained
	Tonnes (t)	Pounds (lb)	Tonnes (t)	Pounds (lb)	(%)
USA – Area 4B (central/western Aleutians)	**616.89**	**1,360,000**	**285.39**	**629,183**	**46**
Directed commercial fishery landings	553.38	1,220,000	207.73	457,965	38
Directed commercial discard mortality[3]	4.54	10,000	2.27	5,000	50
Recreational fishery[3]	--	--	0.00	0	--
Recreational discard mortality	--	--	0.00	0	--
Subsistence[3]	--	--	0.10	218	--
Non-directed commercial discard mortality (O26)[3]	58.97	130,000	75.30	166,000	128
IPHC fishery-independent setline survey and research[4]	--	--	--	--	--
Non-directed commercial discard mortality (U26)	4.54	10,000	6.80	15,000	150
USA – Area 4CDE and Closed (Bering Sea)	**1,746.33**	**3,850,000**	**1,361.48**	**3,001,546**	**78**
Directed commercial fishery landings	916.26	2,020,000	608.87	1,342,329	66
Directed commercial discard mortality[3]	36.29	80,000	23.59	52,000	65
Recreational fishery[3]	--	--	0.00	0	--
Recreational discard mortality	--	--	0.00	0	--
Subsistence[3]	18.14	40,000	6.00	13,217	33
Non-directed commercial discard mortality (O26)[3]	780.18	1,720,000	723.03	1,594,000	93
IPHC fishery-independent setline survey and research[4]	--	--	--	--	--
Non-directed commercial discard mortality (U26)	399.16	880,000	558.37	1,231,000	140
Totals	**16,769.31**	**36,970,000**	**15,508.98**	**34,191.463**	**92**
Directed commercial fishery	11,924.94	26,290,000	10,691.75	23,571,287	90
Recreational fishery	2,989.17	6,590,000	2,726.82	6,011,614	91
Subsistence[3]	435.45	960,000	379.52	836,708	87
Non-directed commercial discard mortality (O26)[3]	1,419.74	3,130,000	1,379.37	3,041,000	97
IPHC fishery-independent setline survey and research[4]	--	--	*331.51*	*730,854*	--
Non-directed commercial discard mortality (U26)	621.42	1,370,000	780.63	1,721,000	126

Note: in italics, values not covering whole year, accurate as of report date.

[1] Totals by IPHC Regulatory area include all TCEY components, i.e. exclude non-directed commercial discard mortality (U26).
[2] Non-treaty incidental to sablefish fishery limit allocated from Washington sport allocation in accordance with the Pacific halibut Catch Sharing Plan for IPHC Regulatory Area 2A.
[3] Fishery projection is value from 2022 AM estimates which were used in setting the TCEY for each IPHC Regulatory Area (i.e., non-FCEY components of TCEY).
[4] Includes U32 Pacific halibut landed during FISS
[5] XRQ and GAF leased from commercial quota.
[6] Rollover value provided by the Fisheries and Oceans Canada (DFO) as end-of-year projection since 2007.
[7] Limit included in limit listed above.
[8] Estimation method applied by DFO under review, mortality value updated on 14 November.

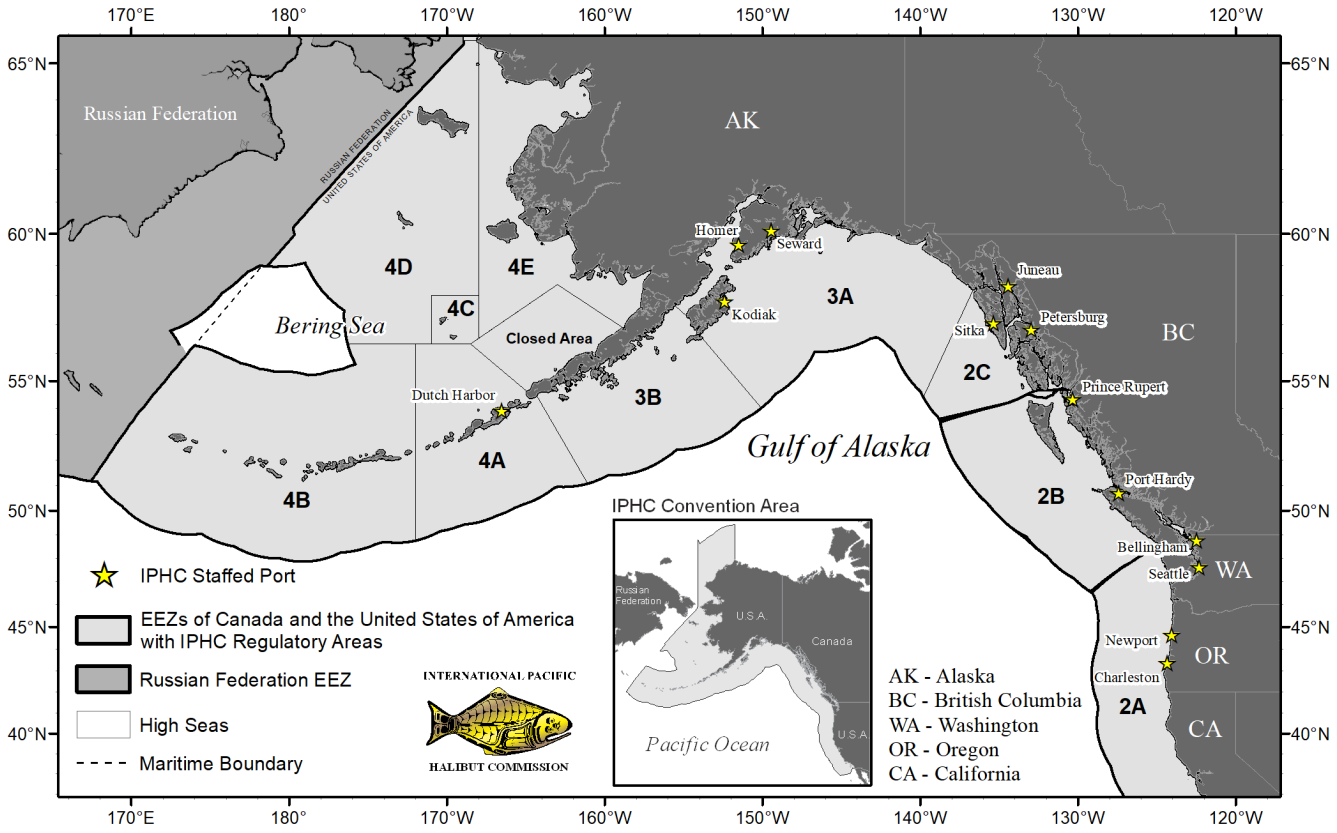


Figure 1. IPHC Convention Area and associated IPHC Regulatory Areas.

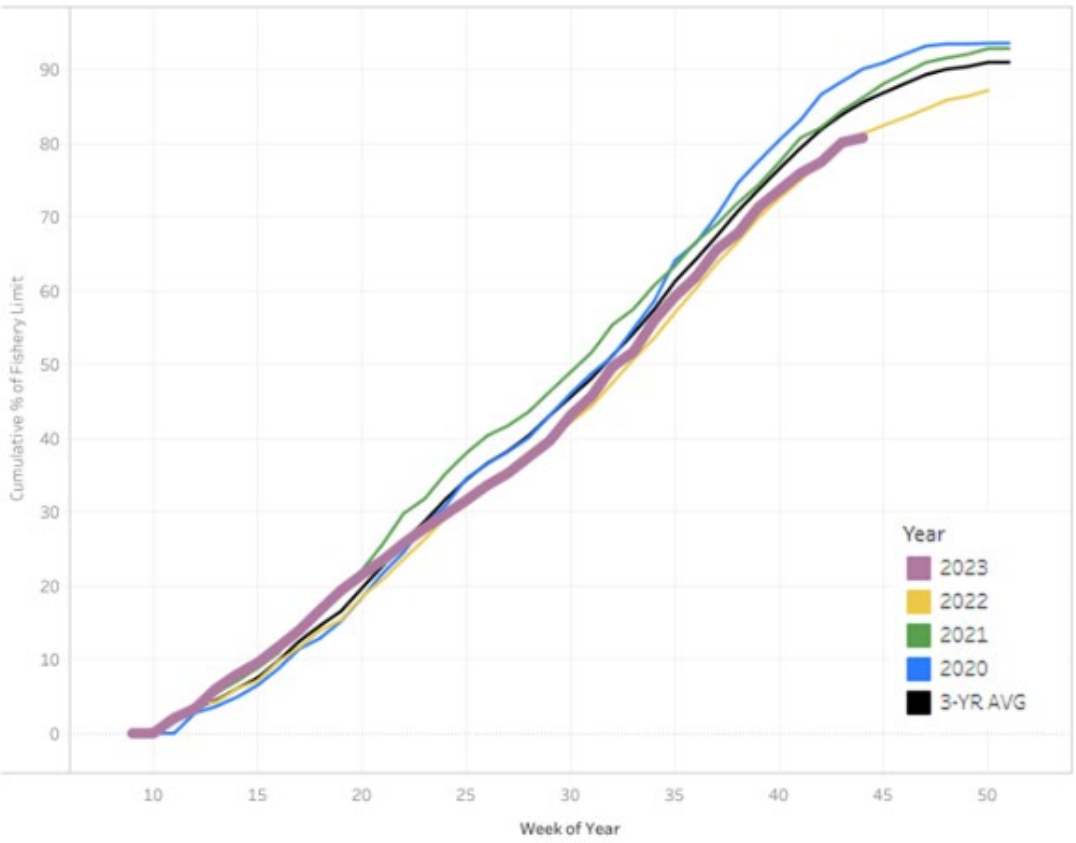


Figure 2. Cumulative percentage of quota share directed commercial Pacific halibut limit landed by week.

DIRECTED COMMERCIAL FISHERIES

The IPHC's directed commercial fisheries span from northern California through to northern and western Alaska in USA and Canadian waters of the northeastern Pacific Ocean. The IPHC sets annual limits for the retention 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 directed 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 directed commercial fisheries consisted of the Individual Vessel Quota (IVQ) fishery in IPHC Regulatory Area 2B in British Columbia, Canada; the Metlakatla fishery in IPHC Regulatory Area 2C; the Individual Fishing Quota (IFQ) system in Alaska, USA; and the CDQ fisheries in IPHC Regulatory Areas 4B and 4CDE. All 2023 landing and discard mortality data presented in this document are preliminary.

Directed Commercial Fishing Periods

The Canadian IVQ fishery in IPHC Regulatory Area 2B and the USA IFQ and CDQ fisheries in IPHC Regulatory Areas 2C, 3A, 3B, 4A, 4B, 4C, 4D, and 4E commenced at 12 (noon) local time on 10 March and will close at 12 (noon) local time on 7 December (Table 3). The IPHC Regulatory Area 2A directed commercial fisheries, including the treaty Indian commercial fisheries, occurred during the same calendar period (10 March to 7 December 2023). In IPHC Regulatory Area 2A, the non-treaty directed commercial fishery operated under 58-hour fishing periods beginning on the fourth Tuesday in June. Each fishing period began on the Tuesday at 0800 and ended on the following Thursday at 1800 local time (58-hours), and was further restricted by fishing period limits. The fishery closed for the remainder of the year after the third opening on 1 August, when the IPHC Regulatory Area 2A directed commercial non-treaty fishery allocation was estimated to have been reached.

Table 3. Fishing periods for directed commercial Pacific halibut fisheries by IPHC Regulatory Area, 2019-2023 (d = days; h = hours).

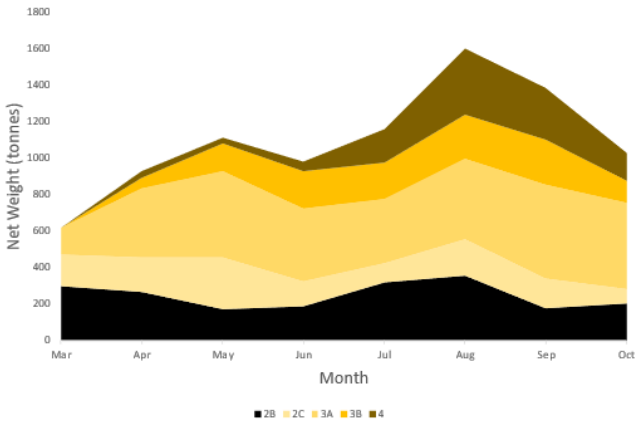
IPHC Regulatory Area		Year			
	2023	2022	2021	2020	2019
Canada: 2B	10 Mar–7 Dec (272 d)	6 Mar–7 Dec (276 d)	6 Mar–7 Dec (276 d)	14 Mar-7 Dec (268 d)	15 Mar-14 Nov (244 d)
USA: 2A Treaty Indian	31 Mar-10 June (55 h) 13 June -31 July (20 h) (Unrestricted) 10 Mar- 31 May (122h) 1 June – 31 July 2 (24h) (Restricted) 31 July 15 Oct 2 (24 h) (Restricted)	6 Mar-31 May (55 h) (Unrestricted) 6 Mar-31 May (122 h) (Restricted) 3 Jun-30 Sept (48 h and 72 h) (Restricted)	6 Mar-16 May (55 h) (Unrestricted) 6 Mar-16 May (102 h) (Restricted) 16 May-20 Jun (24 h)	14 Mar-30 Sep (55 h) (Unrestricted) 14 Mar-30 Sep (222 h) (Restricted) 5 Oct -18 Oct (13 d)	15 Mar-15 May (55 h) (Unrestricted) 15 Mar-15 May (84 h) 20 May-15 Jun (72 h) (Restricted) 11 Jun-24 Jul (35 d)
USA: 2A Commercial Directed	27-29 Jun 11-13 Jul 1-3 Aug (58 h each)	28-30 Jun 12-14 Jul 26-28 Jul (58 h each)	22-24 Jun 6-8 Jul 20-22 Jul (58 h each)	22-24 Jun 6-8 Jul 20-22 Jul 3-5 Aug 17-19 Aug (58 h each)	26 Jun 10 Jul 24 Jul (10 h each)

USA: 2A Commercial Incidental	Salmon 1 Apr – 31 Oct (213 d) Sablefish 1 Apr – 31 Oct (213 d)	Salmon 1 Apr – 31 Oct (213 d) Sablefish 1 Apr – 31 Oct (213 d)	Salmon 1 Apr – 7 Dec (250 d) Sablefish 1 Apr – 7 Dec (250 d)	Salmon 15 Apr–30 Sep (WA – 168 d) 15 Apr–31 Oct (OR - 199 d) 1 Aug–30 Sep (CA - 60 d) Sablefish 1 Apr – 15 Nov (228 d)	Salmon 20 Apr - 30 Sep (WA, CA - 163 d) 20 Apr - 31 Oct (OR - 194 d) Sablefish 1 Apr- 31 Oct (213 d)
USA: Alaska (2C, 3A, 3B, 4A, 4B, 4CDE)	10 Mar–7 Dec (272 d)	6 Mar–7 Dec (276 d)	6 Mar–7 Dec (276 d)	14 Mar-15 Nov (246 d)	15 Mar-14 Nov (244 d)

Directed Commercial Landings

Directed commercial fishery limits and landings by IPHC Regulatory Area for the 2023 fishing season are shown in Table 2. The directed commercial fishery limit, as referred to here, is the IPHC commercial fishery limit set by the Contracting Parties following the IPHC Annual Meeting and is equivalent to the Fishery Constant Exploitation Yield (FCEY). The fishery limits with adjustments from the underage and overage programs from the previous year's quota share programs are not shown. The *Use of Fish* allocation in IPHC Regulatory Area 2B, as defined in the Pacific Region Integrated Fisheries Management Plan – Groundfish are also not presented. Historical landings and fishery limits are available on the IPHC website (https://www.iphc.int/data).

The 2023 directed commercial fishery landings were spread over ten months (March – December) of the year in Canada and the USA (Figure 2). On a month-to-month comparison, August took the lead as the busiest month for total poundage (18%) landed from IPHC Regulatory Area 2B. On a month-to-month comparison, August was also the busiest month for total poundage (18%) from Alaska, USA. A year-to-date visualization is also available on the IPHC website.



Regulatory Area 2B landings from DFO Fishery Operations System (FOS).
Regulatory Areas 2C, 3, and 4 landings from NOAA Fisheries Restricted Access Management (RAM) Program.
Regulatory Area 3B: March combined with and shown above in April to preserve confidentiality.
Regulatory Area 4: March combined with and shown above in April to preserve confidentiality.

Figure 2. 2023 directed commercial landings (tonnes, net weight, preliminary) of Pacific halibut for individual quota fisheries by IPHC Regulatory Area and month.

Canada – IPHC 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 135 in 2023. In addition, Pacific halibut can be landed as incidental catch in other licensed groundfish fisheries. Pacific halibut was landed from a total of 211 active licences in 2023, with 76 of these licences from other fisheries. The 2023 directed commercial landings represented 1,978 tonnes (4,361,127 pounds) of Pacific halibut (as of 1 November 2023).

Directed commercial trips from IPHC Regulatory Area 2B were delivered into 13 different ports in 2023. The ports of Port Hardy (including Coal Harbour and Port McNeill) and Prince Rupert/Port Edward were the major landing locations, receiving 93% of the commercial landings. Port Hardy received 44% while Prince Rupert received 50% of the directed commercial landings. All IVQ landings were landed in IPHC Regulatory Area 2B. In 2023, a total of 31 Canadian vessels landed frozen, head-off Pacific halibut for a total of 32 tonnes (70,175 pounds) over 61 landings.

According to logbook data, minimal weight of Pacific halibut was caught with pot gear and landed within the directed commercial fishery in IPHC Regulatory Area 2B.

USA – IPHC Regulatory Area 2A (Washington, Oregon, California)

The 2023 IPHC Regulatory Area 2A fisheries and respective fishery limits are listed in Table 2. The total IPHC Regulatory Area 2A commercial landings (directed and incidental to salmon troll and sablefish) of 368 tonnes (811,781 pounds) is 7% below the fishery limit. The total non-treaty directed commercial landings of 118 tonnes (259,226 pounds) was over 1% of the fishery limit of 117 tonnes (257,819 pounds) after three 58-hour openers. The fishing period limits by vessel size class for each opening in 2023 are listed in Table 4.

The salmon troll fishery season began on 1 April with an allowable incidental landing ratio of one Pacific halibut per two Chinook, plus an “extra” Pacific halibut per landing, and a vessel trip limit of 35 fish. On 30 June, the fishery was extended at the same ratio and landing limit. Total landings of 13 tonnes (27,600 pounds) are 39% under the fishery limit (21 tonnes or 45,497 pounds).

Incidental Pacific halibut retention during the limited-entry sablefish fishery was open from 1 April to 31 October. Beginning 1 April, the allowable landing ratio was 0.07 tonnes (150 pounds) of Pacific halibut to 0.45 tonnes (1,000 pounds) of sablefish, and up to two additional Pacific halibut in excess of the ratio limit. The total landings of 18 tonnes (40,090 pounds) were 43% under the fishery limit (32 tonnes or 70,000 pounds).

In IPHC Regulatory Area 2A, north of Point Chehalis (46°53.30´ N. latitude), the treaty Indian tribes manage the directed commercial landings for three fisheries under a Memorandum of Understanding among the 13 tribes. These consist of an unrestricted fishery, a restricted fishery with trip limits, and a late season fishery. These fisheries are subject to in-season management. There was an unrestricted, open access fishery, not to exceed 55 hours from 31 March to 10 June; and another unrestricted fishery on 13 July to 31 July for 20 hours. This was followed by two restricted fishery openings not to exceed 24 hours with limit of 0.23 tonnes (500 pounds) from 31 July to 15 October. Estimated total landings of 225 tonnes (494,933 pounds) were 2% under the fishery limit (228 tonnes or 502,500 pounds).

Table 4. The fishing periods and limits (tonnes, dressed, head-on with ice/slime) by vessel class used in the 2023 directed commercial fishery in IPHC Regulatory Area 2A.

Vessel Class		Fishing Period (dates) & Limits (t)		
Letter	**Feet**	**27-29 June**	**11-13 July**	**1-3 August**
A, B and C	1-35	1.2	1.2	.45
D and E	36-45	1.9	1.9	.45
F and G	46-55	2.5	2.5	.45
H	56+	2.8	2.8	.45

USA – IPHC Regulatory Areas 2C, 3, and 4 (Alaska)

In Alaska, the National Oceanic and Atmospheric Administration Fisheries (NOAA Fisheries) Restricted Access Management (RAM) Program 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 2023, RAM reported that 2,241 persons/entities held QS.

The total 2023 landings from the IFQ/CDQ Pacific halibut fishery for the waters off Alaska through 1 November 2023 were 6,823 tonnes (15,042,472 pounds), 21% under the directed commercial fishery limit. By IPHC Regulatory Area, the directed commercial landings were under the fishery limit by 14% for Area 2C, 10% for Area 3A, 13% for Area 3B, 38% for Area 4A, 68% for Area 4B (IFQ/CDQ), and 43% for 4CDE/Closed (IFQ/CDQ).

Homer received approximately 21% (1,403 tonnes or 3,093,000 pounds) of the directed commercial landings of Alaskan catch making it the port that received the greatest landed volume in 2023. Kodiak received the second and Seward the third largest landing volume at 12% (827 tonnes or 1,823,000 pounds) and 9% (582 tonnes or 1,284,000 pounds) of the Alaskan commercial landings, respectively. In Southeast Alaska, the two largest landing volumes were received in Sitka and Juneau, with their combined landings representing 13% (916 tonnes or 2,019,000 pounds) of the directed commercial Alaskan landings. The Alaskan QS catch that was landed in Bellingham, WA was less than 2%.

In Alaska, 24 tonnes (52,00 pounds) of Pacific halibut were caught with pot gear and landed within the directed commercial fishery, representing 0.3% of the total Alaska landings.

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 12 two-day openings between 14 April and 15 September for total landings of 17 tonnes (38,140 pounds). The fishery closed on 17 September.

Directed Commercial Discard Mortality

Incidental mortality of Pacific halibut in the directed commercial Pacific halibut fishery is the mortality of all Pacific halibut that do not become part of the landed catch. 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 81.3 cm (32 inches); 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 (>81.3 cm or 32 inches in length) is determined from the IPHC FISS 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 an estimated 16% mortality rate and Pacific halibut mortality from lost gear is assumed 100%.

Pacific halibut discard mortality estimates from the commercial Pacific halibut fishery are summarized by IPHC Regulatory Area in Table 2.

RECREATIONAL FISHERIES

The 2023 recreational removals of Pacific halibut, including discard mortality, was estimated at 2,727 tonnes (6,011,614 pounds). Changes in harvests varied across areas, in some cases, in response to changes in size restrictions. Recreational fishery limits and landings are detailed by IPHC Regulatory Area in Table 2. Historical recreational removals are also available at the IPHC website, section on recreational fisheries data.

Recreational Landings

Canada – IPHC 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 between 90 and 133 cm (35.4 - 52.4 inches) or two under 90 cm (35.4 inch) when attaining the two fish possession limit, with an annual limit of ten per licence holder (FN100). Effective 1 April, the maximum size limit was decreased to 126 cm (49.6 inch) (FN0264). On 8 July, the daily limit was increased to equal the possession limit, that is one fish between 90 and 126 cm (35.4 - 49.6 inch) or two fish under 90 cm (35.4 inch) (FN0628). The fishery closed on 30 September (FN1049). The IPHC Regulatory Area 2B recreational harvest was at 100% of the recreational fishery limit at 404 tonnes (889,881 pounds).

Note: The estimation method for recreational landings in Canada is currently under review, due to questions raised regarding the methods for calculation of recreational mortality provided in the 2022 Canadian National Report.

Note: In 2022, the IPHC updated the length-weight relationship (see IPHC-2023-AM099-INF04). Application of the updated length-weight relationship is under review by the DFO.

USA – IPHC Regulatory Area 2A (Washington, Oregon, California)

The 2023 IPHC Regulatory Area 2A recreational allocation was 279 tonnes (614,684 pounds) net weight and based on the Pacific Fishery Management Council's Catch Sharing Plan formula, which divides the overall fishery limit among all sectors. The recreational allocation was further subdivided to seven subareas, after 32 tonnes (70,000 pounds) were allocated to the incidental Pacific halibut catch in the commercial sablefish fishery in Washington. This subdivision resulted in 128 tonnes (281,728 pounds) being allocated to Washington subareas, 133 tonnes (293,436 pounds) to Oregon subareas and 18 tonnes (39,520 pounds) to California. The IPHC Regulatory Area 2A recreational harvest totaled 240 tonnes (WA + OR + CA; 528,829 pounds), 14% under the recreational fishery limit. Recreational fishery harvest seasons by subareas varied and were managed in season with fisheries opening on 1 April.

IPHC Regulatory Areas 2C, 3, and 4 (USA: Alaska)

A reverse slot limit allowing for the retention of one Pacific halibut, if less or equal 101.6 cm (40 inches) or more or equal 203.2 cm (80 inches) in total length, was in place for the charter fishery in IPHC Regulatory Area 2C. Retention was also forbidden on any Monday from 24 July to 31 December. In IPHC Regulatory Area 3A, charter anglers were allowed to retain two fish per day, but only one could exceed 71.1 cm (28 inches) in length. One trip per calendar day per charter permit was allowed, with no charter retention of Pacific halibut on Wednesdays or on the following Tuesdays: June 20, June 27, July 4, July 11, July 18, July 25, August 1, August 8, August 15.

The Contracting Party agencies in Alaska (USA) have a program (Guided Angler Fish or GAF) that allow recreational harvesters to land fish that is leased from commercial fishery quota shareholders for the current season.

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 USA agencies of recreational discard mortality have been received and are provided in Table 2. Canada has not provided recreational discard mortality estimates; therefore, the discard mortality rate from IPHC Regulatory Area 2C is applied to the estimated landings from IPHC Regulatory Area 2B.

SUBSISTENCE FISHERIES

Pacific halibut is taken throughout its range as subsistence harvest by several fisheries. Subsistence fisheries 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 2023 was 380 tonnes (836,708 pounds) (Table 2). Historical subsistence removals are also available at the IPHC website, section on subsistence fishing.

Estimated subsistence harvests by area

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 fishery 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 USA, 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.

IPHC Regulatory Area 2A (USA: Washington, Oregon, California)

The Pacific Fishery Management Council's Catch Sharing Plan allocates the Pacific halibut fishery limit to commercial, recreational, and treaty Indian users in IPHC Regulatory Area 2A. The treaty tribal fishery limit is further sub-divided into commercial and C&S fisheries. It is estimated that 13 tonnes (29,500 pounds) were retained as C&S. A revised estimate of the 2023 removals will be provided at the end of the year.

IPHC Regulatory Area 2B (Canada: 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 136 tonnes (300,000 pounds) annually until 2006, and since 2007, the yearly estimate has been provided as 184 tonnes (405,000 pounds).

IPHC Regulatory Areas 2C, 3, and 4 (USA: Alaska)

In 2003, the subsistence Pacific halibut fishery off Alaska was formally recognized by the North Pacific Fishery Management Council and implemented by IPHC and NOAA Fisheries regulations. The fishery allows the customary and traditional use of Pacific halibut by rural residents and members of federally recognized Alaska, USA native tribes who can retain Pacific halibut for non-commercial use, food, or customary trade. The NOAA Fisheries 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 NOAA Fisheries Restricted Access Management to obtain a SHARC. The Division of Subsistence at Alaska

Department of Fish and Game (ADF&G) was contracted by NOAA Fisheries to estimate the subsistence harvest in Alaska through a data collection program. A voluntary survey of fishers is conducted by mail or phone, with some onsite visits. Beginning in 2018, this survey is conducted on a biannual schedule, rather than annually. The 2022 estimate has been carried forward for 2023 are provided in Table 2.

In addition to the SHARC harvest, IPHC regulations allow Pacific halibut less than 81.3 cm or 32 inches 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, if 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 and is reported separately.

Reports for 2023 removals were received from three CDQ management organizations: Bristol Bay Economic Development Corporation (BBEDC), Norton Sound Economic Development Corporation (NSEDC), and Coastal Villages Regional Fund (CVRF).

CDQ – Bristol Bay Economic Development Corporation (BBEDC)

BBEDC requires their fishers to record the lengths of retained U32 Pacific halibut in a separate log, which are then 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 in King Salmon and Naknek in a lesser amount. BBEDC reported 3 harvesters landed 25 U32 Pacific halibut (<1 tonne; 295 pounds).

CDQ – Coastal Villages Regional Fund (CVRF)

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

CDQ – Norton Sound Economic Development Corporation (NSEDC)

NSEDC required their fishers to offload the U32 Pacific halibut for weighing. The fish were not washed nor were the heads removed. The U32 Pacific halibut were then returned to the harvester. NSEDC reported 35 U32 Pacific halibut weighing <1 tonne (350 pounds), weighted head-on, were caught in the local CDQ fishery and landed at the Nome plant.

NON-DIRECTED COMMERCIAL DISCARD MORTALITY

The IPHC accounts for non-directed commercial discard mortality by IPHC Regulatory Area and sector. All removals for 2023 are provided in Table 2. Historical data are also available on the IPHC website, section on non-directed discard mortality.

Estimating Non-Directed Commercial Discard Mortality

Non-directed commercial discard mortality 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 non-directed commercial discard that will not survive, called non-directed commercial discard mortality.

The IPHC relies upon information supplied by observer programs run by Contracting Party agencies for non-directed commercial discard mortality estimates in most fisheries. Non-IPHC research survey information is used to generate estimates of non-directed commercial discard mortality in the few cases where fishery observations are unavailable. Trawl fisheries off British Columbia are monitored, and non-directed commercial discard mortality information is provided to IPHC by DFO. NOAA Fisheries operates observer programs off the USA West Coast and Alaska, which monitor the major groundfish fisheries. Data collected by NOAA fisheries observer programs are used to estimate non-directed commercial discard mortality.

Non-directed Commercial Discard Mortality by Area

Canada – IPHC Regulatory Area 2B (British Columbia)

In Canada, Pacific halibut non-directed commercial discard mortality in trawl fisheries are capped at 454 tonnes round weight by DFO. Non-trawl non-directed commercial discard mortality is handled under the IVQ system within the directed Pacific halibut fishery cap.

USA – IPHC Regulatory Area 2A (Washington, Oregon, California)

Groundfish fisheries off Washington, Oregon, and California are managed by NOAA Fisheries, following advice and recommendations developed by the Pacific Fishery Management Council. Non-directed commercial discard mortality projected estimates are provided by NOAA Fisheries.

USA – IPHC Regulatory Areas 2C, 3, and 4 (Alaska)

Groundfish fisheries in Alaska are managed by NOAA Fisheries, following advice and recommendations developed by the North Pacific Fishery Management Council. Non-directed commercial discard mortality projected estimates for Alaskan areas are provided by NOAA Fisheries and ADF&G.

IPHC Regulatory Area 2C (Southeast Alaska)

For the federal waters of IPHC Regulatory Area 2C, only non-directed commercial discard mortality by hook-and-line vessels fishing in the outside waters were reported by NOAA Fisheries. These vessels are primarily targeting Pacific cod and rockfish (*Sebastes* spp.) in open access fisheries, and sablefish in the IFQ fishery. In 1998, a no trawl zone was established in the Gulf of Alaska eliminating trawl fishing in this area.

Fisheries occurring within state waters and resulting in Pacific halibut non-directed commercial discard mortality include pot fisheries for red and golden king crab, and tanner crab. Information is provided periodically by ADF&G, and the estimate was rolled forward from 2022 to 2023.

IPHC Regulatory Area 3 (Eastern, Central and Western Gulf of Alaska)

IPHC Regulatory Area 3 is comprised of Areas 3A and 3B. For the purposes of stock assessment and management, IPHC tracks non-directed commercial discard mortality in both IPHC Regulatory Areas. Federal groundfish fisheries operate throughout both areas and a subset of these vessels are monitored for discarded Pacific halibut. Trawl fisheries are responsible for most of the non-directed commercial discard mortality in Regulatory Area 3, with hook-and-line fisheries a distant second. State-managed crab and scallop fisheries are also known to take Pacific halibut as non-directed commercial discard mortality, but data from these state-managed fisheries are currently unavailable.

Estimates of non-directed commercial discard mortality in IPHC Regulatory Area 3 reflect different levels of observer coverage by gear and type of fishing trip. 2021 coverage rates vary from 100% to 15% of the estimated discarded groundfish pounds by gear and fishery (Table 3-4 in AFSC 2021). The lowest coverage rates are realized for the non-pelagic trawl fishery, which also has the highest likelihood of encountering Pacific halibut. Analyses of observed and unobserved trip properties (magnitude of the landings, trip duration, species composition of the landed catch, etc.) have shown that observed trips are not representative of all trips in some of these metrics (observed and unobserved) (Appendix A in AFSC 2019). Therefore, non-directed discard mortality estimates for IPHC Regulatory Area 3 have both a greater uncertainty and potential for bias then those from areas with higher coverage rates and/or where there is no evidence of different behavior when observed.

IPHC Regulatory Area 4 (Bering Sea and Aleutian Islands)

In IPHC Regulatory Area 4CDE non-directed commercial discard mortality estimates have typically been the highest (Table 2) due to groundfish fisheries which target flatfish in the Bering Sea.

IPHC Fishery-Independent Setline Survey (FISS)

Approximately 332 tonnes (730,854 pounds) of Pacific halibut were landed from the FISS and in 2023 with the amount landed from each IPHC Regulatory Area documented in Table 2. This also includes IPHC Bait Study Research that is still ongoing.

Non-IPHC Research Removals

In 2023, four IPHC research permits were issued to NOAA to allow the harvest of Pacific halibut while conducting their Gulf of Alaska, Eastern Bering Sea, and Northern Bering Sea standardised bottom trawl surveys. A fifth research permit was issued to the U.S. Department of Energy to allow retention of Pacific halibut for radionuclide analysis. Amounts retained will be reported when available.

Recommendation

That the Commission:

1) **NOTE** paper IPHC-2023-IM099-07 Rev_2 which provides the Commission with a preliminary overview of the 2023 Pacific halibut removals, including the status of mortality reported against fishery limits adopted by the Commission and outlined in the IPHC Fishery Regulations (2023).

Appendices

Nil.

IPHC Fishery-Independent Setline Survey (FISS) design and implementation in 2023

PREPARED BY: IPHC SECRETARIAT (K. UALESI , T. JACK, R. RILLERA, K. COLL; 30 OCTOBER 2023)

PURPOSE

To provide a summary of the IPHC Fishery-Independent Setline Survey (FISS) design and implementation in 2023.

BACKGROUND

The annual IPHC Fishery-Independent Setline Survey (FISS) of the Pacific halibut stock was augmented from 2014-2019 with expansion stations that filled in gaps in coverage in the annual FISS. Prior to 2020, the standard grid of stations comprised 1,200 stations. Following the completion in 2019, expansion stations were added to the standard grid in all IPHC Regulatory Areas, now totaling 1,890 stations for the full FISS design (Figure 1), within the prescribed depth range of 18 to 732 metres (10 to 400 fathoms).

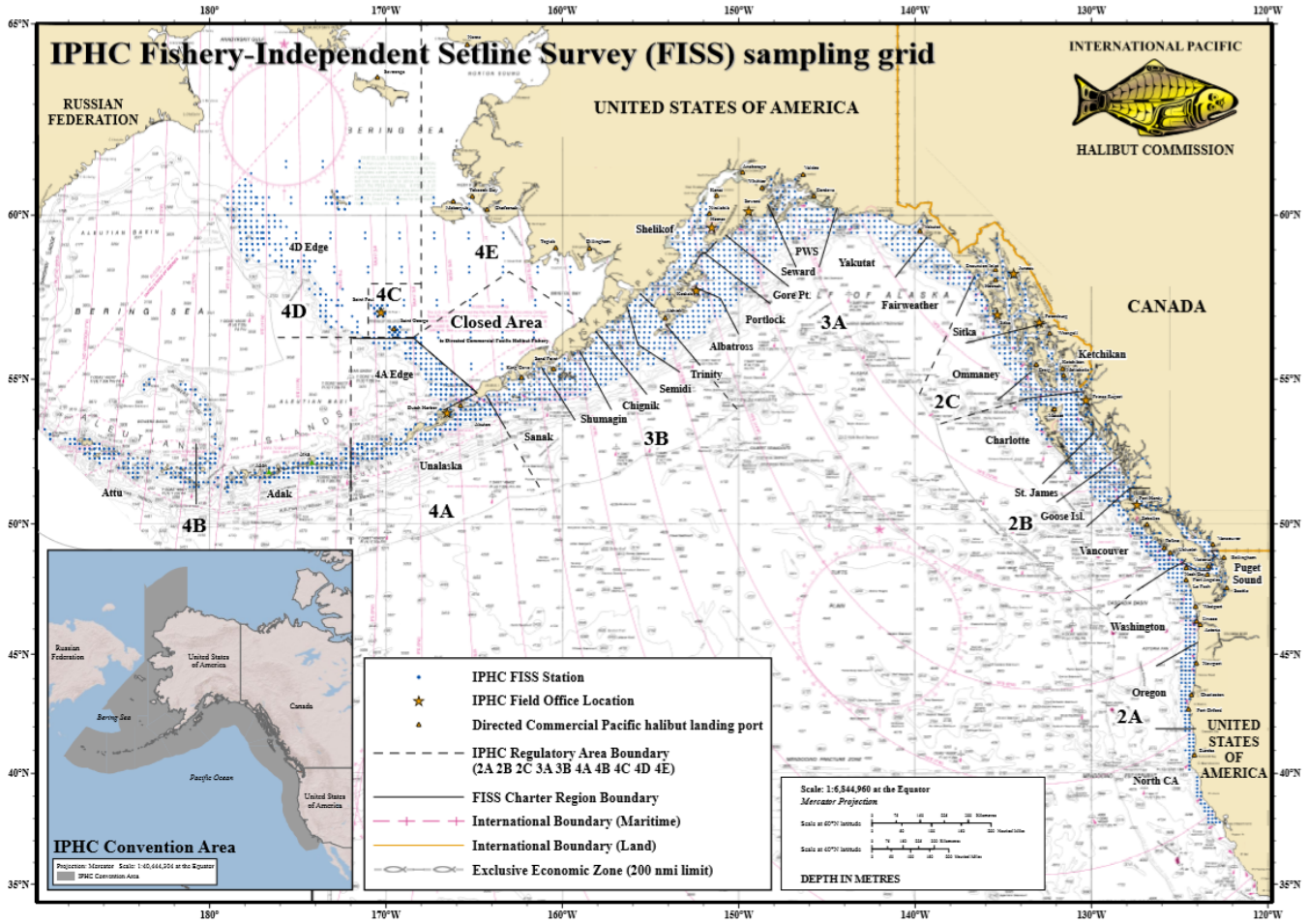


Figure 1. IPHC Fishery-Independent Setline Survey (FISS) with full sampling grid shown.

Prior to 2019, only fixed gear was used to fish FISS sets. With increasing use of snap gear in the commercial fishery, this restriction has limited the number of vessels available for the FISS. Further, any differences between snap and fixed gears (including catch rate differences and differences in fishing locations) may affect our understanding of trends in commercial fishery indices. This has motivated the need for a study comparing the two gear types with this work being done in 2019, 2020,

and again in 2021. While no study was completed in 2022, we recognized the increased use of snap gear and integrated snap gear into the FISS tender specifications for 2023.

Beginning in 2019, individual weight data were collected coastwide from Pacific halibut caught on the FISS to eliminate questions that have arisen regarding the accuracy of estimates that depend on these weights, including weight per unit effort (WPUE) indices of density. Data from IPHC collections from commercial landings and other sources had provided evidence that the current standard length-net weight curve used for estimating Pacific halibut weights on the FISS may have been over-estimating weights on average in most IPHC Regulatory Areas, and that the relationship between weight and length may vary spatially.

2023 FISS design

At the 98th Session of the IPHC Interim Meeting (IM098), the Commission endorsed a FISS design for 2023 that included 958 stations coastwide (Fig. 2). The design comprised sampling of subareas within IPHC Regulatory Areas 2A, 2B, 3A, 3B, 4A, and 4B intended to balance the Commission's primary and secondary objectives for the FISS. 2023 sampling in IPHC Regulatory Areas 2C included 100% of the full FISS design.

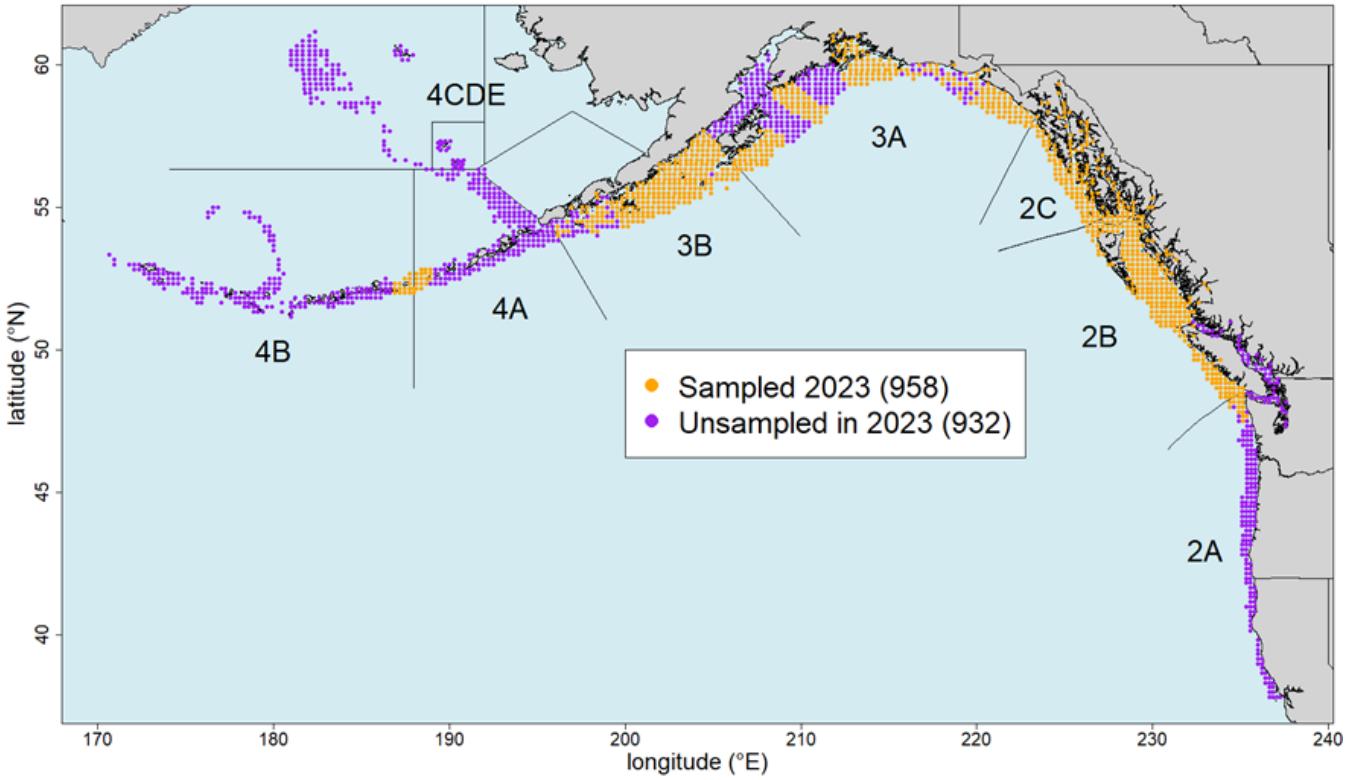


Figure 2. Map of the 2023 FISS design endorsed by the Commission on 1 December 2022 (IPHC-2022-IM098). Purple circles were not sampled in 2023.

At the 99th Session of the IPHC Annual Meeting (IPHC-2023-AM099-R), the Commission:

> (para. 30) "***NOTED*** *paper IPHC-2023-AM099-10 which provided the designs for the IPHC's Fishery-Independent Setline Survey (FISS) for the 2023-25 period, as reviewed by the Scientific Review Board (SRB) in 2022, and endorsed at IM098: IPHC-2022-IM098-R, para. 31: "The Commission* ***ENDORSED*** *an optimized design for the 2023 FISS as provided at Appendix IV, that balances the Commission's primary and secondary objectives for the FISS. As with all years, the Commission will have an additional opportunity to modify the 2023 FISS design at AM099."*

MATERIALS AND METHODS

The IPHC's FISS design encompasses nearshore and offshore waters of the IPHC Convention Area (Fig. 1). The IPHC Regulatory Areas are divided into 29 charter regions, each requiring between 10 and 46 charter days to complete. FISS stations are located at the intersections of a 10 nmi by 10 nmi square grid within the depth range occupied by Pacific halibut during summer months (18 – 732 m [10 – 400 fm]). Figure 2 depicts the 2023 FISS station positions, and IPHC Regulatory Areas.

Fishing vessels are chosen through a competitive bid process where up to four (4) charter regions per vessel may be awarded and typically 10-15 vessels are chosen. In 2023, the process has been clearly documented on the IPHC website for accountability and transparency purposes:https://www.iphc.int/management/science-and-research/fishery-independent-setline-survey-fiss/62-fiss-vessel-recruiting.

In 2023, 8 vessels were chartered to complete the FISS, as detailed in Media Release 2023-008: Notification of IPHC Fishery-Independent Setline Survey (FISS) 2023 Contract Awards.

Sampling protocols

IPHC Setline Survey Specialists (Field) collected data according to protocols established in the 2023 FISS Sampling Manual (IPHC-2023-VSM01).

Sampling challenges - 2023

Of the 958 FISS stations planned for the 2023 FISS season, 865 (90%) were effectively sampled.

Not sampled: A total of 66 initially planned stations were not sampled in 2022. There were challenges with vessel recruitment this season due to 1) increased sablefish quota availability; 2) vessels unable to meet FISS tender specifications regarding deck space, communication capabilities, safety equipment, etc.; and 3) challenges with vessel crew recruitment.

Due to the challenges with vessel recruitment, the following stations within IPHC charter regions were not sampled: Yakutat (36 stations), Unalaska (15 stations) and Adak (15 stations).

In addition, two (2) stations in Sitka were unsampled as they were within Glacier Bay National Park and we were not permitted to complete these stations within the park this year by NOAA.

Ineffective stations: Coastwide, thirty-three (33) stations were deemed ineffective due to Orca depredation (n=3), Sperm whale depredation (n=16), gear soak time (n=2), shark predation (n=3), pinniped predation (n=1), station moved > 3nmi (n=1), and setting and gear issues (n=7).

Bait (Chum salmon)

The minimum quality requirement for FISS bait is No. 2 semi-bright (Alaska Seafood Marketing Institute grades A through E), headed and gutted, and individually quick-frozen chum salmon. Bait usage is based on 0.17 kilograms (0.37 pounds) per hook resulting in approximately 136 kilograms (300 pounds) per eight skate station. Bait quality was monitored and documented throughout the season and found to meet the standard as described above.

Pre-season: In August 2022 (IPHC Media Release 2022-015), the Secretariat made pre-season bait purchases of approximately 105 tonnes (210,000 lbs) to ensure a smooth start to the 2023 FISS.

In-season: Throughout the FISS season, the Secretariat secured an additional 14,400 lb of bait, to supplement pre-season purchases and complete the 2023 FISS successfully.

RESULTS

Interactive views of the FISS results are provided via the IPHC website and can be found here once published:

https://www.iphc.int/data/setline-survey-catch-per-unit-effort

As in previous years, legal-sized (O32) Pacific halibut that were caught on FISS stations and sacrificed in order to obtain biological data were retained and sold. In addition, beginning in 2020, sub-legal (U32) Pacific halibut that were caught and randomly selected for otolith sampling were also retained and sold. This helps to offset costs of the FISS. FISS 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 2023 FISS chartered 8 commercial longline vessels (four Canadian and four USA) during a combined 48 trips and 497 charter days (Tables 1). Otoliths were removed from 8,506 fish coastwide. Approximately 232 tonnes (512,491 pounds) of Pacific halibut, 38 tonnes (83,839 pounds) of Pacific cod, and 39 tonnes (86,871 pounds) of rockfish were landed from the FISS stations.

Table 1a. Effort and landing summary by FISS charter region and vessel for all 2023 stations and all Pacific halibut (sampled U32 and all O32).

IPHC Regulatory Area	Charter Region	Vessel	Vessel Number[1]	Charter Days[2]	Planned Stations	Effective Stations[3]	Pacific halibut Sold (t)[4]	Pacific halibut Sold (lb) [4]	Average Price USD/kg [5]	Average Price USD/lb [5]
2A	Washington	*Pacific Surveyor*	947061	12	24	24	5	11666	$10.60	$4.81
2B	Charlotte	*Pender Isle*	27282	42	89	87	25	55957	$17.42	$7.90
2B	Goose Island	*Star Wars II*	175688	32	57	48	10	21226	$17.25	$7.83
2B	St. James	*Star Wars II*	175688	33	60	57	14	31242	$16.78	$7.61

2B	Vancouver Outside	*Vanisle*	80000	33	57	56	9	19364	$17.62	$7.99
2C	Ketchikan	*Vanisle*	80000	26	43	42	16	35003	$14.99	$6.80
2C	Ommaney	*Bold Pursuit*	383527	30	52	49	36	78373	$12.66	$5.74
2C	Sitka	*Star Wars II*	175688	30	52	49	18	39018	$13.36	$6.06
3A	Albatross	*Kema Sue*	41033	25	49	48	12	26181	$11.09	$5.03
3A	Fairweather	*Bold Pursuit*	383527	25	51	51	5	10975	$12.93	$5.87
3A	Gore Point	*Dangerous Cape*	77199	27	48	48	7	16306	$14.27	$6.47
3A	Prince William Sound	*Dangerous Cape*	77199	39	67	64	9	20495	$11.27	$5.11
3B	Chignik	*Kema Sue*	41033	23	48	46	10	21813	$9.93	$4.51
3B	Sanak	*Kema Sue*	41033	20	36	35	9	20468	$0.34	$4.52
3B	Semidi	*Devotion*	42892	34	56	56	16	35323	$10.64	$4.82
3B	Shumagin	*Kema Sue*	41033	32	54	53	16	34185	$11.04	$5.01
3B	Trinity	*Devotion*	42892	34	56	52	16	34896	$10.99	$4.98
Total		**8 Vessels**		**497**	**899**	**865**	**232**	**512,491**	**$13.31**	**$6.04**

1 Canada: Vessel Registration Number and USA: ADF&G vessel number.

2 Days are estimated - some vessels fished two charter regions in one day.

3 Stations that did not meet setting parameters or deemed ineffective are excluded.

4 Net weight (head-off, dressed, washed). May not sum to correct total due to rounding.

5 Ex-vessel price.

Table 1b. Effort and landing summary by FISS charter region and vessel for all 2023 stations and O32 Pacific halibut.

IPHC Regulatory Area	Charter Region	Vessel	Vessel Number[1]	Charter Days[2]	Planned Stations	Effective Stations[3]	Pacific halibut Sold (t) [4]	Pacific halibut Sold (lb)[4]	Average Price USD/kg[5]	Average Price USD/lb[5]
2A	Washington	*Pacific Surveyor*	947061	12	24	24	4	8,421	$11.54	$5.23
2B	Charlotte	*Pender Isle*	27282	42	89	87	25	54,521	$17.48	$7.93
2B	Goose Island	*Star Wars II*	175688	32	57	48	9	20,464	$17.34	$7.86
2B	St. James	*Star Wars II*	175688	33	60	57	14	30,430	$16.83	$7.63
2B	Vancouver	*Vanisle*	80000	33	57	56	0	0	$17.67	$8.01
2C	Ketchikan	*Vanisle*	80000	26	43	42	16	34,396	$15.01	$6.81
2C	Ommaney	*Bold Pursuit*	383527	30	52	49	35	78,075	$12.67	$5.75
2C	Sitka	*Star Wars II*	175688	30	52	49	17	38,367	$13.38	$6.07
3A	Albatross	*Kema Sue*	41033	25	49	48	11	25,183	$11.13	$5.05
3A	Fairweather	*Bold Pursuit*	383527	25	51	51	5	10,555	$12.97	$5.88
3A	Gore Point	*Dangerous Cape*	77199	27	48	48	7	15,255	$14.36	$6.51
3A	Prince William Sound	*Dangerous Cape*	77199	39	67	64	8	18,674	$11.43	$5.19

3B	Chignik	*Kema Sue*	41033	23	48	46	9	19,332	$10.03	$4.55
3B	Sanak	*Kema Sue*	41033	20	36	35	9	20,059	$9.99	$4.53
3B	Semidi	*Devotion*	42892	34	56	56	16	34,798	$10.67	$4.84
3B	Shumagin	*Kema Sue*	41033	32	54	53	15	33,046	$11.07	$5.02
3B	Trinity	*Devotion*	42892	34	56	52	15	33,211	$11.05	$5.01
Total		**8 Vessels**		**497**	**899**	**865**	**215**	**474,787**	**$13.40**	**$6.08**

1 Canada: Vessel Registration Number and USA: ADF&G vessel number.

2 Days are estimated - some vessels fished two charter regions in one day.

3 Stations that did not meet setting parameters or deemed ineffective are excluded.

4 Net weight (head-off, dressed, washed). May not sum to correct total due to rounding.

5 Ex-vessel price.

Table 1c. Effort and landing summary by FISS charter region and vessel for all 2023 stations and sampled U32 Pacific halibut.

IPHC Regulatory Area	Charter Region	Vessel	Vessel Number[1]	Charter Days[2]	Planned Stations	Effective Stations[3]	Pacific halibut Sold (t)[4]	Pacific halibut Sold (lb)[4]	Average Price USD/kg[5]	Average Price USD/lb[5]
2A	Washington	*Pacific Surveyor*	947061	12	24	24	1	3,245	$8.18	$3.71
2B	Charlotte	*Pender Isle*	27282	42	89	87	1	1,436	$15.41	$6.99
2B	Goose Island	*Star Wars II*	175688	32	57	48	0	762	$14.96	$6.78
2B	St. James	*Star Wars II*	175688	33	60	57	0	812	$14.69	$6.66
2B	Vancouver	*Vanisle*	80000	33	57	56	0	536	$15.90	$7.21
2C	Ketchikan	*Vanisle*	80000	26	43	42	0	607	$13.76	$6.24
2C	Ommaney	*Bold Pursuit*	383527	30	52	49	0	298	$10.67	$4.84
2C	Sitka	*Star Wars II*	175688	30	52	49	0	651	$11.93	$5.41
3A	Albatross	*Kema Sue*	41033	25	49	48	0	998	$9.92	$4.50
3A	Fairweather	*Bold Pursuit*	383527	25	51	51	0	420	$11.96	$5.42
3A	Gore Point	*Dangerous Cape*	77199	27	51	48	0	1,051	$12.89	$5.85
3A	Prince William Sound	*Dangerous Cape*	77199	39	51	64	1	1,821	$9.60	$4.35
3B	Chignik	*Kema Sue*	41033	23	51	46	1	2,481	$9.19	$4.17
3B	Sanak	*Kema Sue*	41033	20	51	35	0	409	$8.82	$4.00
3B	Semidi	*Devotion*	42892	34	51	56	0	525	$8.19	$3.72
3B	Shumagin	*Kema Sue*	41033	32	51	53	1	1,139	$10.17	$4.61
3B	Trinity	*Devotion*	42892	34	51	52	1	1,685	$9.83	$4.46
Total		**8 Vessels**		**497**	**899**	**865**	**9**	**18,876**	**$10.84**	**$4.92**

1 Canada: Vessel Registration Number and USA: ADF&G vessel number.

2 Days are estimated - some vessels fished two charter regions in one day.

3 Stations that did not meet setting parameters or deemed ineffective are excluded.

4 Net weight (head-off, dressed, washed). May not sum to correct total due to rounding.

5 Ex-vessel price.

Vessels chartered by the IPHC delivered fish to 15 different ports (Tables 2). Fish sales were awarded based on obtaining a fair market price. 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. Individual sales were evaluated after each event to ensure that the buyer was meeting IPHC standards. Average prices decreased from $17.01/kg in 2022 to $13.31/kg in 2023 (Tables 3). This represents a 21.8% decrease in price.

Table 2a. FISS Pacific halibut landings by port for all Pacific halibut (sampled U32 and all O32), 2023[1,2].

Offload Port	Trips	Tonnes	Pounds	Total USD	Average Price (USD/kg)	Average Price (USD/lb)
Cordova	1	4	7,788	$37,885.00	$10.72	$4.86
Homer	1	4	7,967	$53,388.00	$14.77	$6.70
Juneau	2	6	14,173	$84,372.30	$13.12	$5.95
Ketchikan	2	6	13,043	$78,128.40	$13.21	$5.99
King Cove	1	9	20,647	$106,332.05	$11.35	$5.15
Kodiak	7	40	88,220	$439,456.00	$10.98	$4.98
Port Angeles	1	2	5,418	$23,073.50	$9.39	$4.26
Port Hardy	9	38	84,369	$643,706.63	$16.82	$7.63
Prince Rupert	9	39	85,936	$658,515.90	$16.89	$7.66
Sand Point	5	29	63,999	$292,250.37	$10.07	$4.57
Seward	4	10	21,046	$118,998.80	$12.47	$5.65
Sitka	4	39	86,885	$478,175.71	$12.13	$5.50
Vancouver	1	1	3,228	$26,732.59	$18.26	$8.28
Westport	1	3	6,248	$33,028.51	$11.65	$5.29
Yakutat	1	2	3,524	$19,965.75	$12.49	$5.67
Grand Total	**49**	**232**	**512,491**	**$3,094,009.51**	**$13.31**	**$6.04**

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

Table 2b. FISS Pacific halibut landings by port for O32 Pacific halibut, 2023[1,2].

Offload Port	Trips	Tonnes	Pounds	Total USD	Average Price (USD/kg)	Average Price (USD/lb)
Cordova	1	3	6,676	$32,603.00	$10.77	$4.88
Homer	1	3	7,358	$49,429.50	$14.81	$6.72
Juneau	2	6	13,756	$82,024.80	$13.15	$5.96
Ketchikan	2	6	12,817	$76,772.40	$13.21	$5.99
King Cove	1	9	20,039	$103,200.85	$11.35	$5.15
Kodiak	7	38	84,648	$423,627.10	$11.03	$5.00
Port Angeles	1	2	3,709	$17,946.50	$10.67	$4.84
Port Hardy	9	37	82,406	$630,435.83	$16.87	$7.65
Prince Rupert	9	38	84,039	$645,564.80	$16.94	$7.68
Sand Point	5	28	60,942	$280,022.21	$10.13	$4.59
Seward	4	9	19,895	$114,165.40	$12.65	$5.74
Sitka	4	39	86,246	$475,027.54	$12.14	$5.51
Vancouver	1	1	3,022	$25,205.31	$18.39	$8.34
Westport	1	2	4,712	$26,118.31	$12.22	$5.54
Yakutat	1	2	3,350	$19,052.25	$12.54	$5.69
Grand Total	**49**	**224**	**49,3615**	**$3,001,195.80**	**$13.40**	**$6.08**

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

Table 2c. FISS Pacific halibut landings by port for sampled U32 Pacific halibut, 2023[1,2].

Offload Port	Trips	Tonnes	Pounds	Total USD	Average Price (USD/kg)	Average Price (USD/lb)
Cordova	1	1	1,112	$5,282.00	$10.47	$4.75
Homer	1	0	609	$3,958.50	$14.33	$6.50
Juneau	2	0	417	$2,347.50	$12.41	$5.63
Ketchikan	2	0	226	$1,356.00	$13.23	$6.00
King Cove	1	0	608	$3,131.20	$11.35	$5.15
Kodiak	7	2	3,572	$15,828.90	$9.77	$4.43
Port Angeles	1	1	1,709	$5,127.00	$6.61	$3.00
Port Hardy	9	1	1,963	$13,270.80	$14.90	$6.76
Prince Rupert	9	1	1,897	$12,951.10	$15.05	$6.83
Sand Point	5	1	3,057	$12,228.16	$8.82	$4.00
Seward	4	1	1,151	$4,833.40	$9.26	$4.20
Sitka	4	0	639	$3,148.17	$10.86	$4.93
Vancouver	1	0	206	$1,527.28	$16.35	$7.41
Westport	1	1	1,536	$6,910.20	$9.92	$4.50
Yakutat	1	0	174	$913.50	$11.57	$5.25
Grand Total	**49**	**9**	**18,876**	**$92,813.71**	**$10.84**	**$4.92**

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

Table 3a. FISS landings (total pounds and price) of all Pacific halibut (sampled U32 and all O32) by IPHC Regulatory Area in 2023[1].

IPHC Regulatory Area	2A	2B	2C	3A	3B	Total Weight and Average Price
Tonnes	5	58	69	34	67	232
Pounds	11,666	127,789	152,394	73,957	146,685	512,491
Price USD/kg	$10.60	$17.27	$13.37	$12.11	$10.62	$13.31
Price USD/lb	$4.81	$7.83	$6.07	$5.49	$4.82	$6.04

1 Net weight (head-off, dressed, washed)

Table 3b. FISS landings (total pounds and price) of O32 Pacific halibut by IPHC Regulatory Area in 2023[1].

IPHC Regulatory Area	2A	2B	2C	3A	3B	Total Weight and Average Price
Tonnes	4	56	68	32	64	224
Pounds	8421	124,243	150,838	69,667	140,446	493,615
Price USD/kg	$11.54	$17.32	$13.38	$12.20	$10.67	$13.40
Price USD/lb	$5.23	$7.86	$6.07	$5.53	$4.84	$6.08

1 Net weight (head-off, dressed, washed)

Table 3c. FISS landings (total pounds and price) of sampled U32 Pacific halibut by IPHC Regulatory Area in 2023[1].

IPHC Regulatory Area	2A	2B	2C	3A	3B	Total Weight and Average Price
Tonnes	1	2	1	2	3	9
Pounds	3245	3,546	1,556	4,290	6,239	18,876
Price USD/kg	$8.18	$15.22	$12.40	$10.71	$9.43	$10.84
Price USD/lb	$3.71	$6.90	$5.63	$4.86	$4.28	$4.92

1 Net weight (head-off, dressed, washed)

FISS timing

Each year, the months of June, July, and August are targeted for FISS fishing. In 2023, this activity took place from 27 May through 1 September. On a coastwide basis, FISS vessel activity was highest in intensity at the beginning of the FISS season and declined early in August as boats finished their charter regions (Figure 8). All FISS activity was completed by early September.

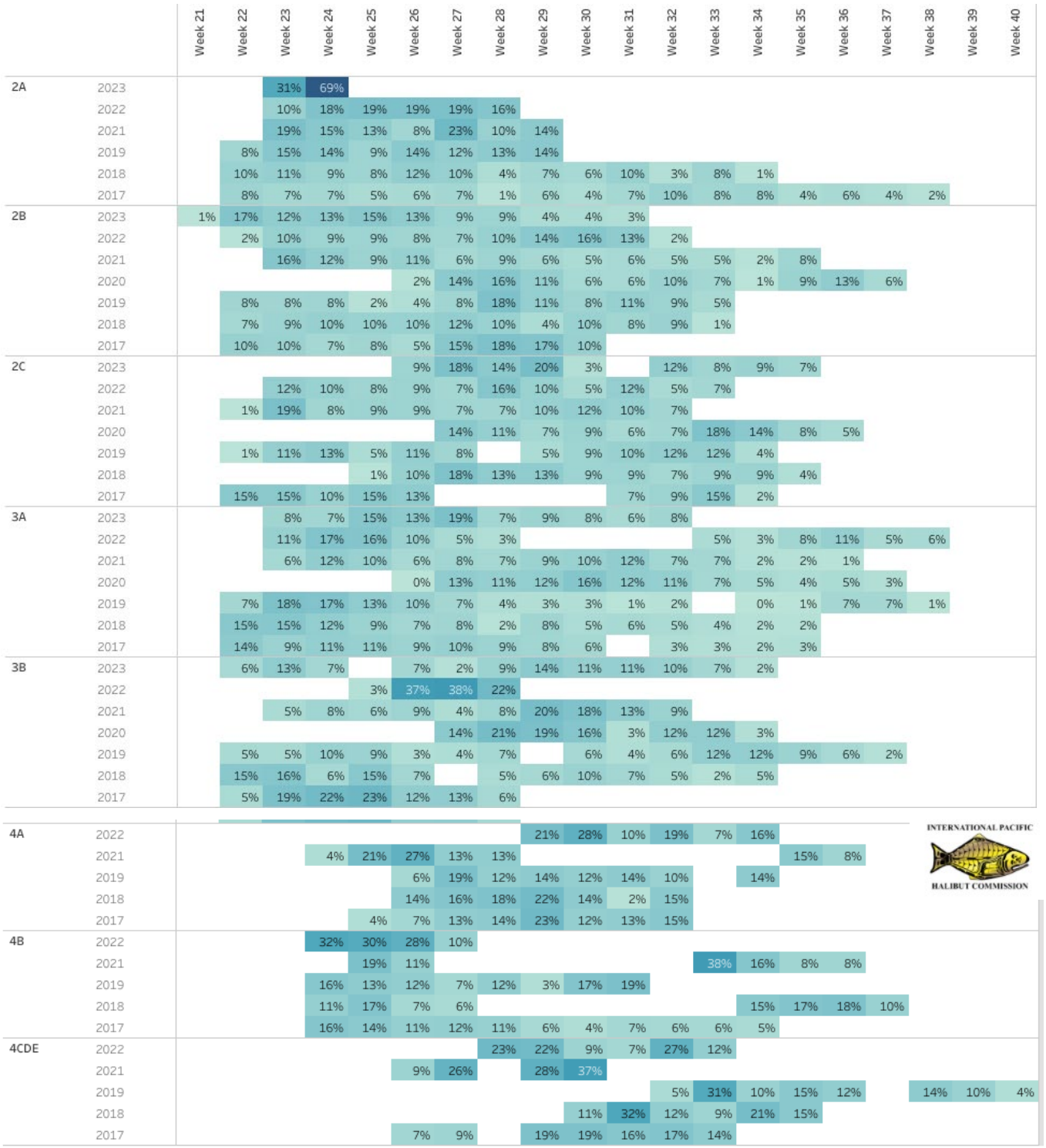


Figure 8. Percent of the total FISS stations completed by IPHC Regulatory Area during each week of the year (2017-2023). Week 21 begins in late May or early June depending on the year.

RECOMMENDATION/S

That the Commission:

1) **NOTE** paper IPHC-2023-IM099-08 which provides a summary of the IPHC Fishery-Independent Setline Survey (FISS) design and implementation in 2023.

APPENDICES

Nil.

Space-time modelling of survey data

PREPARED BY: IPHC SECRETARIAT (R. A. WEBSTER; 31 OCTOBER, 8 NOVEMBER 2023)

PURPOSE

To provide results of the space time modelling of Pacific halibut survey data for the period 1993-2023.

INTRODUCTION

Since 2016 space-time modelling has been used by the IPHC to produce estimates of mean O32 WPUE (weight per unit effort), all sizes WPUE and all sizes NPUE (numbers per unit effort) indices of Pacific halibut density and abundance. The modelling depends primarily on data from the IPHC's Fishery-Independent Setline Survey (FISS, Ualesi et al, 2023), but in the Bering Sea also integrates data from the National Oceanic and Atmospheric Administration - Fisheries annual trawl survey and the Alaska Department of Fish and Game's annual Norton Sound trawl survey. Both surveys are fishery-independent data sources.

Since 2019, weighing of Pacific halibut onboard FISS charter vessels has meant that the weight data used to compute WPUE now comes almost entirely from observed weights of fish rather than estimates from a length-net weight relationship. For fish without directly measured weights, weights are predicted from a year- and IPHC Regulatory Area-specific length-net weight relationship estimated from the FISS length and weight data. For U32 fish with round weight recorded, net weights are estimated from a round-net weight relationship estimated from coastwide sample data from the 2019 FISS.

RESULTS OF SPACE-TIME MODELLING IN 2023

Figures 1-3 show the time series estimates of O32 WPUE (most comparable to fishery catch-rates), all sizes WPUE and all sizes NPUE by IPHC Biological Region over the 1993-2023 period included in the 2023 space-time modelling. Coastwide, we estimate small declines in the indices since 2022 of 2-4%, largely due to 6-8% declines in IPHC Biological Region 3.

Estimated 1993-23 time series by IPHC Regulatory Area are in Appendix A. We note the high uncertainty for estimates in IPHC Regulatory Areas 2A, 4A and 4B in 2023 (Figures A.1 to A.3). Little sampling (minimal 2A FISS, Bering Sea trawl on 4A edge only) or no sampling (4B) took place in these areas in 2023, and caution should be taken when interpreting estimates of change from 2022, as these are not well informed by data.

In 2023, bids for FISS charter regions were opened to vessels fishing snap gear and one vessel fished snap gear in two charter regions in IPHC Regulatory 3A. In 2021, a snap-fixed gear comparison study was conducted in a single charter region in this area, but the limited scope of the study made it impossible to distinguish gear differences from differences in catch rates due to vessel and temporal effects (Webster 2021). The additional 2023 data from snap gear in IPHC Regulatory Area 3A means the space-time modelling now includes snap data from two vessels that fished in three charter regions, leading to revised estimates of gear differences that are likely to be more representative of gear differences in general (Table 1).

Table 1. Posterior estimates of the ratio of snap to fixed gear catch rates for O32 and all sizes WPUE, and all sizes NPUE, from space-time modelling of data from the 2021 study, and the 2023 modelling/

Variable	Ratio of snap to fixed catch rate			
	2021 study		2023 modelling	
	Posterior mean	95% credible interval	Posterior mean	95% credible interval
O32 WPUE	1.28	0.96 – 1.72	0.97	0.81 – 1.17
All sizes WPUE	1.18	0.89 – 1.56	1.08	0.90 – 1.30
All sizes NPUE	1.43	1.08 – 1.89	1.15	0.95 – 1.39

Tables of model output (time series, stock distribution estimates) are updated annually on the IPHC website at https://www.iphc.int/data/time-series-datasets.

FISS model output may also be explored interactively using the link on this page of the IPHC website: https://www.iphc.int/data/datatest/fishery-independent-setline-survey-fiss.

RECOMMENDATION

That the Commission **NOTE** paper IPHC-2023-IM099-09 Rev_1 which provides results of the space-time modelling of Pacific halibut survey data for 1993-2023.

REFERENCE

Ualesi, K., Rillera, R., Jack, T. and Coll, K. (2023) IPHC Fishery-independent setline survey (FISS) design and implementation in 2023. IPHC-2023-IM099-08.

Webster, R. A. (2021). Space-time modelling of survey data. IPHC-2021-IM097-08 Rev_1.

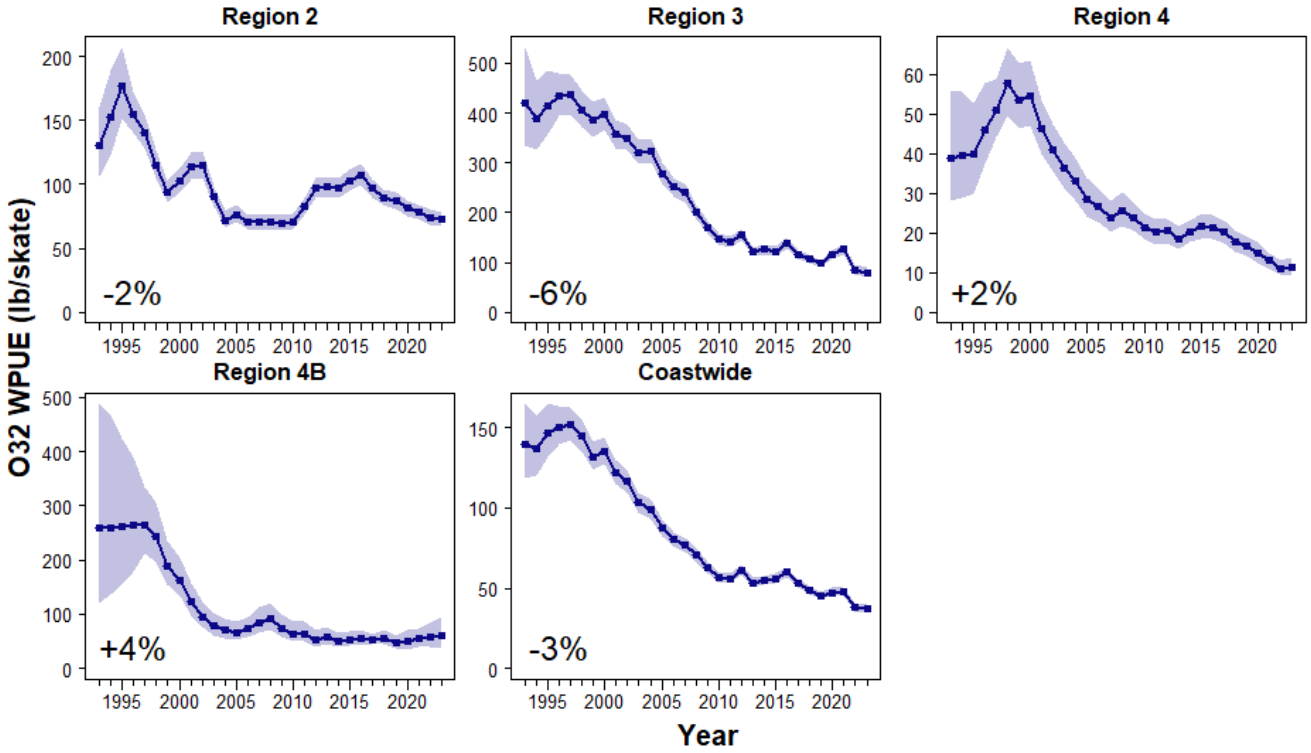


Figure 1. Space-time model output for O32 WPUE for 1993-2023 for Biological Regions. Filled circles denote the posterior means of O32 WPUE for each year. Shaded regions show posterior 95% credible intervals, which provide a measure of uncertainty: the wider the shaded interval, the greater the uncertainty in the estimate. Numeric values in the lower left-hand corners are estimates of the change in mean O32 WPUE from 2022 to 2023.

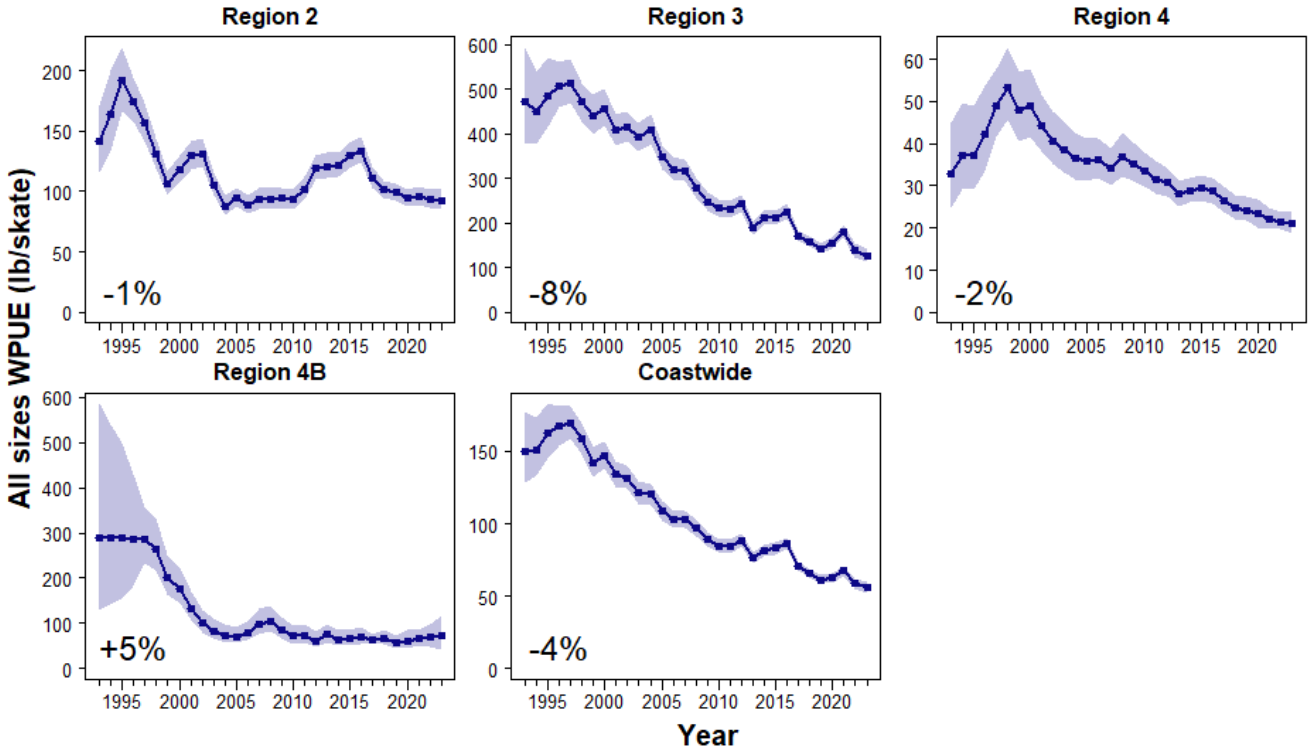


Figure 2. Space-time model output for all sizes WPUE for 1993-2023 for Biological Regions. Filled circles denote the posterior means of all sizes WPUE for each year. Shaded regions show posterior 95% credible intervals, which provide a measure of uncertainty: the wider the shaded interval, the greater the uncertainty in the estimate. Numeric values in the lower left-hand corners are estimates of the change in mean all sizes WPUE from 2022 to 2023.

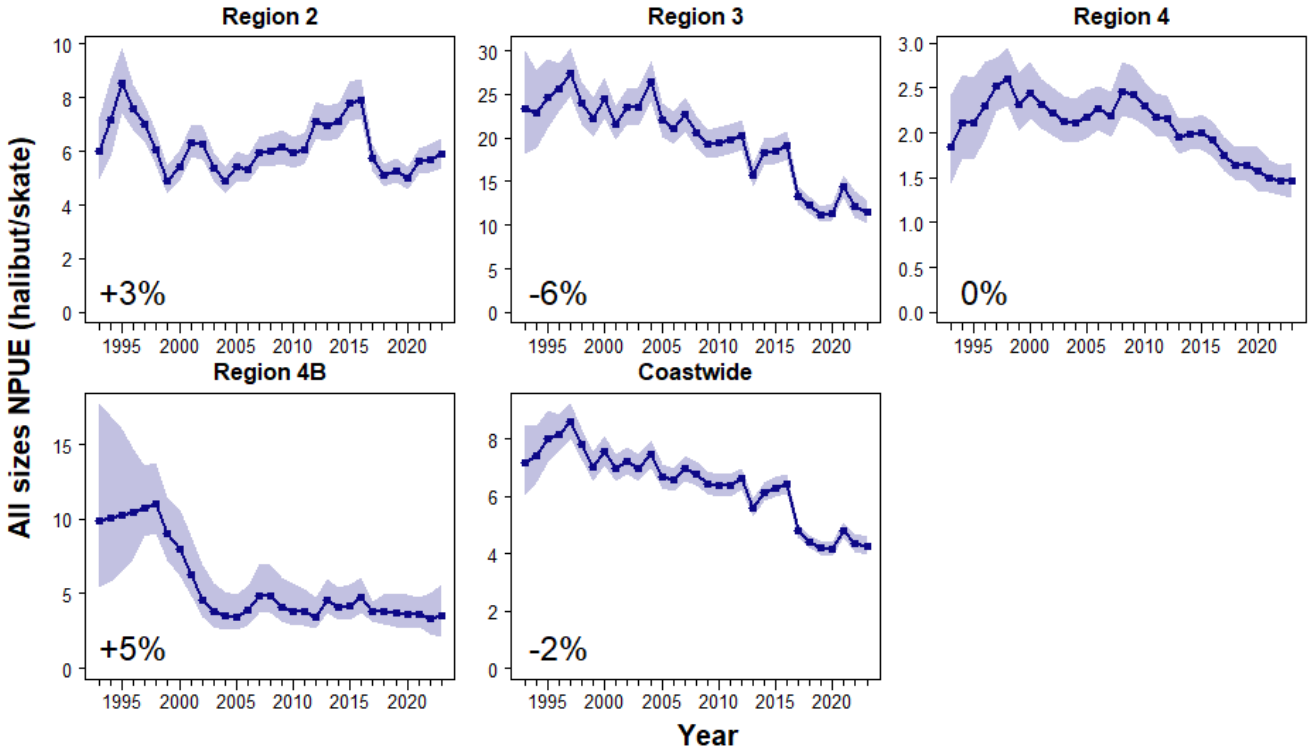


Figure 3. Space-time model output for all sizes NPUE for 1993-2023 for Biological Regions. Filled circles denote the posterior means of all sizes NPUE for each year. Shaded regions show posterior 95% credible intervals, which provide a measure of uncertainty: the wider the shaded interval, the greater the uncertainty in the estimate. Numeric values in the lower left-hand corners are estimates of the change in mean all sizes NPUE from 2022 to 2023.

APPENDIX A

Space-time modelling results by IPHC Regulatory Area

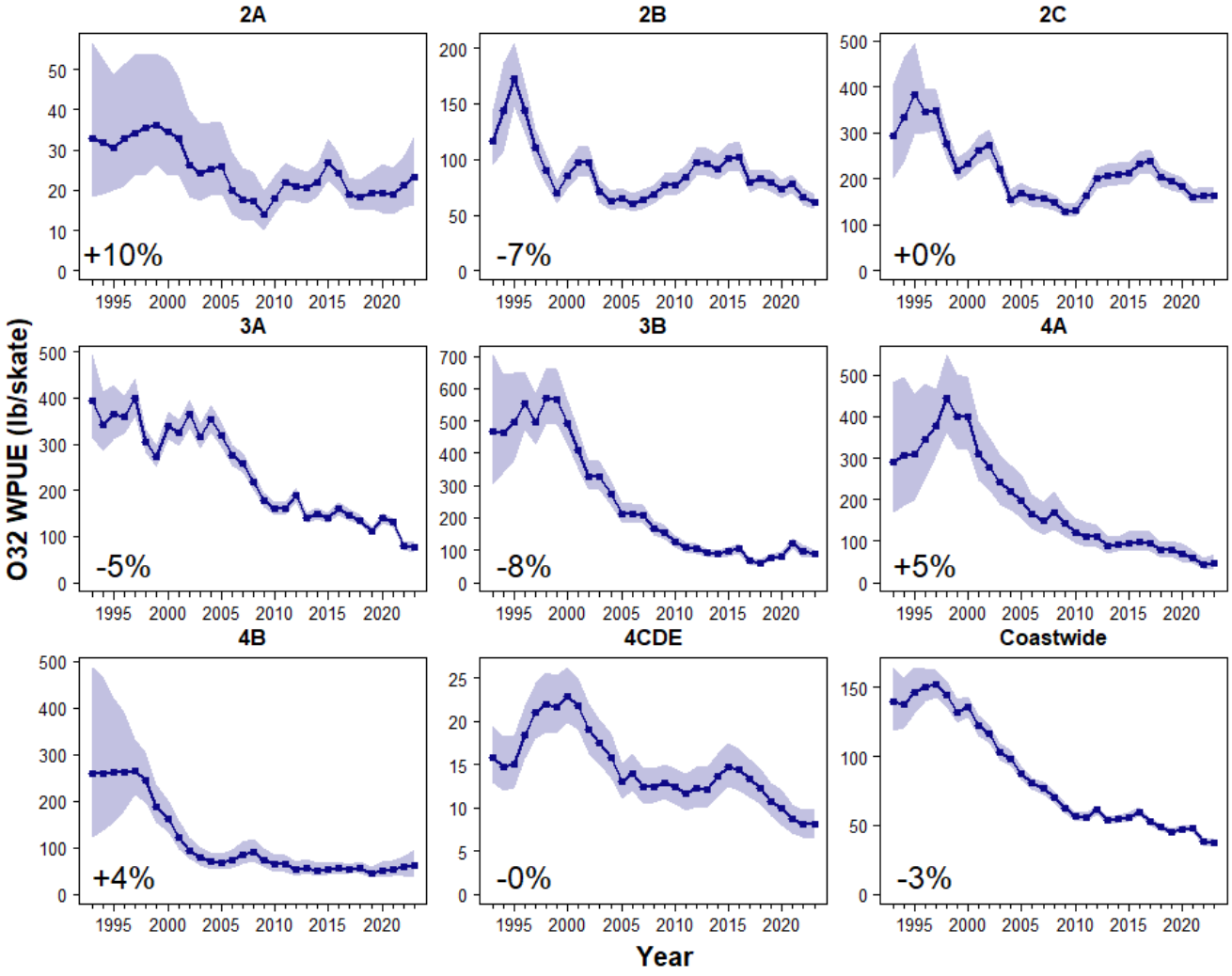


Figure A.1. Space-time model output for O32 WPUE for 1993-2023. Filled circles denote the posterior means of O32 WPUE for each year. Shaded regions show posterior 95% credible intervals, which provide a measure of uncertainty: the wider the shaded interval, the greater the uncertainty in the estimate. Numeric values in the lower left-hand corners are estimates of the change in mean O32 WPUE from 2022 to 2023.

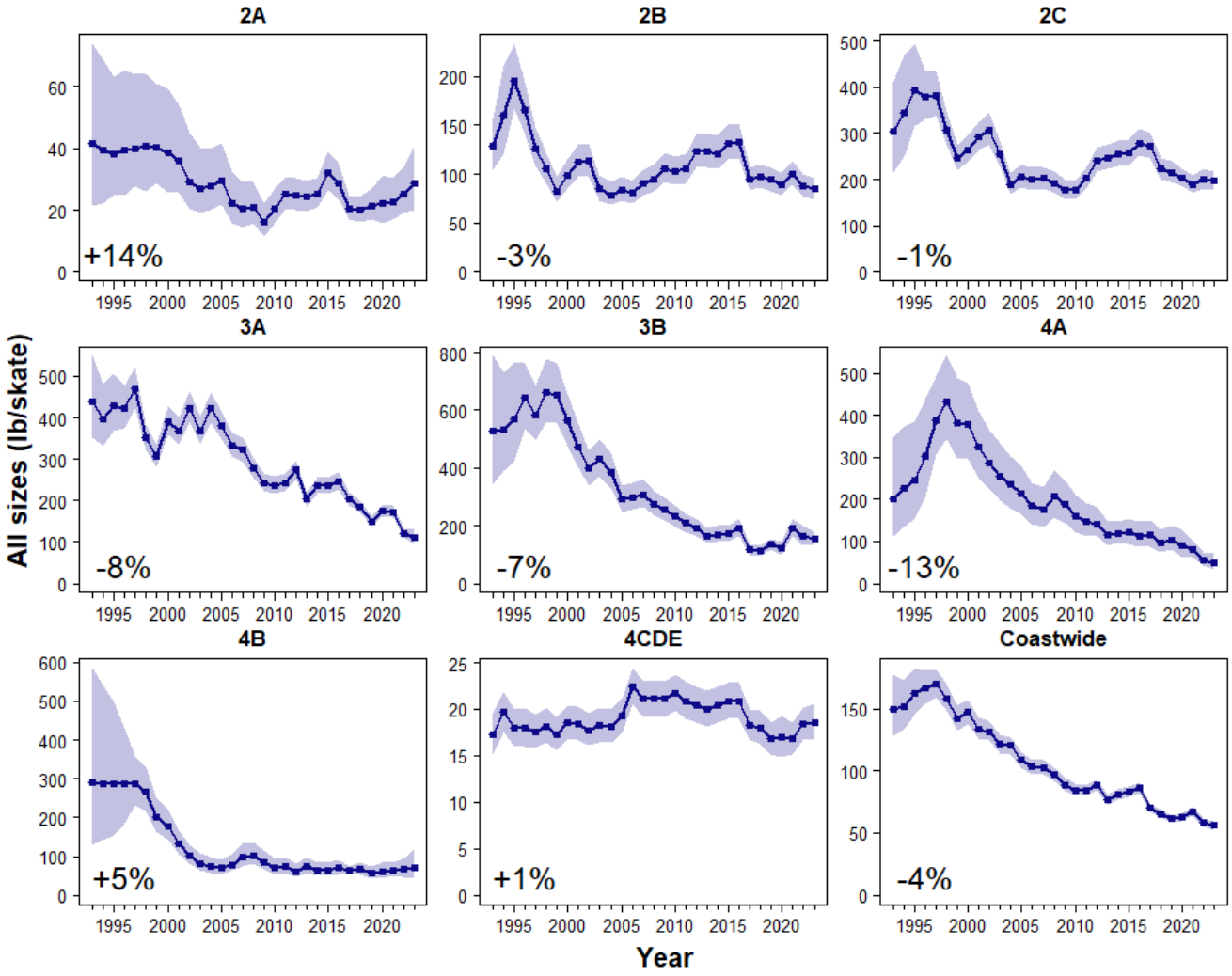


Figure A.2. Space-time model output for all sizes WPUE for 1993-2023. Filled circles denote the posterior means of all sizes WPUE for each year. Shaded regions show posterior 95% credible intervals, which provide a measure of uncertainty: the wider the shaded interval, the greater the uncertainty in the estimate. Numeric values in the lower left-hand corners are estimates of the change in mean all sizes WPUE from 2022 to 2023.

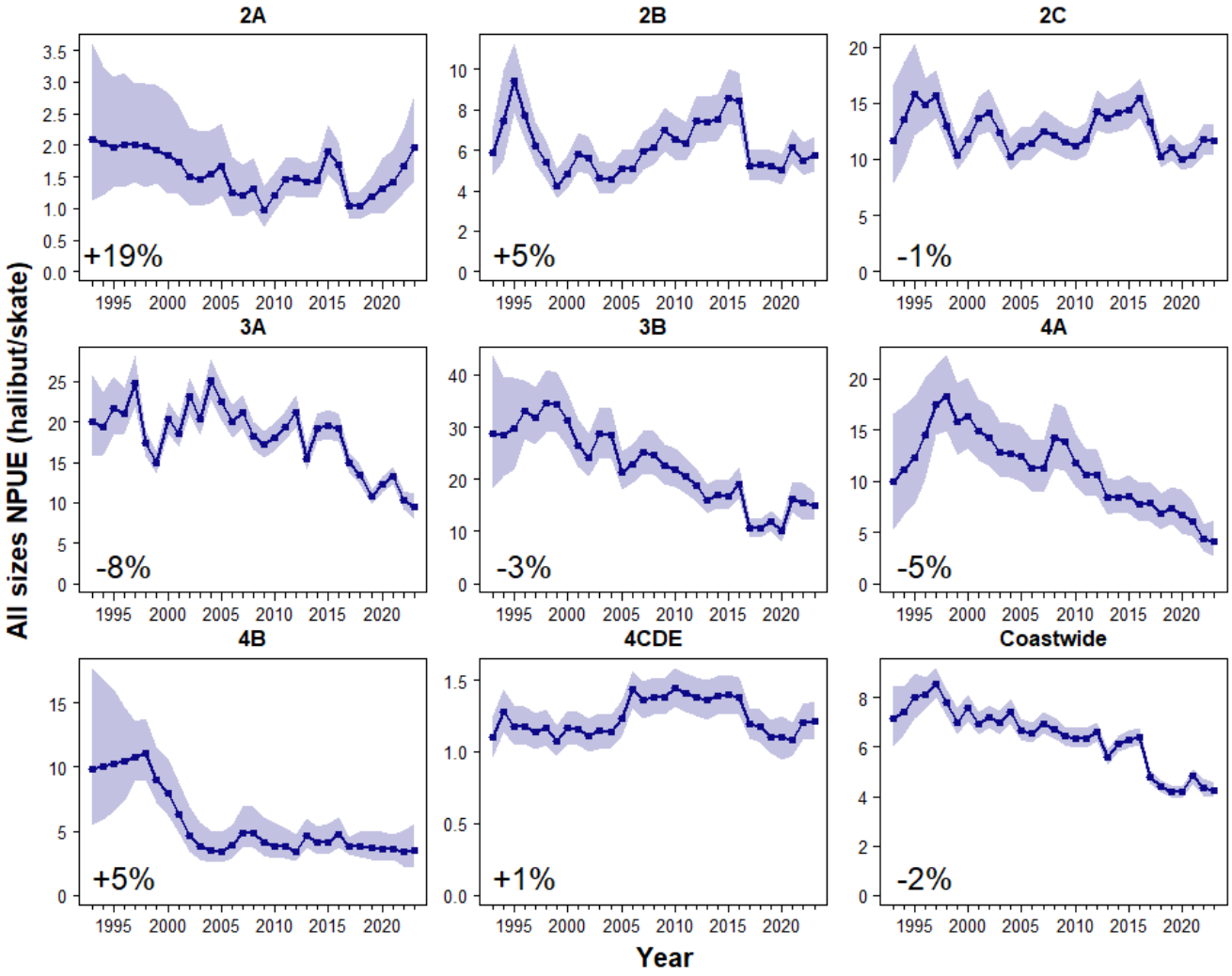


Figure A.3. Space-time model output for all sizes NPUE for 1993-2023. Filled circles denote the posterior means of all sizes NPUE for each year. Shaded regions show posterior 95% credible intervals, which provide a measure of uncertainty: the wider the shaded interval, the greater the uncertainty in the estimate. Numeric values in the lower left-hand corners are estimates of the change in mean all sizes NPUE from 2022 to 2023.

Data overview and stock assessment for Pacific halibut (*Hippoglossus stenolepis*) at the end of 2023

PREPARED BY: IPHC SECRETARIAT (I. STEWART, A. HICKS, R. WEBSTER, AND D. WILSON; 30 OCTOBER & 20 NOVEMBER 2023)

PURPOSE

To provide the Commission with a summary of the data, stock assessment at the end of 2023.

INTRODUCTION

In 2023 the International Pacific Halibut Commission (IPHC) undertook its annual coastwide stock assessment of Pacific halibut (*Hippoglossus stenolepis*). This stock assessment represents an update, following the full assessment conducted in 2022. There are no structural changes to the assessment methods for 2023. Supporting analyses were reviewed by the IPHC's Scientific Review Board (SRB) in June (SRB022; IPHC-2023-SRB022-08, IPHC-2023-SRB022-R) and September 2023 (SRB023; IPHC-2023-SRB023-06, IPHC-2023-SRB023-R).

This document provides an overview of the data sources available for the 2023 Pacific halibut stock assessment including the population trends and distribution among IPHC Regulatory Areas based on the modelled IPHC fishery-independent setline survey (FISS), directed commercial fishery data, and results of the stock assessment. All standard data sources have been updated with new information available from 2023 for this analysis, which includes updates to data collected in previous years.

Overall, spawning biomass (SB) estimates are slightly lower than those in last year's stock assessment, but the recent estimated trend is nearly flat. Year-classes estimated for 2012 and 2014 are both larger than those occurring from 2006-2011, but well below the average observed over the last 30 years. Stock distribution trends continue to show an increasing proportion of the stock in Biological Region 2 and a decreasing proportion in Biological Region 3.

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 Strait of Georgia and Puget Sound, but excludes known extremities in the western Bering Sea within the Russian Exclusive Economic Zone (Figure 1).

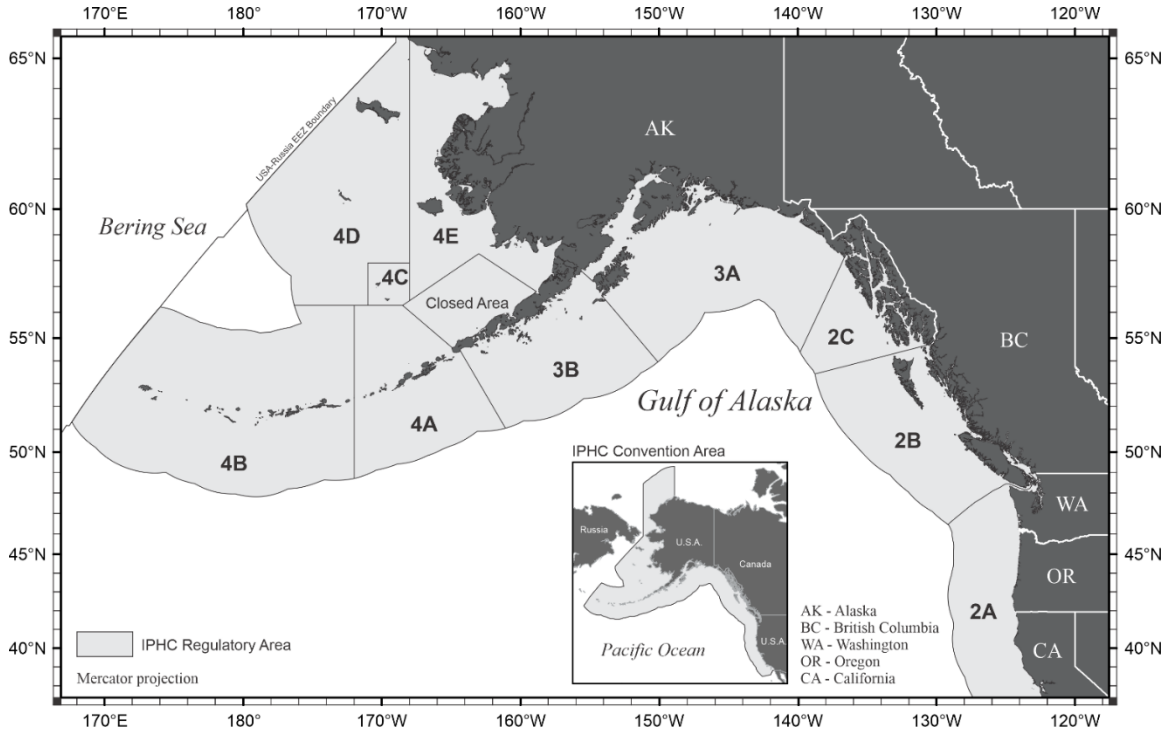


Figure 1. IPHC Convention Area (insert) and IPHC Regulatory Areas.

The Pacific halibut fishery has been managed by the IPHC since 1924. Catch limits for each of eight IPHC 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. Short-term projections and the harvest decision table for 2024 are reported in a separate document (IPHC-2023-IM099-12 Rev_1).

DATA

Historical mortality

Known Pacific halibut mortality consists of directed commercial fishery landings and discard mortality (including research), recreational fisheries, subsistence, and discard mortality in fisheries targeting other species ('non-directed' fisheries where Pacific halibut retention is prohibited). Over the period 1888-2023, mortality from all sources has totaled 7.4 billion pounds (~3.3 million metric tons, t). Since 1923, the fishery has ranged annually from 34 to 100 million pounds (16,000-45,000 t) with an annual average of 63 million pounds (~28,000 t; Figure 2). Annual mortality was above this 100-year average from 1985 through 2010 and has averaged 37.4 million pounds (~17,000 t) from 2019-23.

2023 Fishery and IPHC FISS statistics

Data for stock assessment use are compiled by IPHC Regulatory Area, and then aggregated to four Biological Regions: Region 2 (Areas 2A, 2B, and 2C), Region 3 (Areas 3A, 3B), Region 4 (4A, 4CDE) and Region 4B and then coastwide (Figure 1). The assessment data from both fishery-dependent and fishery-independent sources, as well as auxiliary biological information, are mostly spatially complete since the late-1990s. Primary sources of information for this assessment include mortality estimates from all sources (IPHC-2023-IM099-07_Rev_1), modelled indices of abundance (IPHC-2023-IM099-09 Rev_1) based on the IPHC's FISS (in

[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.

numbers and weight) and other surveys, commercial Catch-Per-Unit-Effort (in weight), and biological summaries from both sources (length-, weight-, and age-composition data).

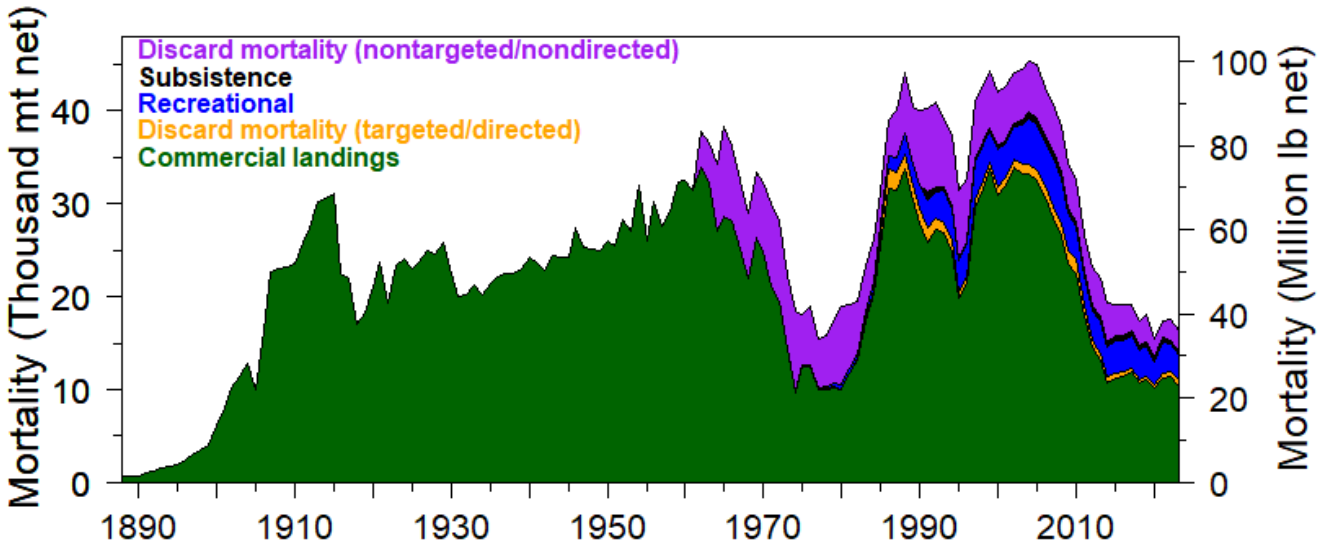


Figure 2. Summary of estimated historical mortality by source (colors), 1888-2023.

All data sources are reprocessed each year to include new information from the terminal year, as well as any additional information for or changes made to the entire time-series. Routine updates of logbook records from the 2023 and earlier directed commercial fishery, as well as age-frequency observations and individual weights from the commercial fishery were also included. Directed commercial fishery sex-ratios at age from the 2022 fishery were genetically analyzed and made available for this assessment. Mortality estimates (including changes to the existing time-series where new estimates have become available) from all sources were extended to include 2023. Available information was finalized on 6 November 2023 in order to provide adequate time for analysis and modeling. As has been the case in all years, some data remain incomplete (commercial fishery logbook and age information) or include projections for the remainder of the year (mortality estimates for ongoing fisheries or for fisheries where final estimation is still pending).

Coastwide commercial Pacific halibut fishery landings (including research landings) in 2023 were approximately 23.0 million pounds (~10,400 t), down 8% from 2022[2]. Discard mortality in non-directed fisheries was estimated to be 4.8 million pounds in 2023 (~2,200 t)[3], down 6% from 2022 and remaining below all recent estimates prior to 2019. The total recreational mortality (including estimates of discard mortality) was estimated to be 6.0 million pounds (~2,700 t) down 4% from 2022. Mortality from all sources decreased by 7% to an estimated 35.9 million pounds (~16,300 t) in 2023 based on preliminary information available for this assessment.

The 2023 modelled FISS results detailed an estimated coastwide aggregate Numbers-Per-Unit-Effort (NPUE) which decreased by 2% from 2022 to 2023, remaining at a level similar to those

[2] The mortality estimates reported in this document are those available on 6 November 2023 and used in the assessment analysis; they include projections through the end of the fishing season.

[3] The IPHC receives preliminary estimates of the current year's non-directed commercial discard mortality from the NOAA-Fisheries National Marine Fisheries Service Alaska Regional Office, Northwest Fisheries Science Center, and Fisheries and Oceans Canada in late October. Where necessary, projections are added to approximate the total mortality from ongoing fisheries through the end of the calendar year. Further updates are anticipated in January 2024.

observed in 2018-2020 (Figure 3). Biological Region 3 decreased by 6%, while Biological Region 2 increased by 3% and Biological Region 4 remained unchanged. Biological Region 4B is estimated to have increased by 5%; however, this area was not sampled in 2023 and credible intervals are appreciably wider than in recent years, reflecting a wide plausible range of potential trends, both increasing and decreasing, from 2022 to 2023. The 2023 modelled coastwide Weight-Per-Unit-Effort (WPUE) of legal (O32) Pacific halibut, the most comparable metric to observed commercial fishery catch rates, decreased by 3% from 2022 to 2023. Individual IPHC Regulatory Areas varied from an estimated 10% increase (Regulatory Area 2A) to an 8% decrease (Regulatory Area 3B) in O32 WPUE (Figure 4).

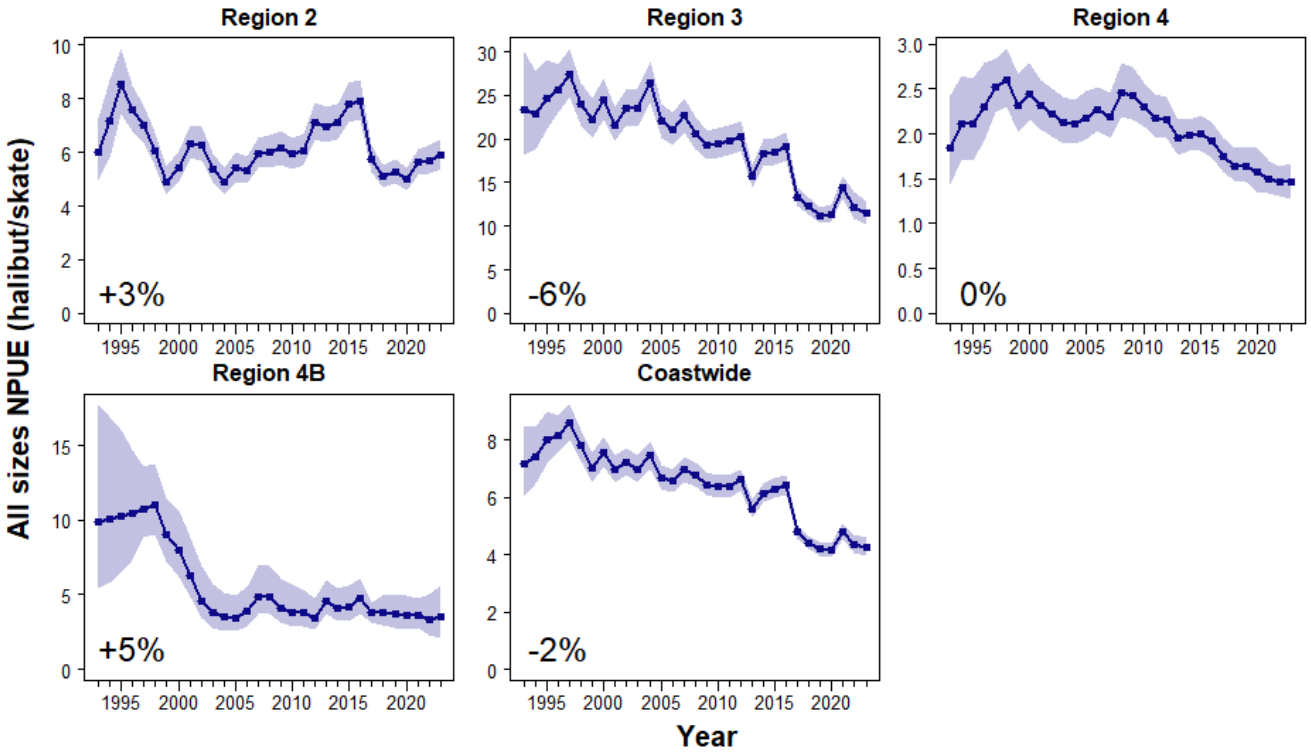


Figure 3. Trends in modelled FISS NPUE by Biological Region, 1993-2023. Percentages indicate the change from 2022 to 2023. Shaded zones indicate 95% credible intervals.

Preliminary commercial fishery WPUE estimates from 2023 logbooks showed a 10% decrease from 2022 to 2023 at the coastwide level larger than the FISS index (Figure 5). The bias correction to account for additional logbooks compiled after the fishing season further increased this drop to 12%. Trends varied among IPHC Regulatory Areas, fisheries, and gears; however, all areas showed decreased CPUE in one or more index.

Biological information (ages and lengths) from the commercial fishery landings showed that in 2023 the 2012 year-class (now 11 years old) was again the largest coastwide contributor (in number) to the fish landed. This follows the same pattern observed in 2022, when the fishery transitioned from the previously most-abundant 2005 year-class. The FISS also observed the 2012 year-class at the largest proportion of the total catch of any age class. There is no clear indication of younger year-classes than 2012 in large abundance in the 2023 data. Recent trawl surveys suggest the potential for one or more strong year-classes in 2017-2018; however, it will be several years before these fish can be confirmed in the FISS and directed fisheries. Individual size-at-age appears to be increasing for younger ages (<14) and was relatively stable for older fish in most IPHC Regulatory Areas and coastwide.

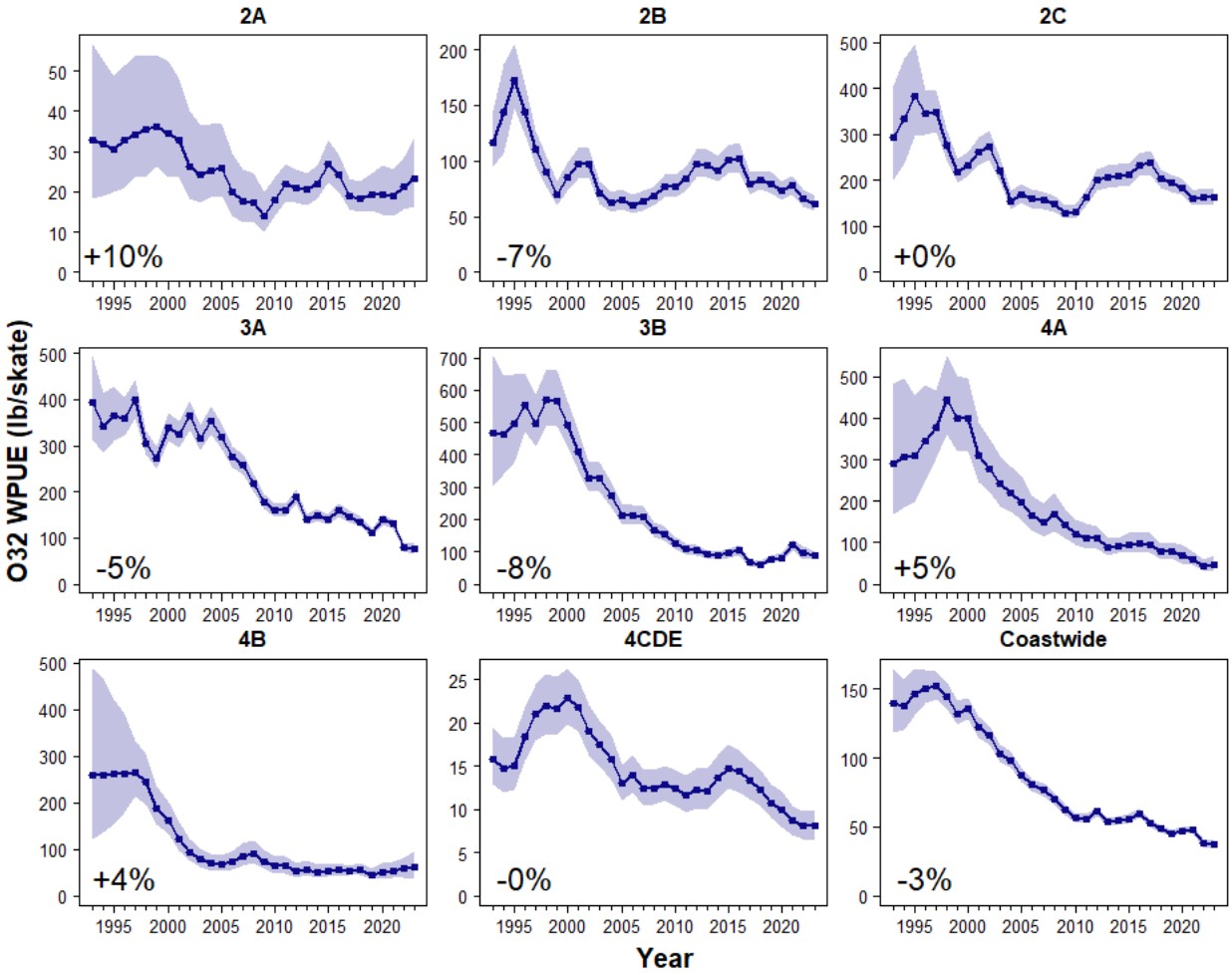


Figure 4. Trends in modelled FISS legal (O32) WPUE by IPHC Regulatory Area, 1993-2023. Percentages indicate the change from 2022 to 2023. Shaded zones indicate 95% credible intervals.

Biological stock distribution

The population distribution (measured via the modelled FISS catch in weight of all Pacific halibut) showed a continued decrease in Biological Region 3 to the lowest proportion of the coastwide stock in the time-series (Figure 6; recent years in Table 1). Biological Region 2 increased to the highest proportion observed. As there was no FISS sampling in Biological Region 4B, the credible intervals were very wide, consistent with either a decrease or increase in the proportion in this Region. Survey data are insufficient to estimate stock distribution prior to 1993. It is therefore unknown how historical distributions may compare with recent observations.

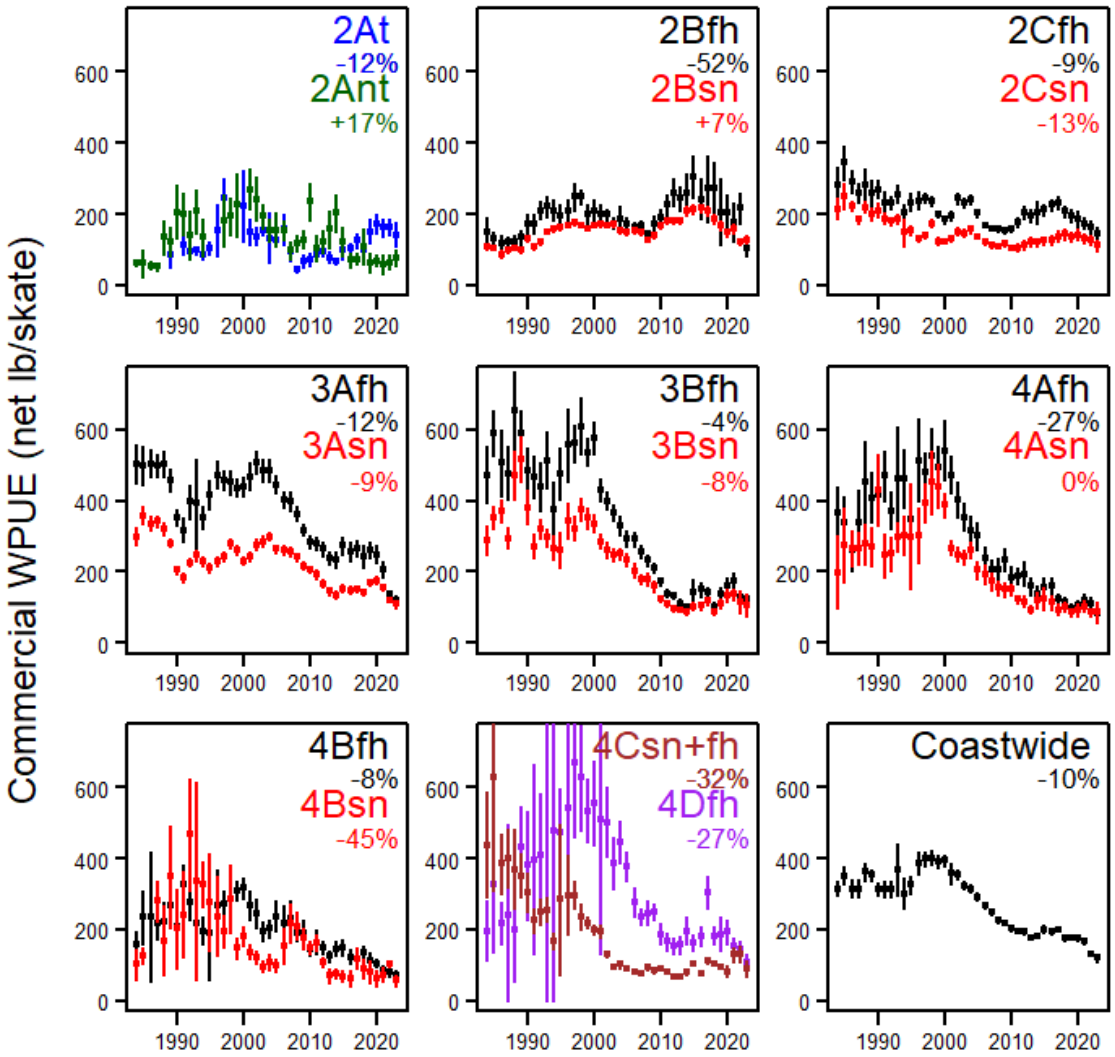


Figure 5. Trends in commercial fishery WPUE by IPHC Regulatory Area and fishery or gear, 1984-2023. The tribal fishery in 2A is denoted by "2At", non-tribal by "2Ant", fixed hook catch rates by "fh" and snap gear catch rates by "sn" for IPHC Regulatory Areas 2B-4D. Percentages indicate the change from 2022 to 2023 uncorrected for bias due to incomplete logbooks (see text above). Vertical lines indicate approximate 95% confidence intervals.

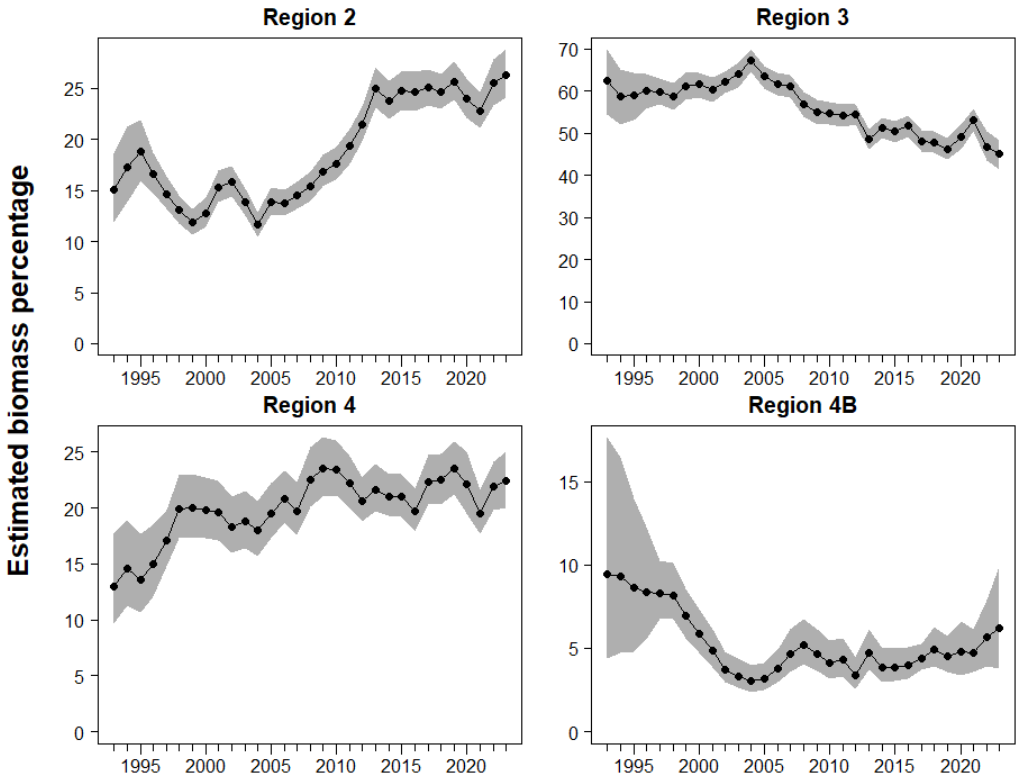


Figure 6. Estimated stock distribution (1993-2023) based on modelled survey catch weight per unit effort of all sizes of Pacific halibut. Shaded zones indicate 95% credible intervals.

Table 1. Recent stock distribution estimates by Biological Region based on modelling of all Pacific halibut captured by the FISS.

Year	Region 2 (2A, 2B, 2C)	Region 3 (3A, 3B)	Region 4 (4A, 4CDE)	Region 4B
2019	25.7%	46.3%	23.5%	4.5%
2020	24.0%	49.1%	22.2%	4.8%
2021	22.7%	53.0%	19.5%	4.7%
2022	25.5%	46.8%	22.0%	5.7%
2023	26.3%	45.0%	22.5%	6.2%

STOCK ASSESSMENT

This stock assessment continues to be implemented using the generalized stock synthesis software (Methot and Wetzel 2013). The analysis consists of an ensemble of four equally weighted models: two long time-series models, reconstructing historical dynamics back to the beginning of the modern fisheries (1888), and two short time-series models incorporating data only from 1992 to the present, a time-period for which estimates of all sources of mortality and survey indices for all regions are available. For each time-series length, there are two models: one fitting to coastwide aggregate data, and one fitting to data disaggregated into the four Biological Regions. This combination of models includes uncertainty in the form of alternative hypotheses about several important axes of uncertainty, including: natural mortality rates (estimated in three of the four models), environmental effects on recruitment (estimated in the long time-series models), and other model parameters.

The results of this stock assessment are based on the approximate probability distributions derived from the ensemble of models, thereby incorporating the uncertainty within each model (parameter or estimation uncertainty) as well as the uncertainty among models (structural uncertainty). This uncertainty provides a basis for risk assessment and reduces the potential for abrupt changes in management quantities as improvements and additional data are added to individual models. The four models continue to be equally weighted. Within-model uncertainty was propagated through to the ensemble results via the maximum likelihood estimates and an asymptotic approximation to individual model variance estimates. Point estimates in this stock assessment correspond to median values from the ensemble with the simple probabilistic interpretation that there is an equal probability above or below the reported value.

This stock assessment represents an update, following the full assessment conducted in 2022 (IPHC-2023-SA01). There are no structural changes to the assessment methods for 2023. Supporting analyses were reviewed by the IPHC's Scientific Review Board (SRB) in June (SRB022; IPHC-2023-SRB022-08, IPHC-2023-SRB022-R) and September 2023 (SRB023; IPHC-2023-SRB023-06, IPHC-2023-SRB023-R).

The most influential source of new information in this assessment was the directed commercial fishery logbook trend, including the 2023 estimate as well as an updated (and lower) estimate of the catch-rate in 2022. The addition of just this information resulted in an 11% decrease in the 2023 spawning biomass estimate, compared to that in the 2022 stock assessment. Although differences in trend between the FISS and commercial fishery are not uncommon in the historical time-series, the sensitivity of this year's assessment results highlights the importance of both time-series in estimating the stock size and trend.

BIOMASS, RECRUITMENT, AND FISHING INTENSITY TRENDS

The results of the 2023 stock assessment indicate that the Pacific halibut stock declined continuously from the late 1990s to around 2012 (Figure 7). That trend is estimated to have been largely a result of decreasing size-at-age, as well as lower recruitment than observed during the 1980s. The spawning biomass increased gradually to 2016, and then decreased to an estimated 171 million pounds (~77,500 t) at the beginning of 2023. At the beginning of 2024 the spawning biomass is estimated to have increased slightly (largely due to the rapidly maturing 2012 year-class) to 174 million pounds (78,900 t), with an approximate 95% credible interval ranging from 111 to 258 million pounds (~50,400-116,900 t; Figure 8). The recent spawning biomass estimates from the 2022 stock assessment are very consistent with previous analyses up 2021, and slightly below most recent estimates (Figure 9).

The IPHC's interim management procedure uses a relative spawning biomass of 30% as a trigger, below which the reference fishing intensity is reduced. At a relative spawning biomass limit of 20%, directed fishing is halted due to the critically low biomass condition. This calculation is based on recent biological conditions: weight-at-age and estimated recruitments currently influencing the stock. Thus, the 'dynamic' calculation measures only the effect of fishing on the spawning biomass, and not natural fluctuations due to recruitment variability and weight-at-age. The relative spawning biomass in 2024 was estimated to be 42% (credible interval: 20-56%) slightly higher than the estimate for 2023 (41%). The probability that the stock is below the $SB_{30\%}$ level is estimated to be 26% at the beginning of 2023, with a 1% chance that the stock is below $SB_{20\%}$. The two long time-series models (coastwide and areas-as-fleets) show different results when comparing the current stock size to that estimated at the historical low in the 1970s. The

AAF model estimates that recent stock sizes are well below those levels (44%), and the coastwide model above (168%). The relative differences among models reflect both the uncertainty in historical dynamics (there was very little data available from IPHC Regulatory Areas 4A-4CDE prior to the 1970s) as well as the importance of spatial patterns in the data and population processes, for which all of the models represent only simple approximations.

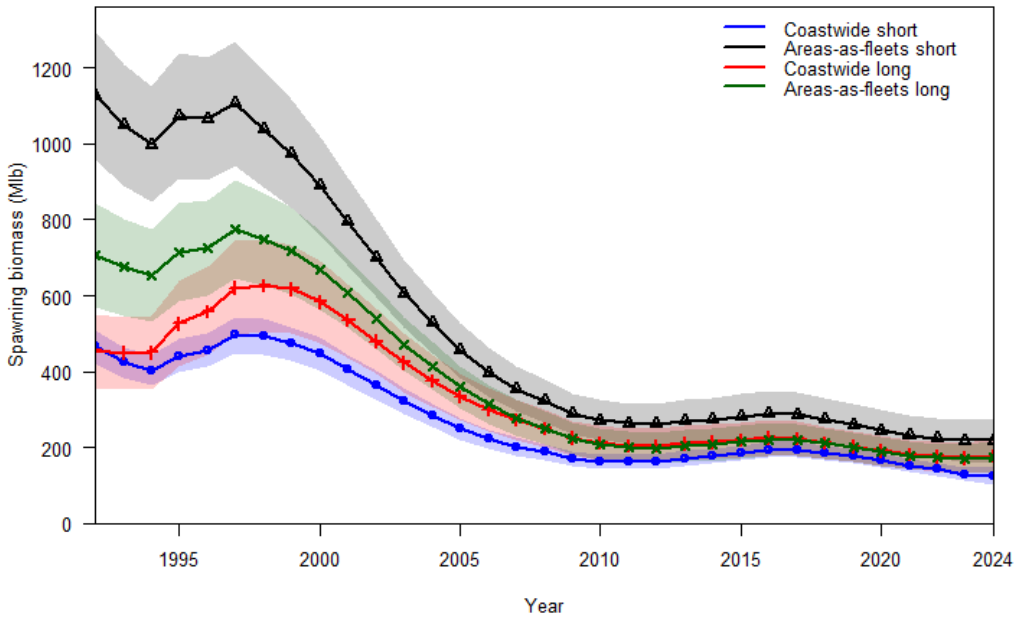


Figure 7. Estimated spawning biomass trends (1992-2024) based on the four individual models included in the 2023 stock assessment ensemble. Series indicate the maximum likelihood estimates; shaded intervals indicate approximate 95% credible intervals.

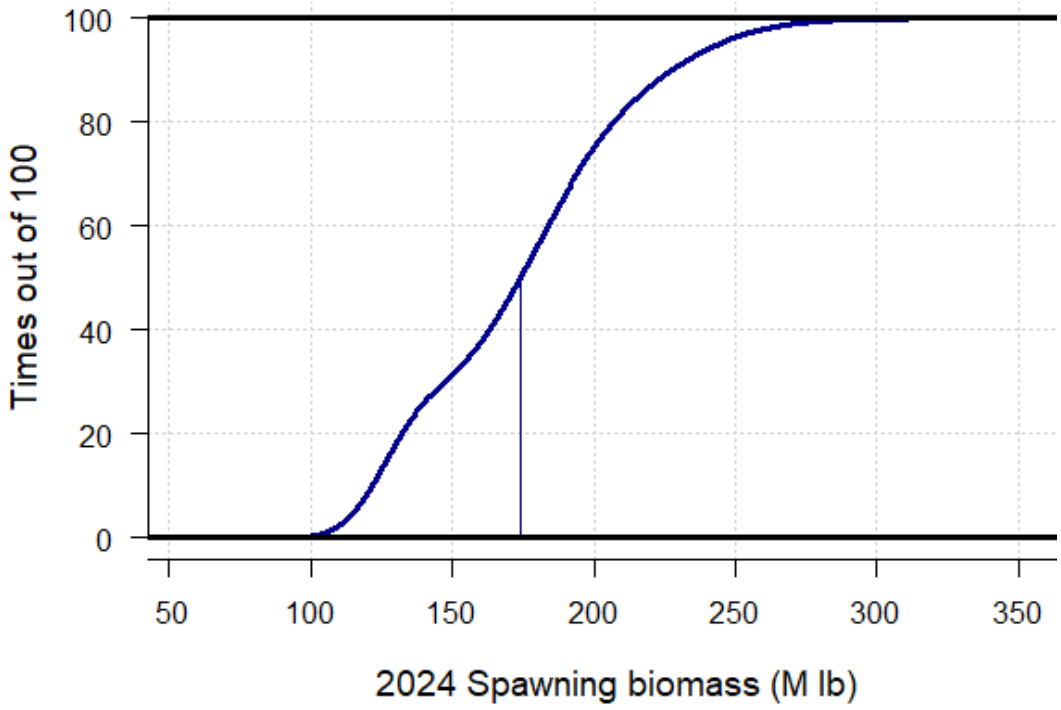


Figure 8. Cumulative distribution of the estimated spawning biomass at the beginning of 2024. Curve represents the estimated probability that the biomass is less than or equal to the value on the x-axis; vertical line represents the median (174 million pounds, ~78,900 t).

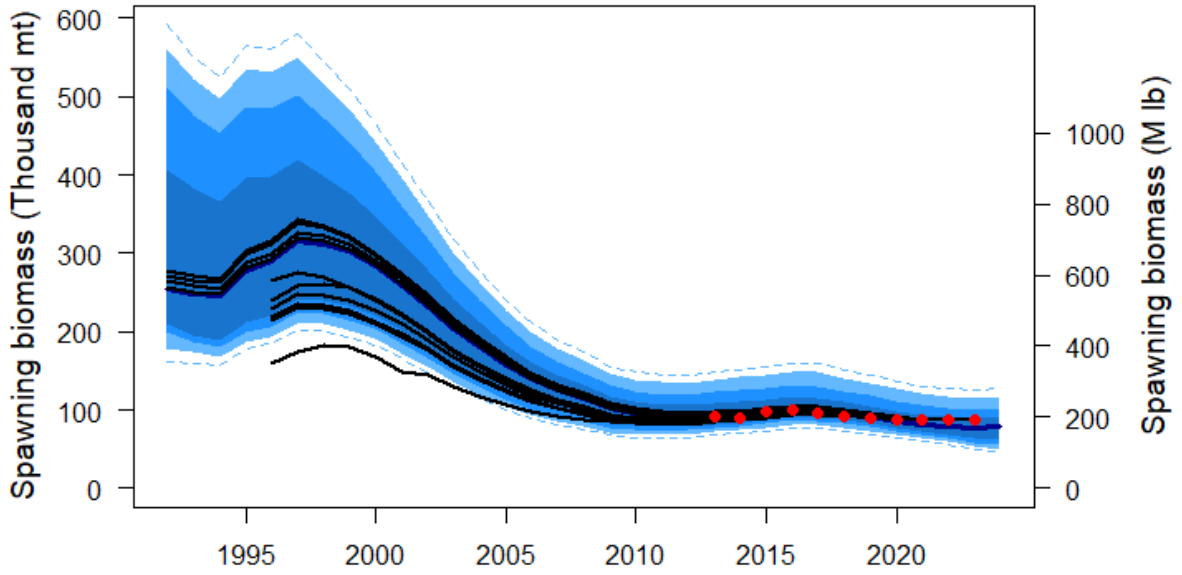


Figure 9. Retrospective comparison of female spawning biomass among recent IPHC stock assessments. Black lines indicate estimates from assessments conducted in 2012-2022 with the terminal estimate shown as a red point. The shaded distribution denotes the 2023 ensemble: the dark blue line indicates the median (or "50:50 line") with an equal probability of the estimate falling above or below that level; and 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.

Average Pacific halibut recruitment is estimated to be higher (50 and 53% for the coastwide and AAF models respectively) during favorable Pacific Decadal Oscillation (PDO) regimes, a widely recognized indicator of ecosystem productivity in the north Pacific (primarily the Gulf of Alaska). Historically, these regimes included positive conditions prior to 1947, from 1976-2006 and from 2014-2019, with poor conditions from 1947-1975, 2007-2013 and after 2020 (through September 2023). Although strongly correlated with historical recruitments, it is unclear whether recent conditions are comparable to those observed in previous decades.

Pacific halibut recruitment estimates show the recent large cohorts in 1999 and 2005 (Figure 10). Cohorts from 2006 through 2011 are estimated to be much smaller than those from 1999-2005, which has resulted in a decline in both the stock and fishery yield as these low recruitments have moved into the spawning biomass. Based on age data through 2023, individual models in this assessment produced estimates of the 2012 year-classes that were similar to the average level observed over 1994-2005. The 2012 year-class is estimated to be 42% mature in 2023 and the maturation of this cohort has a strong effect on the short-term projections. The 2023 data indicate that the 2014 year-class is larger than those observed from 2006-2011, but smaller than 2012. Estimates of year-classes after 2014 remain very uncertain.

The historical time-series of fishing intensity is estimated to be considerably lower in the 2022 and 2023 stock assessments than in previous analyses until around 2015 (Figure 11). Several recent stock assessments (2016-2016 and 2018) produced terminal estimates of fishing intensity very similar to this year's results; in contrast, the 2017, and 2019-2021 stock assessments all estimated a higher level of fishing intensity in the terminal years. All of these models estimated the highest fishing intensity between 2005 and 2010.

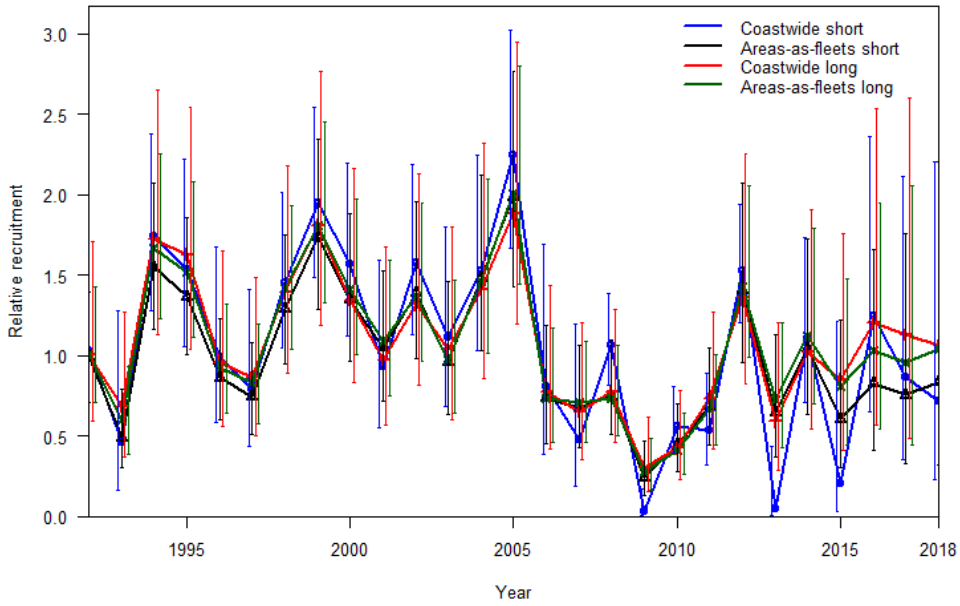


Figure 10. Estimated trends in age-0 relative recruitment (standardized to the mean for each model) from 1992-2018, based on the four individual models included in the 2023 stock assessment ensemble. Series indicate the maximum likelihood estimates; vertical lines indicate approximate 95% credible intervals.

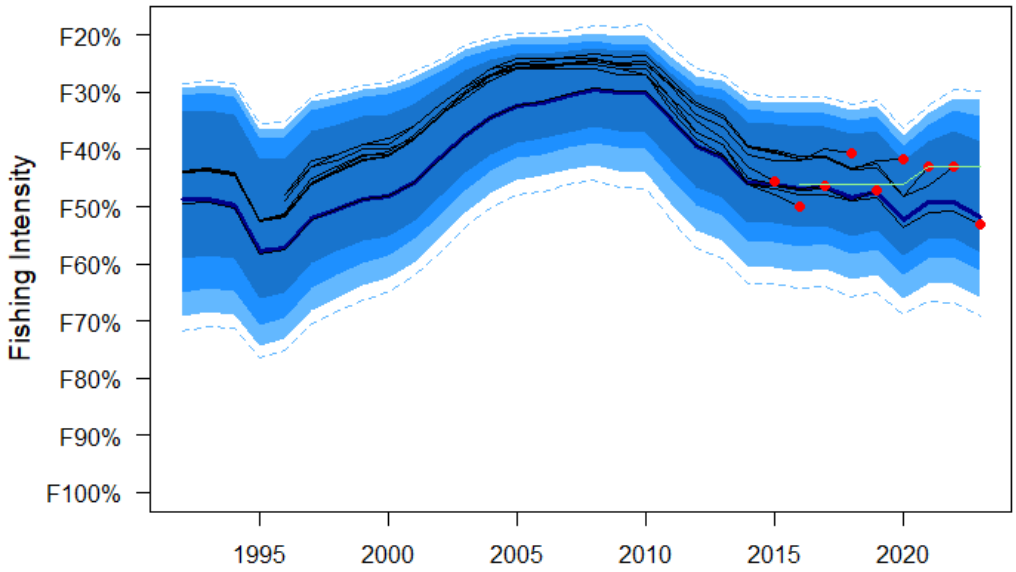


Figure 11. Retrospective comparison of fishing intensity (measured as $F_{xx\%}$, where xx% indicates the Spawning Potential Ratio (SPR) or the reduction in the lifetime reproductive output due to fishing) among recent IPHC stock assessments. Black lines indicate estimates of fishing intensity from assessments conducted in 2014-2022 with the projection for the mortality limit adopted based on that assessment shown as a red point. The shaded distribution denotes the 2023 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; and 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. The green line indicates the reference level of fishing intensity used by the Commission in each year it has been specified ($F_{46\%}$ during 2016-2020 and $F_{43\%}$ thereafter).

The IPHC's interim management procedure specifies a reference level of fishing intensity of $F_{43\%}$ (SPR=43%); this equates to the level of fishing that would reduce the lifetime spawning output per recruit to 43% of the unfished level given current biology, fishery characteristics and demographics. The 2023 fishing intensity is estimated to correspond to $F_{52\%}$ (credible interval: 31-66%; Table 2). The most recent four years (2020-2023) are estimated to correspond to the lowest levels of fishing intensity since the mid-1990s. Comparing the relative spawning biomass and fishing intensity over the recent historical period shows that the relative spawning biomass decreased as fishing intensity increased through 2010, then subsequently increased (Figure 12).

Table 2. Status summary of the Pacific halibut stock and fishery in the IPHC Convention Area at beginning of 2024.

Indicators	Values	Trends	Status
BIOLOGICAL			
SPR_{2023}: P(SPR<43%): P(SPR<limit):	52% (31-66%)[2] 27% LIMIT NOT SPECIFIED	FISHING INTENSITY REDUCED FROM 2022 TO 2023	**FISHING INTENSITY BELOW REFERENCE LEVEL**[3]
SB_{2024} (MLBS): SB_{2024}/SB_0: $P(SB_{2024}<SB_{30})$: $P(SB_{2024}<SB_{20})$:	174 (111–258) Mlbs 42% (20-56%) 26% 1%	SB INCREASED 2% FROM 2023 TO 2024	**NOT OVERFISHED**[4]
Biological stock distribution:	SEE TABLES AND FIGURES	REGION 3 DECREASED, REGION 2 INCREASED FROM 2022 TO 2023	**REGION 3 AT THE LOWEST OBSERVED PROPORTION**
FISHERY CONTEXT			
Total mortality 2023: Percent retained 2023: Average mortality 2019–23:	35.87 Mlbs, 16,270 t[1] 83% 37.37 Mlbs, 16,951 t	MORTALITY DECREASED FROM 2022 TO 2023	**2023 MORTALITY NEAR 100-YEAR LOW**

[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% credible intervals from the stock assessment ensemble.
[3] Status determined relative to the IPHC's interim reference Spawning Potential Ratio level of 43%.
[4] Status determined relative to the IPHC's interim management procedure biomass limit of $SB_{20\%}$.

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.

The assessment utilized six years (2017-22) of sex-ratio information from the directed commercial fishery landings. However, uncertainty in historical ratios remains unknown. Additional years of data are likely to further inform selectivity parameters and cumulatively reduce uncertainty in future stock size estimates. The treatment of spatial dynamics and

movement rates among Biological Regions, which are represented via the coastwide and AAF approaches, has large implications for the current stock trend, as evidenced by the different results among the four models comprising the stock assessment ensemble. This assessment also does not include mortality, trends, or explicit demographic linkages in Russian waters, although such linkages may be increasingly important as warming waters in the Bering Sea allow for potentially important exchange across the international border.

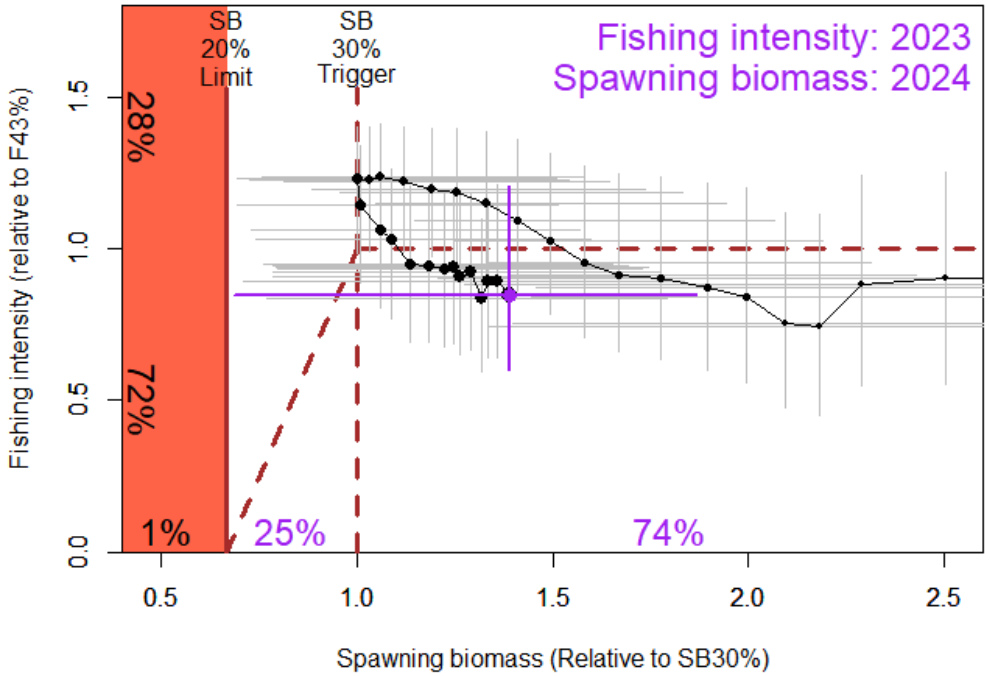


Figure 12. Phase plot showing the estimated time-series (1992-2024) of spawning biomass and fishing intensity relative to the reference points specified in the IPHC's interim management procedure. Dashed lines indicate the current $F_{43\%}$ (horizontal) reference fishing intensity, with linear reduction below the $SB_{30\%}$ (vertical) trigger, the red area indicates relative spawning biomass levels below the $SB_{20\%}$ limit. Each year of the time series is denoted by a solid point (credible intervals by horizontal and vertical whiskers), with the relative fishing intensity in 2023 and spawning biomass at the beginning of 2024 shown as the largest point (purple). Percentages along the y-axis indicate the probability of being above and below $F_{43\%}$ in 2023; percentages on the x-axis the probabilities of being below $SB_{20\%}$, between $SB_{20\%}$ and $SB_{30\%}$ and above $SB_{30\%}$ at the beginning of 2024.

Additional important contributors to assessment uncertainty (and potential bias) include the lag in estimation of incoming recruitment between birth year and direct observation in the fishery and survey data (6-10 years). Like most stock assessments, there is no direct information on natural mortality, and increased uncertainty for some estimated components of the fishery mortality. Fishery mortality estimates are assumed to be accurate; therefore, uncertainty due to discard mortality estimation (observer sampling and representativeness), discard mortality rates, and any other documented mortality in either directed or non-directed fisheries (e.g., whale depredation) could create bias in this assessment. Maturation schedules and fecundity are currently under renewed investigation by the IPHC. Historical values are based on visual field assessments, and the simple assumption that fecundity is proportional to spawning biomass and that Pacific halibut do not experience appreciable skip-spawning (physiologically mature fish which do not actually spawn due to environmental or other conditions). To the degree that

maturity, fecundity or skip spawning may be temporally variable, the current approach could result in bias in the stock assessment trends and reference points. New information will be incorporated as it becomes available; however, it may take years to better understand trends in these biological processes at the scale of the entire population. Projections beyond three years are avoided due to the lack of mechanistic understanding of the factors influencing size-at-age and relative recruitment strength, the two most important factors in historical population trends.

Due to the many remaining uncertainties in Pacific halibut biology and population dynamics, a high degree of uncertainty in both stock scale and trend will continue to be an integral part of an annual management process. Results of the IPHC's ongoing Management Strategy Evaluation (MSE) process can inform the development of management procedures that are robust to estimation uncertainty via the stock assessment, and to a wide range of hypotheses describing population dynamics.

SCIENTIFIC ADVICE

Sources of mortality: In 2023, total Pacific mortality due to fishing decreased to 35.87 million pounds (16,270 t), slightly below the 5-year average of 37.37 million pounds (16,951 t). Of that total, 83% comprised the retained catch (Table 2), equal to the percent utilized in 2022 and down from 87% in 2021.

Fishing intensity: The 2023 fishing mortality corresponded to a point estimate of SPR = 52%; there is a 27% chance that fishing intensity exceeded the IPHC's current reference level of $F_{43\%}$ (Table 2). The Commission does not currently have a coastwide fishing intensity limit reference point.

Stock status (spawning biomass): Current (beginning of 2024) female spawning biomass is estimated to be 174 million pounds (78,900 t), which corresponds to an 26% chance of being below the IPHC trigger reference point of $SB_{30\%}$, and a 1% chance of being below the IPHC limit reference point of $SB_{20\%}$. The stock is estimated to have declined 23% from 2016 to 2023, then increased by 2% to the beginning of 2024. The relative spawning biomass (compared to the biomass projected to be present at the beginning of 2024 in the absence of any fishing) is currently estimated to be 42%, after reaching the lowest point in the recent time series (30%) in 2011. Therefore, the stock is considered to be '**not overfished**'.

Stock distribution: After increases in 2020-2021, the proportion of the coastwide stock represented by Biological Region 3 has decreased in both 2022 and 2023 to the lowest estimate in the time-series, (Figure 6, Table 1). This trend occurs in tandem with increases in Biological Region 2. The lack of FISS sampling in Biological Region 4B in 2023 has resulted in increased uncertainty in both the trend and scale of the stock distribution in this Region.

Additional risks not included in this analysis: Directed commercial fishery catch rates coastwide, and in nearly all IPHC Regulatory Areas were at or near the lowest observed in the last 40 years. The absolute level of spawning biomass is also estimated to be near the lowest observed since the 1970s. The directed commercial fishery transitioned from the 2005 year-class to the 2012 year-class in 2022, with the 2012 year-class again the most numerous in the landed catch in 2023. This shift from older to younger (and smaller fish) has contributed to observed reduced catch rates. This year-class is estimated to be only 42% mature in 2023; the

current spawning stock is heavily reliant on this single year-class. Environmental conditions continue to be unpredictable, with important deviations from historical patterns in both oceanographic and biological processes observed across the stock range in the last decade.

RESEARCH PRIORITIES

Research priorities for the stock assessment and related analyses have been consolidated with those for the IPHC's MSE and the Biological Research program and are included in the IPHC's 5-year research plan (IPHC-2023-IM099-06).

OUTLOOK

Short-term projections and the harvest decision table for 2024-2026 are reported in a separate document (IPHC-2023-IM099-12 Rev_1).

ADDITIONAL INFORMATION

A more detailed description of the stock assessment (IPHC-2024-SA-01) and the data sources (IPHC-2024-SA-02), will be published directly to the stock assessment page on the IPHC's website. That page also includes recent peer review documents and previous stock assessment documents. Further, the IPHC's website contains many interactive tools for both FISS and commercial fishery information, as well as historical data series providing detailed tables of data and other information.

RECOMMENDATION/S

That the Commission:

a) **NOTE** paper IPHC-2023-IM099-10 Rev_1 which provides a summary of data and the results of the 2023 stock assessment.

REFERENCES

IPHC. 2023a. Report of the 22nd session of the IPHC scientific review board (SRB022). Meeting held in Seattle, WA, USA, 20-22 June 2023. IPHC-2023-SRB022-R. 23 p.

IPHC. 2023b. Report of the 23rd session of the IPHC scientific review board (SRB023). IPHC-2023-SRB023-R. 26 p.

Methot, R.D., and Wetzel, C.R. 2013. Stock synthesis: A biological and statistical framework for fish stock assessment and fishery management. Fisheries Research **142**(0): 86-99. doi:http://dx.doi.org/10.1016/j.fishres.2012.10.012.

Stewart, I., and Hicks, A. 2023a. Development of the 2023 Pacific halibut (*Hippoglossus stenolepis*) stock assessment. IPHC-2023-SRB022-08. 18 p.

Stewart, I., and Hicks, A. 2023b. Development of the 2023 Pacific halibut (*Hippoglossus stenolepis*) stock assessment. IPHC-2023-SRB023-06. 8 p.

Stewart, I., and Hicks, A. 2023c. Assessment of the Pacific halibut (*Hippoglossus stenolepis*) stock at the end of 2022. IPHC-2023-SA-01. 37 p.

Webster, R. 2022. Space-time modelling of survey data. IPHC-2022-IM098-09 Rev_1. 6 p.

IPHC Management Strategy Evaluation and Harvest Strategy Policy Updates

PREPARED BY: IPHC SECRETARIAT (A. HICKS, I. STEWART & D. WILSON; 30 OCTOBER 2023)

PURPOSE

To provide the Commission with an update of the Management Strategy Evaluation (MSE) process and the Harvest Strategy Policy, and to seek guidance on the MSE Program of Work.

INTRODUCTION

The Management Strategy Evaluation (MSE) Program of Work for 2021–2023 (IPHC-2021-MSE-02) was completed in early 2023 and presented at the 99th Session of the IPHC Annual Meeting (AM099).

MSE is used to evaluate management procedures with the ultimate goal of determining a harvest strategy that is robust to uncertainty and variability. The IPHC currently has an interim management procedure, which is a major part of a harvest strategy, but to formally define an IPHC harvest strategy, a few tasks remain. This includes evaluating multi-year MPs and determining if the current reference fishing intensity (SPR=43%) still meets IPHC objectives. Additions and edits to the current harvest strategy policy document are also necessary for the adoption of a formal harvest strategy policy.

This summary document describes various tasks related to ongoing MSE work that would assist in adopting a harvest strategy policy. These tasks include:

1) outcomes of the 18th Session of the IPHC Management Strategy Advisory Board (MSAB018);
2) updates to the operating model (OM);
3) considering new objectives and performance metrics;
4) evaluating various elements of management procedures (MPs);
5) defining exceptional circumstances; and
6) updating the Harvest Strategy Policy document.

Potential decision points are listed at the end of each section and summarized in the final Recommendation/s section.

OUTCOMES OF THE 18TH SESSION OF THE IPHC MANAGEMENT STRATEGY ADVISORY BOARD

The MSAB018 occurred in May 2023 and members discussed membership, past evaluations, and a Program of Work.

The MSAB discussed MSAB member succession planning and the potential for the designation of alternate members. Some members expressed interest in having alternates available in case the member is unable to attend a meeting or ends their term. The MSAB requested that domestic agency staff consider providing text to update the IPHC Rules of Procedure.

> **IPHC-2023-MSAB018-R, para. 10:** ***NOTING*** *the extensive discussion surrounding MSAB member succession planning and how the appointment of alternates may be useful, the MSAB* ***REQUESTED*** *that domestic agency staff from the Contracting Parties consider drafting text to amend the IPHC Rules of Procedure to allow alternates to be designated for MSAB members, for Commission consideration in the future.*

Results of MSE simulations assuming a persistent low or high Pacific Decadal Oscillation (PDO) were presented at MSAB018. Even though we cannot "manage" the PDO regime, it is useful to understand the effects of the PDO regime on the results, allowing for the separation of the effects of fishing from the effects of the environment. For Pacific halibut, the environment sometimes may have a larger effect on the distribution of spawning biomass than fishing does (at an SPR of 43%). These results are dependent upon the harvest strategy, and different fishing intensities or distribution procedures may produce different outcomes.

MSAB members were very interested in these results and requested that outreach materials be developed explaining the effects of the environment (i.e. PDO) on coastwide and regional stock dynamics and the relative effect of fishing. This may be done as a poster for future IPHC meetings that could potentially be turned into a pamphlet.

> **IPHC-2023-MSAB018-R, para. 21:** *The MSAB* ***REQUESTED*** *that outreach materials be developed that synthesize the effect of the PDO (e.g. via recruitment) on the coastwide and regional stock dynamics and the relative effect of fishing. This may be a pamphlet or poster to be reviewed at a future MSAB meeting.*

A major outcome of MSAB018 was the request that the evaluation of annual and multi-year assessments be done subsequent to an agreement on a distribution procedure and include elements such as multi-year management procedures, constraints on the coastwide TCEY, smoothing elements on the calculation of stock distribution, and various SPR values.

> **IPHC-2023-MSAB018-R, para. 29:** *The MSAB* ***REQUESTED*** *that subsequent to an agreement on a distribution procedure by the Commission, the evaluation of annual and multi-year assessments include, but not limited to, the following concepts.*
>
> *a) Annual changes in the TCEY driven by FISS observations in non-assessment years of a multi-year MP;*
>
> *b) A constraint on the coastwide TCEY to reduce inter-annual variability and the potential for large changes in assessment years of a multi-year. This may*

be a 10% or 15% constraint, a slow-up fast-down approach, or similar approach;

c) A smoothing element in the distribution procedure to account for uncertainty in the estimates of stock distribution and reduce the variability in area-specific TCEYs. For example, this may include a 3-year rolling average of stock distribution estimates;

d) SPR values ranging from 30% to 56% and alternate trigger reference points in the harvest control rule.

This is congruent with an agreement by the Commission at AM099.

> **IPHC-2023-AM099-R, para. 87:** The Commission **AGREED** that following agreement about a distribution procedure, the IPHC Secretariat and MSAB should reassess multi-year stock assessment management procedures, as well as coastwide elements of a management procedure such as the SPR value.

The MSAB also discussed exceptional circumstances and gained a better understanding of what an exceptional circumstance is and what details need to be defined.

> **IPHC-2023-MSAB018-R, para. 42:** *The MSAB **AGREED** that FISS observations (coastwide or by area/region) are useful to define the limits defining an exceptional circumstance and that individual years may be used as well as observed trends over time.*
>
> **IPHC-2023-MSAB018-R, para. 43:** *The MSAB **NOTED** that the defined responses to an exceptional circumstance may include: a) reviewing the MSE framework including the operating model; IPHC-2023-MSAB018-R Page 12 of 19 b) examining objectives; c) evaluating additional MPs; d) completing a stock assessment at the next appropriate time.*
>
> **IPHC-2023-MSAB018-R, para. 44:** *The MSAB **AGREED** that there are other circumstances within the acceptable range simulated by the MSE when one may deviate from an adopted MP because of an unexpected event. For example, a high probability of predicted declines in the spawning biomass under the interim management procedure may have been contributing factors in the decision to depart from the interim management procedure in 2023, even though these declines were within the simulated range of MSE results.*

Finally, the MSAB requested that MSAB019 be held in the Spring of 2024.

> **IPHC-2023-MSAB018-R, para. 47:** The *MSAB **REQUESTED** that MSAB019 be held in May 2024, rather than October 2024, as previously noted by the Commission, and that future MSAB meetings occur prior to the June SRB meeting in that same year.*

Decision/Action

None

UPDATED 2023 OPERATING MODEL

The Scientific Review Board (SRB) has reviewed the IPHC's MSE Operating Model (OM) for 2023 at the 22nd Session of the SRB (SRB022) and the 23rd Session of the SRB (SRB023). The IPHC's MSE Operating Model for 2023 has been updated to reflect the 2022 stock assessment ensemble and is performing well for evaluating management procedures, noting that further adjustments may be made, at the request of the Commission. The SRB endorsed the 2023 OM.

Specific details of the OM are presented in the document Technical Details of the IPHC MSE Framework (IPHC-2023-MSE-02). Overall, the 2023 OM is ready to be used to investigate elements of MPs that will lead to the adoption of a harvest strategy. This may include, for example, multi-year assessments and fishing intensity. Additionally, the 2023 OM may be used to inform decisions regarding monitoring of the Pacific halibut stock, such as investigating the effects of FISS designs on management outcomes.

Decision/Action

1. **Note** that the SRB endorsed the 2023 OM for use in MSE evaluations of MPs that would lead to the adoption of a harvest strategy, including assessment frequency, fishing intensity, and data monitoring.

OBJECTIVES

Four priority coastwide objectives are currently endorsed by the Commission for use in the IPHC's MSE process.

a. Maintain the long-term coastwide female spawning stock biomass above a biomass limit reference point ($B_{20\%}$) at least 95% of the time.

b. Maintain the long-term coastwide female spawning stock biomass above a biomass target reference point ($B_{36\%}$) at least 50% of the time.

c. Optimise average coastwide TCEY.

d. Limit annual changes in the coastwide TCEY.

The SRB made a recommendation to re-evaluate what they called the [biomass] target objective. This is objective (b): to maintain the spawning biomass above $B_{36\%}$.

> **IPHC-2023-SRB023-R, para. 25.** *The SRB **RECOMMENDED** that the Commission re-evaluate the target objective for long-term coastwide female spawning stock biomass given that estimated 2023 female spawning biomass (and associated WPUE), which was well-above the current target B36%, in part triggered harvest rate reductions from the interim harvest policy. Such ad-hoc adjustments limited the value of projections and performance measures from MSE.*

However, instead of updating the $B_{36\%}$ objective, it may be prudent to consider an absolute spawning biomass, or catch-rate, threshold in a new objective to meet some concerns

expressed at the 99th Session of the IPHC Annual Meeting (AM099). This may be a possible topic for the MSAB in 2024.

Additional area-specific objectives are listed in Appendix A. The IPHC Secretariat is working with the SRB to develop a region-specific objective to conserve spatial structure that is informative of the changes in biomass within a region. This would be a secondary objective to consider after meeting all priority objectives.

> **IPHC-2023-SRB023-R, para 24.** *The SRB **RECOMMENDED** that an objective to maintain spatial population structure be added or redefined to maintain the spawning biomass in a Biological Region above a defined threshold relative to the dynamic unfished equilibrium spawning biomass in that Biological Region with a pre-defined tolerance. The percentage and tolerance may be defined based on historical patterns and appropriate risk levels recognizing the limited fishery control of biomass distribution.*

Decision/Action

Consider whether the Commission should

2. **Recommend** that the Secretariat, working with the MSAB and SRB, develop a new coastwide objective related to absolute spawning biomass or catch-rates, to either replace the current $B_{36\%}$ objective or be added as a fifth priority objective. The Secretariat supports developing a new objective for the Commission to decide if it is a useful objective to assist in determining an MP that optimizes yield.

PERFORMANCE METRICS

The IPHC Secretariat is using performance metrics developed for the four (4) priority objectives listed above. These are a subset of the various metrics presented in Appendix A. Other performance metrics are useful to gain additional insight into management procedures, and is often used by the MSAB in identifying trade-offs between MPs.

The MSAB also requested that a new performance metric be developed to assist with evaluating multi-year MPs.

> **IPHC-2023-MSAB018-R, para. 38:** *The MSAB **REQUESTED** new performance metrics representing the change in the TCEY in non-assessment years and the change in TCEY in assessment years be developed for the evaluation of multi-year assessment MPs.*

The Secretariat will continue to work with the MSAB on how to calculate these new performance metrics, and then report them in the MSE Explorer.

Decision/Action

None

MANAGEMENT PROCEDURES (MPS)

The MSAB and the SRB have provided requests to investigate various MP elements.

> **IPHC-2023-SRB023-R, para. 29:** *The SRB **RECOMMENDED** evaluating fishing intensity and frequency of the stock assessment elements of management procedures and FISS uncertainty scenarios using the MSE framework. MP elements related to constraints on the interannual change in the TCEY and calculation of stock distribution may be evaluated for a subset of the priority management procedures as time allows*.

The following describes these elements of MPs that could be evaluated as part of the future MSE Program of Work.

Annual and multi-year stock assessment MPs: These are management procedures that conduct a stock assessment annually or every 2nd or 3rd year and use an empirical MP based on the FISS survey trends to determine the TCEY in non-assessment years.

Fishing intensity: A range of SPR values (i.e. fishing intensity, currently 43%) and alternative trigger reference points (currently 30%) in the harvest control rule.

FISS reductions: Investigate scenarios where the FISS effort is reduced or occasionally eliminated in various IPHC Regulatory Areas.

Constraints: A constraint on the coastwide TCEY to reduce inter-annual variability. Past examples include a 15% constraint and a slow-up/fast-down approach.

Stock distribution: A method to reduce the inter-annual variability in the estimates of stock distribution for use in the MP. This may include using the average of the stock distribution estimates over the past 3 years, for example.

TCEY distribution: Procedures to distribute the TCEY to IPHC Regulatory Areas.

Decision/Action

Consider if the Commission should:

3. **Recommend** the evaluation of multi-year management procedures along with fishing intensity, which may be done subsequent to an agreement on distribution of the TCEY, or could incorporate uncertainty in how the TCEY is distributed. These are two MP elements that are necessary to evaluate for the adoption of a coastwide MP in the harvest strategy policy.
4. **Recommend** the evaluation of FISS design scenarios using the MSE framework, as recommended by the SRB. This will provide an understanding of how reductions in the FISS design may affect management outcomes.
5. **Recommend** any additional management procedures to evaluate including constraints on the coastwide TCEY, methods to smooth estimation of stock distribution, and procedures to distribute the TCEY to IPHC Regulatory Areas. These are additional MP elements that may be beneficial to the harvest strategy policy.

EXCEPTIONAL CIRCUMSTANCES

Exceptional circumstances are used as part of a process that identifies specific actions for deviating from an adopted harvest strategy. An exceptional circumstance is an event that is beyond the expectations of the MSE evaluation and is used to determine if specific actions should be taken to re-examine the harvest strategy. This is useful to ensure that the adopted harvest strategy is retained unless it is absolutely necessary to deviate from the adopted process. The IPHC interim harvest strategy policy has a decision-making step after the MP, thus the Commission may deviate from an adopted MP as part of the harvest strategy. This decision-making variability is included in the MSE simulations. However, defining exceptional circumstances would involve defining events that result in re-examination of the MSE process to determine if an update to the framework and evaluation of management procedures is necessary. Potential exceptional circumstances (i.e. events) and the actions following the declaration of an exceptional circumstance are given below.

An exceptional circumstance, in an MSE context, does not usually trigger an action within the management procedure. Instead, a trigger can be defined as part of a management procedure such that a management action takes place. An example is the 30:20 control rule which defines a reduction in the fishing intensity when stock status is less than 30%. A similar trigger could be defined that indicates an assessment should be done in a year when one was normally not scheduled (if time allows). On the other hand, an exceptional circumstance is declared if it is persistent and beyond the simulated variability of the MSE.

The Secretariat, with the assistance of the SRB and MSAB, is defining exceptional circumstances and prescribing the response that would be initiated, as well as identifying potential triggers in a management procedure that would result in a stock assessment being done (if time allows) in a year that would normally not have one scheduled (e.g. in multi-year MPs). Working with the SRB, the following potential exceptional circumstances have been described:

a) The coastwide all-sizes FISS WPUE or NPUE from the space-time model falls above the 97.5th percentile or below the 2.5th percentile of the simulated FISS index for two or more consecutive years.

b) The observed FISS all-sizes stock distribution for any Biological Region is above the 97.5th percentile or below the 2.5th percentile of the simulated FISS index over a period of 2 or more years.

c) Recruitment, weight-at-age, sex ratios, other biological observations, or new research indicating parameters that are outside the 2.5th and 97.5th percentiles of the range used or calculated in the MSE simulations.

Furthermore, if an exceptional circumstance is declared, the SRB and MSAB have prescribed that the following actions may take place.

a) A review of the MSE simulations to determine if the OM can be improved and MPs should be reevaluated.

b) If a multi-year MP was implemented and an exceptional circumstance occurred in a year without a stock assessment, a stock assessment would be completed as soon as possible along with the re-examination of the MSE.

c) Consult with the SRB and MSAB to identify why the exceptional circumstance occurred, what can be done to resolve it, and determine a set of MPs to evaluate with an updated OM.

d) Further consult with the SRB and MSAB after simulations are complete to identify whether a new MP is appropriate.

Decision/Action

Consider if the Commission should:

6. **Recommend** that the Secretariat continue to work with the SRB and MSAB to define exceptional circumstances (events) using FISS observations, biological observations, and new research. These should be defined as part of the adopted harvest strategy.

7. **Recommend** that the Secretariat continue to work with the SRB and MSAB to prescribe the actions to take when an exceptional circumstance is triggered.. These should be defined as part of the adopted harvest strategy.

RESULTS

MSE simulations are currently being conducted, with a priority on multi-year assessments and SRB-requested FISS scenarios. Results will be added to the MSE Explorer website as they become available.

Results of MSE simulations assuming a persistent low or high PDO were presented at MSAB018. These results were not available at AM099 and were also presented at the fifth conference for Effects of Climate Change on the Worlds Oceans (ECCWO5) and the PICES 2023 Annual Meeting (PICES-2023). Since then, similar MSE simulations were performed using the updated operating model (OM) for 2023, without decision-making variability, estimation error, or observation error. Variable weight-at-age and recruitment were used. These updated results, presented here, are very similar to the previous analysis presented at MSAB018.

Updated results, using the 2023 Operating Model (OM) show similar results to what was presented to MSAB members at MSAB018. The median relative spawning biomass (RSB) when fishing at an SPR equal to 43% was similar for the high and low PDO scenarios (Table 1). However, even though the median was near 38%, there was a higher probability that the RSB was less than 36% for the low PDO scenario. The long-term median TCEY was 22% less for the low PDO scenario and 26% more for the high PDO scenario when compared to the median TCEY for the base simulations that modelled PDO regime shifts. The TCEY for a persistent high PDO was 1.6 times greater than the TCEY for a persistent low PDO. Inter-annual variability in the TCEY was the same for the persistent low and high PDO scenarios, but less than the AAV when PDO regime shifts were modelled. Without decision-making variability, estimation error,

and observation error, the AAVs are less than when these additional sources of variation are included, as expected.

Table 1. Performance metrics related to primary objectives for scenarios with modeled cycles of PDO (both), always low PDO (Low), and always high PDO (High) with an annual assessment, 32-inch size-limit, no decision-making variability, no estimation error, and no observation error. Long-term results are only shown for all performance metrics.

MP name	**MP-A32**	**MP-A32**	**MP-A32**
PDO	**Both**	**Low**	**High**
SPR	**0.43**	**0.43**	**0.43**
Long-Term Metrics			
Median RSB	38.8%	37.6%	39.2%
P(RSB_y<20%)	<0.001	<0.001	<0.001
P(RSB<36%)	0.238	0.329	0.157
Median TCEY (Mlbs)	65.64	51.42	82.95
Median AAV TCEY	5.2%	4.5%	4.5%
Median TCEY Region 2 (Mlbs)	20.49	19.07	21.20
Median TCEY Region 3 (Mlbs)	33.67	22.98	48.74
Median TCEY Region 4 (Mlbs)	8.13	6.55	9.35
Median TCEY Region 4B (Mlbs)	2.40	2.24	2.63

The percentage of spawning biomass in each Biological Region is affected by fishing under an SPR-based management procedure (Figure 1). The distribution of spawning biomass across the Biological Regions is also affected by the PDO regime because movement, recruitment distribution, and average recruitment are dependent on the PDO regime. Region 2 shows a reduction in the percentage of spawning biomass with fishing, and the low PDO scenario results in a higher percentage than the persistent high PDO scenario. Region 3 shows a similar percentage of spawning biomass with fishing and a higher percentage of spawning biomass with a high PDO. Region 4 shows a higher percentage of spawning biomass with fishing and is largely unaffected by the PDO regime. Region 4B has a higher percentage of spawning biomass with fishing and a higher spawning biomass for the low PDO scenario.

Decision/Action

None

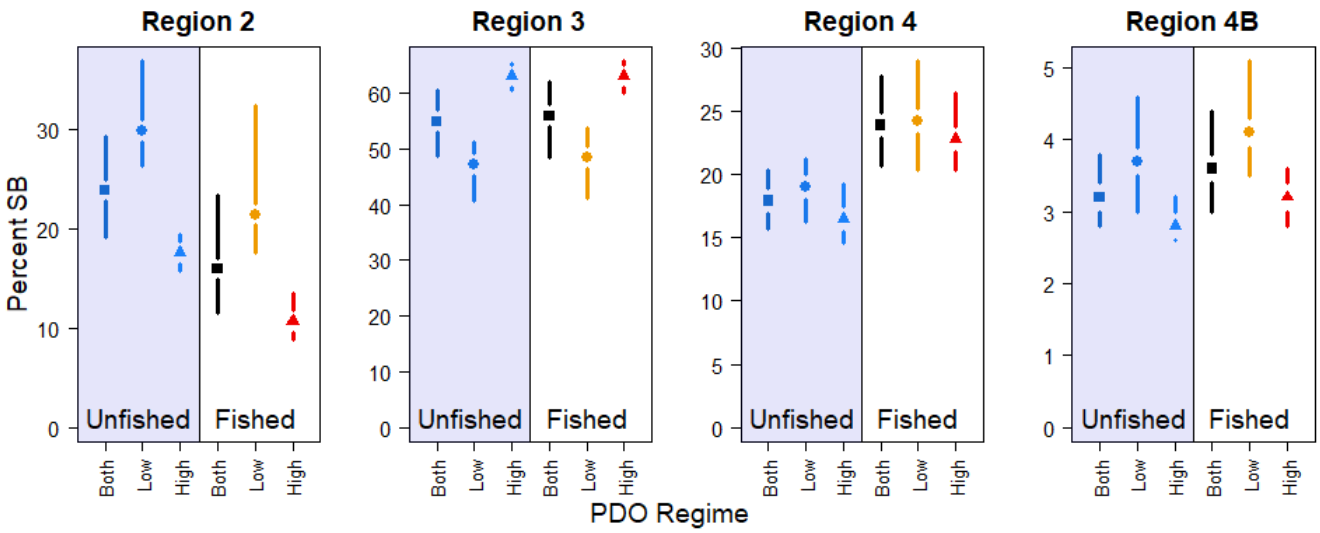


Figure 1. Percentage of spawning biomass in each Biological Region when fished with an SPR of 43% (no estimation error, no observation error, and no implementation error) and when not fished. The PDO is modelled with cyclical low and high periods in "Both", is persistently low in "Low", and is persistently high in "High".

IPHC HARVEST STRATEGY POLICY

The IPHC Secretariat is currently in the process of updating the existing IPHC harvest strategy policy document, which was last edited in 2019. The new document will update text and add sections to reflect decisions of the Commission since the 95th Annual Meeting of the IPHC (AM095). Appendix B presents the current harvest strategy policy text with comments and potential edits.

Some topics that could be added to the Harvest Strategy Policy document include the following:

- More details on the IPHC Harvest Strategy Policy framework, such as described in the Interim IPHC Harvest Strategy and Policy (IPHC-2020-IntHSP). This includes the management procedure, tactical decision-making as part of the Commission process, and strategic development of the management procedure.
- An explanation how MSE is used to inform/develop the harvest strategy, and how risk is incorporated.
- A description of the priority objectives.
- A description of each element of a management procedure including monitoring, assessment, and determination of coastwide and area-specific mortality limits.
    - Monitoring and data collection goals and requirements.
    - Stock assessment schedule and necessary outputs.
    - Technical details of how the coastwide TCEY is determined.

    - Pertinent details on how the TCEY may be distributed to IPHC Regulatory Areas, and any other technical details that affect the final determination of mortality limits for sectors that may not be specifically under IPHC jurisdiction. This may or not be a part of a tested management procedure but a decision-making process that occurs after the coastwide TCEY is determined, this is part of the policy but not necessarily the harvest strategy.
- The annual meeting schedule and involvement of IPHC subsidiary bodies.

To move towards formally adopting a harvest strategy policy at AM101, with potentially an interim harvest strategy policy at AM100, the SRB recommended separating the coastwide TCEY management procedure from the distribution procedure.

> **IPHC-2023-SRB023-R, para. 30:** *The SRB **RECOMMENDED** that the Commission consider revising the harvest policy to (i) determine coastwide TCEY via a formal management procedure and (ii) negotiate distribution independently (e.g. during annual meetings). Such separated processes are used in other jurisdictions (e.g. most tuna RFMOs, Mid Atlantic Fishery Management Council, AK Sablefish, etc.).*

The coastwide TCEY determined from the MP in the harvest strategy would be an input into the allocation decision-making process. This process would be described in the harvest strategy policy document, including the distribution procedure used as a starting point of the decision-making process.

Decision/Action

8. **Recommend** that the Secretariat continue developing an updated Harvest Strategy Policy document, noting that decisions regarding the assessment frequency and potentially a change to the reference fishing intensity need to be made. An interim harvest strategy policy may be adopted at AM100 given the current interim management procedure (i.e. annual assessment and a reference SPR=43%).

RECOMMENDATION/S

That the Commission

1) **NOTE** paper IPHC-2023-IM099-11 presenting outcomes of MSAB018 and SRB023, potential additions to the MSE Program of Work for 2023–2025, and potential edits to the Harvest Strategy Policy document.

2) **NOTE** that the SRB endorsed the 2023 operating model for use in MSE evaluations of MPs that would lead to the adoption of a harvest strategy, including assessment frequency, fishing intensity, and data monitoring.

3) **NOTE** the current priority objectives and **RECOMMEND** that the Secretariat, working with the MSAB and SRB, develop a new coastwide objective related to absolute spawning biomass or catch-rates, to either replace the current $B_{36\%}$ objective or be added as a fifth priority objective. The Secretariat supports developing a new objective for the Commission to decide if it is a useful objective to assist in determining an MP that optimizes yield via optimal catch-rates or opportunity.

4) **NOTE** that the following decisions are necessary for the adoption of a Harvest Strategy Policy at the 101st Annual Meeting of the IPHC (AM101), or sooner:

   a) that the harvest strategy is related to a management procedure to determine the coastwide TCEY, and that the TCEY distribution is an independent negotiation that is part of the policy;

   b) the evaluation of multi-year management procedures along with fishing intensity incorporating uncertainty in how the TCEY is distributed;

   c) additional management procedure elements to evaluate including constraints on the coastwide TCEY, methods to smooth estimation of stock distribution, and, if desired, procedures to distribute the TCEY to IPHC Regulatory Areas;

   d) the Secretariat to continue to work with the SRB and MSAB to define specific exceptional circumstances using FISS observations, biological observations, and new research;

   e) the Secretariat to continue to work with the SRB and MSAB to prescribe the actions to take when an exceptional circumstance occurs;

   f) edits and additions to the current harvest strategy policy document.

5) **NOTE** that to understand how reductions in the FISS design may affect management outcomes, the evaluation of FISS design scenarios using the MSE framework was recommended by the SRB at SRB023.

6) **NOTE** that an interim Harvest Strategy Policy document may be adopted at the 100th Annual Meeting of the IPHC (AM100) using the current interim management procedure for a coastwide TCEY along with edits and additions to the current harvest strategy policy document.

APPENDICES

Appendix A: Objectives used by the Commission for the MSE

Appendix B: The draft IPHC harvest strategy policy

Appendix C: Supplementary material

APPENDIX A
OBJECTIVES USED BY THE COMMISSION FOR THE MSE

Table A1. Primary objectives, evaluated over a simulated ten-year period, accepted by the Commission at the 7th Special Session of the Commission (SS07). Objective 1.1 is a biological sustainability (conservation) objective and objectives 2.1, 2.2, and 2.3 are fishery objectives. Priority objectives are shown in green text.

GENERAL OBJECTIVE	MEASURABLE OBJECTIVE	MEASURABLE OUTCOME	TIME-FRAME	TOLERANCE	PERFORMANCE METRIC
1.1. KEEP FEMALE SPAWNING BIOMASS ABOVE A LIMIT TO AVOID CRITICAL STOCK SIZES AND CONSERVE SPATIAL POPULATION STRUCTURE	Maintain the long-term coastwide female spawning stock biomass above a biomass limit reference point ($B_{20\%}$) at least 95% of the time	*B* < Spawning Biomass Limit (B_{Lim}) B_{Lim}=20% unfished spawning biomass	Long-term	0.05	$P(SB < SB_{Lim})$ Fail if greater than 0.05
	Maintain a defined minimum proportion of female spawning biomass in each Biological Region	$p_{SB,2} > 5\%$ $p_{SB,3} > 33\%$ $p_{SB,4} > 10\%$ $p_{SB,4B} > 2\%$	Long-term	0.05	$P(p_{SB,R} < p_{SB,R,min})$
2.1 MAINTAIN SPAWNING BIOMASS AT OR ABOVE A LEVEL THAT OPTIMIZES FISHING ACTIVITIES	Maintain the long-term coastwide female spawning stock biomass at or above a biomass reference point ($B_{36\%}$) 50% or more of the time	*B*<Spawning Biomass Reference (B_{Thresh}) B_{Thresh}=$B_{36\%}$ unfished spawning biomass	Long-term	0.50	$P(SB < SB_{Thresh})$ Fail if greater than 0.5
2.2. PROVIDE DIRECTED FISHING YIELD	Optimize average coastwide TCEY	Median coastwide TCEY	Short-term		*Median* $\overline{TCEY}$
	Optimize TCEY among Regulatory Areas	Median $TCEY_A$	Short-term		*Median* $\overline{TCEY_A}$
	Optimize the percentage of the coastwide TCEY among Regulatory Areas	Median %$TCEY_A$	Short-term		*Median* $\overline{\left(\frac{TCEY_A}{TCEY}\right)}$
	Maintain a minimum TCEY for each Regulatory Area	Minimum $TCEY_A$	Short-term		*Median Min(TCEY)*
	Maintain a percentage of the coastwide TCEY for each Regulatory Area	Minimum %$TCEY_A$	Short-term		*Median Min(%TCEY)*
2.3. LIMIT VARIABILITY IN MORTALITY LIMITS	Limit annual changes in the coastwide TCEY	Annual Change (*AC*) > 15% in any 3 years	Short-term		$P(AC_3 > 15\%)$
		Median coastwide Average Annual Variability (AAV)	Short-term		*Median AAV*
	Limit annual changes in the Regulatory Area TCEY	Annual Change (*AC*) > 15% in any 3 years	Short-term		$P(AC_3 > 15\%)$
		Average AAV by Regulatory Area (AAV_A)	Short-term		*Median* AAV_A

APPENDIX B
THE DRAFT IPHC HARVEST STRATEGY POLICY

The following is a Draft document based on an amalgamation of current IPHC practices and best practices in harvest strategy policy. It is not intended to be a definitive policy, noting that the IPHC is yet to adopt a formal harvest strategy for Pacific halibut. It is expected that over the coming years, the IPHC will develop and implement a harvest strategy, and that this policy document will then be updated accordingly.

The text below is from the draft harvest strategy policy currently available on the IPHC website (https://www.iphc.int/the-commission/harvest-strategy-policy) with potential edits highlighted in red and comments *highlighted in orange italics*.

1 Introduction

The *IPHC Harvest Strategy Policy* provides a framework for applying a science-based approach to setting harvest levels for Pacific halibut (*Hippoglossus stenolepis*) throughout the Convention Area.

It defines biological and economic objectives that apply to the development of a harvest strategy for Pacific halibut. It also identifies reference points for use in the harvest strategy to achieve the Commission's stated objectives. This policy, together with the *Protocol amending the Convention between Canada and the United States of America for the preservation of the [Pacific] halibut fishery of the northern Pacific Ocean and Bering Sea (1979)*, provides the basis to manage the risk to Pacific halibut fisheries and the Pacific halibut population.

A harvest strategy developed under this policy will take available information about the Pacific halibut resource and apply a science-based approach to setting catch levels. A harvest strategy consistent with this policy will provide all interested sectors with confidence that Pacific halibut is being managed for long-term ecological sustainability and economic viability. The implementation of a clearly specified harvest strategy will also provide the fishing industry with a more certain operating environment.

Harvest strategy defined: A harvest strategy sets out a decision framework necessary to achieve defined biological and economic objectives for Pacific halibut. A harvest strategy will outline:

- Objectives and key principles for the sustainable and profitable use of Pacific halibut.
- Reference points and other quantities used when applying the harvest strategy.
- Processes for monitoring and assessing the biological and economic conditions of Pacific halibut in relation to fishery and biological reference levels (a reference point or points).
- Pre-determined rules that control fishing activity according to the biological and economic conditions of the fishery (as defined by monitoring and/or assessment). These rules are referred to as harvest control rules or decision rules.

1.1 Scope

The IPHC Harvest Strategy Policy applies to the Pacific halibut population managed by the IPHC, and where overlap with domestic jurisdictional management exists (e.g. managed jointly by the IPHC and Contracting Party domestic agencies) the IPHC will seek to apply and encourage the adoption of this policy in negotiating and implementing joint or cooperative management arrangements.

2 Objectives and Key Principles

The objective of the IPHC Harvest Strategy Policy is the sustainable and profitable use (optimum yield) of Pacific halibut through the implementation of a harvest strategy that maintains the stock at sustainable levels while maximising economic returns (*simply maximising economic returns is unlikely to meet a future distribution agreement. I think it would be useful to move the paragraph after the bullets to here because it explains this*.) Maximising the net economic return from the fishery may not always equate with maximising the profitability of the fishery. Net economic return (NER) may consider inter-annual stability to maintain markets, and economic activity may also arise from recreational and Indigenous fishing, and the need to share the resources appropriately will be considered where necessary.

To achieve this objective the IPHC will implement a harvest strategy that pursues optimal yield and seeks to: I reordered these so they are in the priority order endorsed by the Commission, although I do not mention priority as that is more of a MSE concept.

- maintain Pacific halibut above a dynamic female spawning biomass limit where the risk to the stock is regarded as unacceptable (SB_{LIM}), at least 95% of the time;
- maintain Pacific halibut, at least 50% of the time, at or above a target ~~(fixed or~~ dynamic female spawning biomass equal to the stock size required to produce maximum coastwide net economic returns accounting for a spatial and temporal scale relevant to the fishery;
- maintain Pacific halibut above the estimated biomass in 2023 (an observed low abundance that is preferred to be avoided) at least XX% of the time. *Note that this is a potential objective that is not currently endorsed by the Commission.*
- pursue maximum coastwide economic yield (MEY) for the directed Pacific halibut fishery given agreed upon distribution of mortality limits among IPHC Regulatory Areas (IPHC) and fishery sectors (domestic).
- Limit annual changes in mortality limits.

Maximising the net economic return from the fishery may not always equate with maximising the profitability of the fishery. Net economic return may consider inter-annual stability to maintain markets, and economic activity may also arise from recreational and Indigenous fishing, and the need to share the resources appropriately will be considered where necessary. *This paragraph moved above.*

The harvest strategy will ensure fishing is conducted in a manner that does not lead to *overfishing*. *Overfishing* is defined as where the stock is subject to a level of fishing that would move it to an overfished state, or prevent it from rebuilding to a '*not overfished'* state, within a specific time-frame and probability. Where it is identified that *overfishing* of the stock is occurring, action will be taken immediately to cease that *overfishing* and action taken to recover the overfished stock to levels that will ensure long-term sustainability and productivity to maximise NER.

The harvest strategy will also ensure that if the stock is overfished, the fishery must be managed such that, with regard to fishing impacts, there is a high degree of probability the stock will recover. If the stock is assessed to be below the female spawning biomass limit reference point (i.e. *overfished*), a stock rebuilding strategy will be developed to rebuild the stock to the limit female spawning biomass level, whereby the harvest control rules would then take effect to build the stock further to target female spawning biomass levels.

Overfished: when the estimated probability that female spawning stock biomass is below the limit reference point (SB_{LIM}) is greater than 50%.

Overfishing: where the stock is subject to a level of fishing that would move it to an overfished state, or prevent it from rebuilding to a '*not overfished*' state, within a specific time-frame and probability, to be determined.

3 Applying the Harvest Strategy Policy

The following requirements provide the basis for a transparent and systematic approach for developing the harvest strategy to assist in meeting the objectives of the Harvest Strategy Policy.

3.1 Accounting for all sources of fishing mortality

The harvest strategy will account for all known sources of fishing mortality on the stock, including recreational and Indigenous fishing; and fishing under the management of another jurisdiction, such as non-directed (incidental) fishing mortality.

3.2 Establishing and applying decision rules

The harvest strategy developed under this policy will specify any required management actions or considerations for Pacific halibut, at the stock or management unit level, necessary to achieve the ecological and economic management objectives for the fishery.

3.3 Balancing rick, cost, and catch

This policy establishes a risk-based management approach, which provides for an increased level of caution when establishing control rules in association with increasing levels of uncertainty about stock status. *Currently, control rules do not change with increased uncertainty, but structural and observation uncertainty are accounted for and risk neutral (median) quantities are used in the control rules. Also note that overfished is defined above with a 50% probability.*

In the context of this policy, the risk, cost, and catch trade-off, refers to a trade-off between the amount of resources invested in data collection, analysis and management of Pacific halibut, and the level of catch (or fishing mortality) applied. Fishing mortality should always be

constrained to levels at which scientific assessment indicates Pacific halibut is not exposed to an ‘unacceptable ecological risk’ (that is the risk that stocks will fall below the limit reference point).

The management decision to be taken in this context is whether investment of more resources in data collection and analyses and/or additional management will increase the understanding of the risk to a species or stock from fishing and provide confidence in the sustainability of a higher level of fishing pressure or catch. In the absence of this additional information–and associated improved understanding of a stock–it may be necessary to reduce the fishing effort in order to manage the risk. Decisions about investment in managing risk versus the economic return of the catch taken will be transparently made, clearly documented and publicly available. *I wonder if this section could use some work to separate the concepts used for tactical decision-making and the concepts evaluated with the MSE simulations. In other words, how was risk evaluated when the HSP was developed (and evaluated further such as the effect of additional info), and how is risk used in the application for annual decision-making.*

APPENDIX C
SUPPLEMENTARY MATERIAL

The IPHC MSE Research website contains additional documents with more detailed information.

https://www.iphc.int/management/science-and-research/management-strategy-evaluation

This includes a technical description in document IPHC-2023-MSE-02.

The MSE Explorer will be updated as additional results are produced. Links to the current MSE Explorer as well as archived results are available at

http://iphcapps.westus2.cloudapp.azure.com/

Stock projections and the harvest decision table for 2024-2026

PREPARED BY: IPHC SECRETARIAT (I. STEWART AND A. HICKS; 30 OCTOBER & 20 NOVEMBER 2023)

PURPOSE

To provide the Commission with short-term (3 year) stock projections and the harvest decision table for 2024-2026.

METHODS

Short-term tactical stock projections under varying levels of mortality are conducted using the results from the 2023 stock assessment (IPHC-2023-IM099-10 Rev_1). Standard projections are based on existing Catch Sharing Agreements/Plans (CSPs) for directed commercial and recreational fisheries where they exist, as well as summaries of the 2023 and earlier directed and non-directed fisheries.

Specifically, the projected mortality levels are based on the three-year running average non-directed discard mortality[1] through the most recent year (2023), per the decision during AM096 para. 97). Subsistence harvest is assumed to be constant at the most recent year's estimates. The discard mortality for the directed commercial fisheries is assumed to occur at the same rate observed in the most recent year, and to scale up or down with the projected landings.

The harvest decision table provides a comparison of the relative risk (in times out of 100), using stock and fishery metrics (rows), against a range of coastwide alternative harvest levels for 2024 (columns). 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 relative to the approach identified in the interim management procedure. The alternatives (columns) include several levels of mortality intended for evaluation of stock and management procedure dynamics including:

- No fishing mortality (useful to evaluate the stock trend due solely to population processes)
- The mortality consistent with repeating the coastwide TCEY set for 2023 (the *status quo*)
- Bracketing alternatives 5 and 10% above and below the *status quo*

[1] The North Pacific Fishery Management Council is expected to adopt a new method for setting the Prohibited Species Catch (PSC) limit for Pacific halibut mortality in the Amendment 80 (A80) trawl sector in 2024. This approach adjusts PSC limits based on the NOAA Fisheries Eastern Bering Sea trawl survey and the modelled FISS index of abundance for IPHC Regulatory Areas 4A, 4B, and 4CDE. Although this new approach results in a 20% reduction to the A80 sector's PSC limit, the actual halibut mortality has been far below the aggregate PSC limit for all sectors in the Bering Sea and Aleutian Islands (59% in 2023). Therefore, it is unclear whether any future adjustments to the 3-year running average approach might be warranted, as actual mortality could still go up or down from the three year-average under current conditions. Recent actual non-directed discard mortality estimates in both IPHC Regulatory Areas 2A and 2B and in the Gulf of Alaska are similarly far below full regulatory limits.

- The mortality at which there is less than or equal to a 50% chance that the spawning biomass will be smaller in 2025 than in 2024 ("*1-year surplus*")
- The mortality at which there is less than or equal to a 50% chance that the spawning biomass will be smaller in 2027 than in 2024 ("*3-year surplus*")
- The mortality consistent with the current "Reference" SPR ($F_{43\%}$) level of fishing intensity
- The mortality consistent with the Maximum Economic Yield (*MEY*) proxy SPR ($F_{40\%}$) level of fishing intensity
- The mortality consistent with the Maximum Sustainable Yield (*MSY*) proxy SPR ($F_{35\%}$) level of fishing intensity
- Other levels of mortality spaced between the above alternatives to provide for continuous evaluation of the change in risk across alternative yields

For each column of the decision table, the projected total fishing mortality (including all sizes and sources), the coastwide TCEY and the associated level of estimated fishing intensity projected for 2024(median value with the 95% credible interval below) are reported.

RESULTS

Spawning biomass estimates from the 2023 stock assessment are slightly lower (11%) than those in last year's stock assessment, but the recent estimated trend is nearly flat. Updated estimates of the 2012 and 2014 year-classes (both larger than all those occurring from 2006-2011) show that these two year-classes will be highly important in the short-term stock projections as both will be maturing over the next several years. However, these two year-classes are insufficient to support short-term fishing mortality appreciably higher than the *status quo* without a decrease in spawning biomass. Risks tend to decrease slightly over the three-year period as both year-classes approach full maturity.

Projections indicate that the spawning biomass would increase relatively rapidly in the absence of any fishing mortality, with risks of stock decline over one and three years both less than 1/100 (Table 1, Figure 1). At the *status quo* coastwide TCEY (36.97 million pounds; Table 2), risks of stock decrease over one and three years are 45/100. For all harvest levels that exceed the three-year surplus (39.1 million pounds) risks of stock decline are larger than 50/100, and reaching 94/100 for the coastwide TCEY that is projected to correspond to the $F_{35\%}$ *MSY* proxy harvest level in 2024. Alternative harvest levels around the *status quo* (+/- 5 and 10%) are projected to result in levels of fishing intensity ranging from $F_{54\%}$ to $F_{48\%}$, similar to those estimated for 2020-2023. At the reference level of fishing mortality ($F_{43\%}$) the 2024 coastwide TCEY is projected to be 48.9 million pounds (50.5 million pounds of mortality including U26 non-directed discard mortality). Stock decline over the next three years is projected to be very likely (72/100) at this level of fishing intensity. The probability of a reduction in the coastwide TCEY in order to maintain a fishing intensity no greater than $F_{43\%}$ over the next three years is projected to be 52/100.

All projections result in a low probability of the relative spawning biomass dropping below the $SB_{30\%}$ threshold over the next three years (8-26/100) and an even lower probability of dropping below the $SB_{20\%}$ limit (<1-19%).

Table 1. Harvest decision table for 2024-2026 mortality limits. 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.

2024 Alternative					*Status quo -10%*	*Status quo -5%*	*Status quo*	*Status quo +5%*	3-Year Surplus	*Status quo +10%*		*Reference $F_{43\%}$*	*MEY proxy*	*MSY proxy*	
Total mortality (M lb)			0.0	21.6	34.9	36.7	38.6	40.4	40.7	42.3	46.6	50.5	56.1	67.3	
TCEY (M lb)			0.0	20.0	33.3	35.1	37.0	38.8	39.1	40.7	45.0	48.9	54.5	65.7	
2024 fishing intensity			$F_{100\%}$	$F_{68\%}$	$F_{54\%}$	$F_{52\%}$	$F_{51\%}$	$F_{50\%}$	$F_{49\%}$	$F_{48\%}$	$F_{45\%}$	$F_{43\%}$	$F_{40\%}$	$F_{35\%}$	
Fishing intensity interval			--	46-79%	32-68%	31-67%	29-65%	28-64%	28-64%	27-63%	25-60%	23-58%	20-55%	17-50%	
Stock Trend (spawning biomass)	in 2024	is less than 2023	<1	7	35	40	45	50	51	55	66	74	85	96	a
		is 5% less than 2023	<1	<1	7	9	12	15	15	18	26	33	44	69	b
	in 2025	is less than 2023	<1	8	35	40	45	50	50	54	65	74	84	95	c
		is 5% less than 2023	<1	2	17	20	24	28	29	32	42	51	64	85	d
	in 2026	is less than 2023	<1	10	36	40	45	49	50	54	64	72	82	94	e
		is 5% less than 2023	<1	4	23	26	30	34	35	39	49	57	69	87	f
Stock Status (Spawning biomass)	in 2024	is less than 30%	25	25	25	25	25	25	25	25	26	26	26	26	g
		is less than 20%	<1	<1	1	2	2	2	2	2	3	4	5	9	h
	in 2025	is less than 30%	21	24	25	25	25	25	25	25	25	25	26	26	i
		is less than 20%	<1	<1	2	2	2	3	3	3	5	7	9	16	j
	in 2026	is less than 30%	8	21	24	25	25	25	25	25	25	25	26	26	k
		is less than 20%	<1	<1	2	2	3	3	3	4	6	8	12	19	l
Fishery Trend (TCEY)	in 2024	is less than 2023	0	<1	25	27	28	30	31	33	41	50	63	85	m
		is 10% less than 2023	0	<1	23	25	26	27	27	29	34	41	52	75	n
	in 2025	is less than 2023	0	1	25	26	28	30	31	33	42	51	65	87	o
		is 10% less than 2023	0	<1	22	24	26	27	27	29	35	42	55	78	p
	in 2026	is less than 2023	0	1	24	26	28	30	31	33	42	52	67	88	q
		is 10% less than 2023	0	<1	21	23	25	27	27	29	35	43	57	81	r
Fishery Status (Fishing intensity)	in 2023	is above $F_{43\%}$	0	<1	26	27	29	31	32	34	42	50	62	82	s

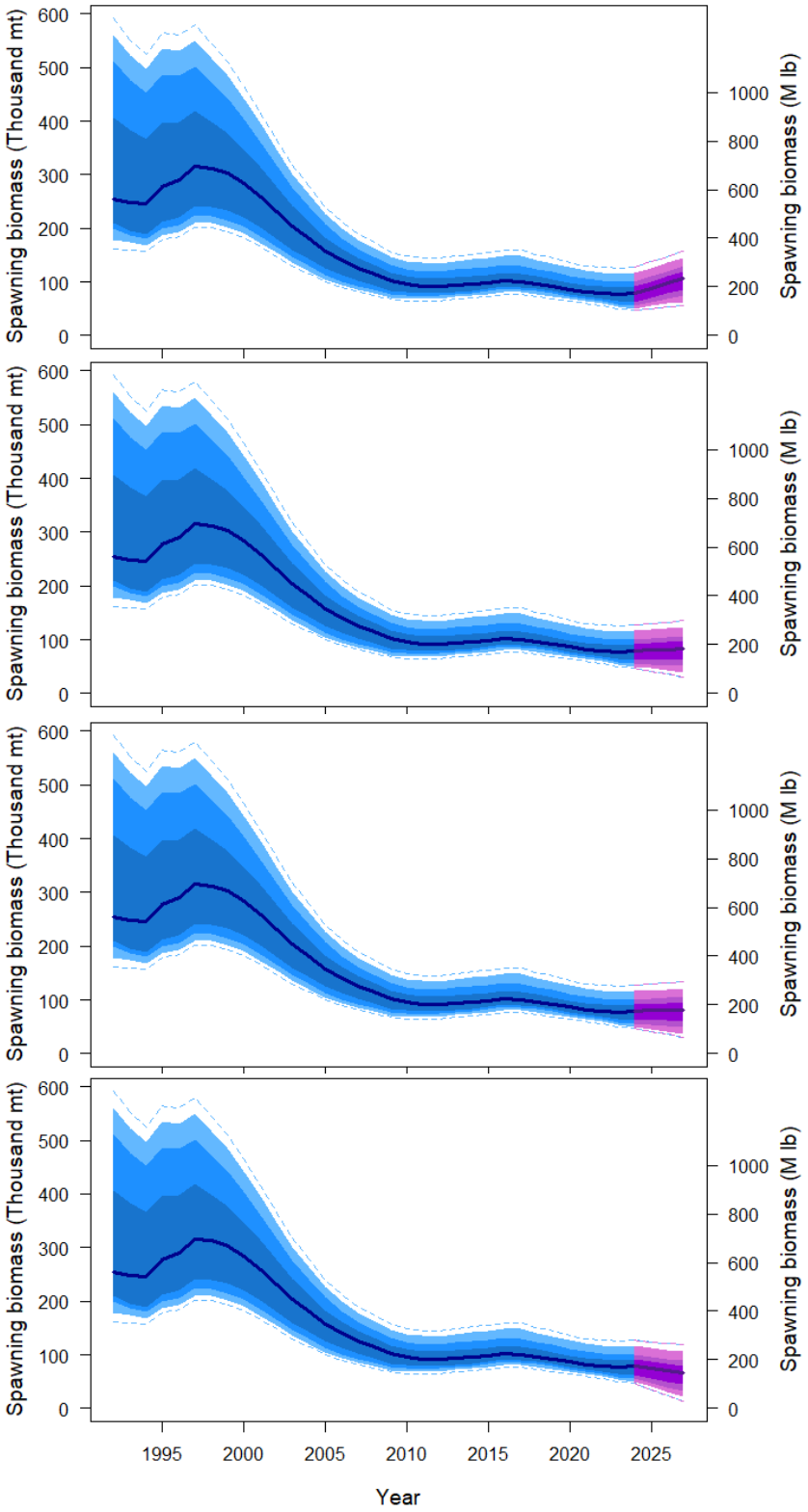


Figure 1. Three-year projections of stock trend under alternative levels of mortality: no fishing mortality (upper panel), the *status quo* coastwide TCEY set in 2023 (36.97 million pounds; second panel), the 3-year surplus (39.1 million pounds; third panel), and the TCEY projected for the $F_{43\%}$ reference level of fishing intensity (48.9 million pounds, fourth panel) and the TCEY projected for the $F_{35\%}$ MSY proxy level of fishing intensity (65.7 million pounds, bottom panel).

Table 2. Recent adopted TCEYs by IPHC Regulatory Area and coastwide (M lbs net).

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
2018	1.32	7.10	6.34	12.54	3.27	1.74	1.28	3.62	37.21
2019	1.65	6.83	6.34	13.50	2.90	1.94	1.45	4.00	38.61
2020	1.65	6.83	5.85	12.20	3.12	1.75	1.31	3.90	36.60
2021	1.65	7.00	5.80	14.00	3.12	2.05	1.40	3.98	39.00
2022	1.65	7.56	5.91	14.55	3.90	2.10	1.45	4.10	41.22
2023	1.65	6.78	5.85	12.08	3.67	1.73	1.36	3.85	36.97

RISKS NOT INCLUDED IN THE HARVEST DECISION TABLE

The IPHC's current management procedure uses threshold and limit reference points in relative spawning biomass (current estimate compared to the spawning biomass estimated to have occurred in that year in the absence of any fishing mortality). This calculation measures the effects of fishing on the stock. Other factors affecting the spawning biomass (i.e., trends in recruitment and weight-at-age) have resulted in the absolute spawning biomass in 2023 estimated to be lower than at any time in the last 31 years. Although this does not represent a conservation concern at this time, low stock size results in additional risks to the IPHC's Fishery Independent Setline Survey (FISS) design objective of revenue neutrality and to fishery efficiency and economic viability. Further, the modelled FISS index in 2023 suggests that the stock distribution now shows the lowest proportion of the coastwide biomass in Biological Region 3 observed in the modern time-period (1992+). Finally, increased environmental/climate-related variability in the marine ecosystems comprising the Pacific halibut species range in Convention waters lead to little expectation that historical productivity patterns may be relevant for future planning. Specifically, it is unclear whether long-term productivity levels are likely to occur under continued climate change, or whether increases or decreases may be likely for critical life-history stages of Pacific halibut.

ADDITIONAL INFORMATION

An updated document for AM100 will include revisions based on end-of-year 2023 non-directed discard mortality estimates that affect the scale and distribution of projected 2024 mortality. This information will be available in early January.

Detailed stock assessment (IPHC-2024-SA-01) and data overview (IPHC-2024-SA-02) documents will be published directly to the stock assessment page on the IPHC's website.

RECOMMENDATION/S

That the Commission:

a) **NOTE** paper IPHC-2023-IM099-12 Rev_1, which provides a summary of projections and the harvest decision table for 2024-2026.
b) **REQUEST** any additional harvest decision table alternatives for evaluation at AM100.
c) **REQUEST** any detailed mortality projections[2] for 2024 (by IPHC Regulatory Area and fishery sector) for evaluation at AM100.

REFERENCES

IPHC. 2020. Report of the 96th Session of the IPHC Annual Meeting (AM096). Anchorage, Alaska, USA, 3-7 February 2020. IPHC-2020-AM096-R. 51 p.

[2] Detailed projections will include revised non-directed discard estimates through the end of 2023, available in early January 2024.

2024 and 2025-28 FISS design evaluation

Part 1: Potential 2024-26 designs

PREPARED BY: IPHC SECRETARIAT (R. WEBSTER, I. STEWART, K. UALESI, D. WILSON; 31 OCTOBER, 17 NOVEMBER 2023)

PURPOSE

To present potential design options for the IPHC's Fishery-Independent Setline Survey (FISS) for the 2024-26 period, and a cost evaluation of the 2024 designs proposed.

BACKGROUND

The IPHC's Fishery-Independent Setline Survey (FISS) 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 IPHC Regulatory Area, computed as the average of WPUE of all Pacific halibut and for 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 for use in the stock assessment models. Annual FISS designs are developed by selecting a subset of stations for sampling from the full 1890-station FISS footprint (Figure 1.1).

Further background information on FISS history and space-time modelling is in Appendix A.

FISS DESIGN OBJECTIVES (Table 1.1)

Primary objective: *To sample Pacific halibut for stock assessment and stock distribution estimation.*

The primary purpose of the annual FISS is to sample Pacific halibut to provide data for the stock assessment (abundance indices, biological data) and estimates of stock distribution for use in the IPHC's management procedure. The priority of the current rationalized FISS is therefore to maintain or enhance data quality (precision and bias) by establishing baseline sampling requirements in terms of station count, station distribution and skates per station.

Secondary objective: *Long-term revenue neutrality.*

The FISS is intended to have long-term revenue neutrality, and therefore any implemented design must consider both logistical and cost considerations.

Tertiary objective: *Minimize removals and assist others where feasible on a cost-recovery basis.*

Consideration is also given to the total expected FISS removals (impact on the stock), data collection assistance for other agencies, and IPHC policies.

Table 1.1 Prioritization of FISS objectives and corresponding design layers.

Priority	Objective	Design Layer
Primary	Sample Pacific halibut for stock assessment and stock distribution estimation	Minimum sampling requirements in terms of: • Station distribution • Station count • Skates per station
Secondary	Long term revenue neutrality	Logistics and cost: operational feasibility and cost/revenue neutrality
Tertiary	Minimize removals and assist others where feasible on a cost-recovery basis.	Removals: minimize impact on the stock while meeting primary priority Assist: assist others to collect data on a cost-recovery basis IPHC policies: ad-hoc decisions of the Commission regarding the FISS design

Annual design review, endorsement, and finalisation process

Since completion of the FISS expansions, a review process has been developed for annual FISS designs created according to the above objectives:

- Step 1: The Secretariat presents preliminary design options based on the primary objective (Table 1.1) to the SRB for three subsequent years at the June meeting based on analysis of prior years' data. Commencing in 2024, this will include prior year fiscal details (revenue) and current year vessel contract cost updates;
- Step 2: Design options for the following year that account for both primary and secondary objectives (Table 1.1) are reviewed by Commissioners at the September work meeting, recognising that revenue and cost data from the current year's FISS are still preliminary at this time;
- Step 3: At their September meeting, the SRB reviews design options accounting for both primary and secondary objectives (Table 1.1) for comment and advice to the Commission (recommendation);
- Step 4: Designs are further modified to account for updates based on secondary and tertiary objectives before being finalized during the Interim and Annual meetings and the period prior to implementation:
    - Presentation of FISS designs for 'endorsement' by the Commission occurs at the November Interim Meeting;
    - Ad-hoc modifications to the design for the current year (due to unforeseen issues arising) are possible at the Annual Meeting of the Commission;
    - The endorsed design for current year is then modified (if necessary) to account for any additional tertiary objectives or revision to inputs into evaluation of secondary objectives prior (i.e. updated cost estimates) prior to summer implementation (February-April).

Consultation with industry and stakeholders occurs throughout the FISS planning process, at the Research Advisory Board meeting (late November) and particularly in finalizing design details as part of the FISS charter bid process, when stations can be added and other

adjustments made to provide for improved logistical efficiency. We also note the opportunities for stakeholder input during public meetings (Interim and Annual Meetings).

Note that while the review process examines designs for the next three years, revisions to designs for the second and third years are expected during subsequent review periods as additional data are collected. Having design proposals available for three years instead of the next year only assists the Secretariat with medium-term planning of the FISS, and allows reviewers (SRB, Commissioners) and stakeholders to see more clearly the planning process for sampling the entire FISS footprint over multiple years.

POTENTIAL DESIGNS FOR 2024-26

IPHC Secretariat began the design process in early 2023 with the development of design options based on the Primary Objective (Table 1.1) for 2024-26 (Figures 1.2 to 1.4). These designs were presented to the Scientific Review board at their June meeting (IPHC-2023-SRB022-06).

During the operation of the 2023 FISS, it became apparent that low prices for Pacific halibut and lower than expected catches in some charter regions were likely to result in a substantial net operating loss for the FISS in 2023. Preliminary estimates of net revenue for the 2024 design in Figure 2 projected a net operating loss of over $3 million. Optimizing the design for revenue by adding stations in revenue-positive charter regions and adjusting the number of skates still led to a projected loss of almost $3 million. For this reason, neither version of the design was considered feasible (IPHC-2023-SRB023-09).

Projected revenue-positive design for 2024

The IPHC Secretariat developed a series of designs that improved revenue and reduced cost to different degrees. These were presented to the SRB in September 2023 (IPHC-2023-SRB023-09) as well as at the Commissioner Work Meeting that same month. Included in these potential designs was a design that was projected to be slightly revenue-positive. This design has since been revised based on improved cost projections, and includes sampling only in IPHC Regulatory Areas 2B, 2C and one charter region in IPHC Regulatory 3A (Figure 1.5).

In order to achieve a revenue-positive design, several aspects of the standard FISS procedures were removed:

- No oceanographic monitoring will take place;
- NOAA Fisheries trawl surveys are not staffed by IPHC;
- All FISS training will be conducted virtually;
- Reduce field staff on each vessel from two to one in two charter regions; only basic biological information (length, weight and sex) would be collected.

Additional changes were required to the standard FISS design in sampled areas:

- Allow for “Vessel captain stations”, in which vessel captains can choose to fish up to one third of their sets at a location that is optimal in terms of catch rates or revenue. It is assumed pending further evaluation these stations will achieve 120% of the average catch rate of the usual fixed-station design stations

Further, the following assumptions regarding FISS bait were made:

- That the price of chum salmon is projected to be US$2.00/lb in 2024 and pink salmon US$1.30/lb.

With these modifications and assumptions, this design (Figure 1.5) has **a projected net operating profit of $3,000**.

Base HQ staff costs (incurred even if no survey is conducted) are projected to be US$490,000 for 2024. These costs are fully offset, along with all variable costs, in the revised revenue-positive design (Table 1.2 and Figure 1.5).

Variable FISS costs

Due to concerns about the implications of the reduced sampling in the revenue-positive design (see below), IPHC Secretariat also projected costs of additional sampling and monitoring effort should supplementary funding become available. These are presented as a series of modular options that can be added to the revenue positive design (Table 1.2). All modular options (Table 1.2, options 2-6) were designed to include an entire charter region or comprise at least 60 stations to increase the likelihood of obtaining one or more competitive bids.

Individual charter regions were added to the revenue neutral design one at a time, selecting the charter region that was closest to net revenue neutrality for each IPHC Regulatory Area (Table 1.2). The exceptions to this were in IPHC Regulatory Area 2A, where 60 stations were selected to encompass higher catch-rate areas in both Washington and Oregon, and in IPHC Regulatory Areas 4A/4B where 60 adjacent stations were clustered around the boundary between these areas. The choice of 60 stations was motivated by the lack of bids for the 32 stations proposed in 2023 and intended to provide sufficient work to make the travel required for most vessels to reach 4A/4B worthwhile. No charter regions were evaluated for IPHC Regulatory Area 4CDE as the NOAA Fisheries trawl surveys are anticipated to provide a solid baseline of Pacific halibut density information even in the absence of direct FISS sampling.

The net cost projected for each of these additional charter regions ranged from $47,000 for IPHC Regulatory Area 3A (Shelikof), to $245,000 for the 60 stations IPHC Regulatory Areas 4A/4B.

Staffing of the NOAA Fisheries trawl survey allows for much more extensive biological sampling (age, length, and weight) of Pacific halibut than is possible otherwise, and also provides a platform for wire-tagging of juvenile halibut in this area to provide long-term monitoring of migratory pathways. These data are used in the annual stock assessment to inform weight-at-age for young Pacific halibut (up to approximately age 6) that are not captured in large numbers by the FISS. As there is not considerable variability in weight-at-age, missing a year of this sampling (as was the case when the NOAA Fisheries trawl survey was cancelled in 2020) would not be a critical problem for subsequent analyses.

Oceanographic monitoring during FISS operations provides a valuable long-term monitoring data set that is used by both IPHC and external fisheries scientists. In some years (e.g. 2017) it has provided valuable supporting information for better interpreting anomalous catch-rates due to hypoxic events (observed periodically, primarily off the coasts of Oregon and Washington). Missing a single year of this time series, although unfortunate for long-term monitoring, would not be problematic for standard stock assessment and management supporting analyses provided for the Commission unless unexpected oceanographic conditions were encountered.

Table 1.2. Comparison of design alternative costs for the 2024 FISS; see text for additional details on each design. Each of options 2-8 can be added in any combination by summing the additional costs for each option selected.

Option	Design	IPHC Regulatory Areas sampled (charter regions)	Additional net cost
1	Revenue neutral with efficiencies	2B (2), 2C (3), 3A (1)	--
2	Add additional 3A to Option 1	2B (2), 2C (3), 3A (**2**)	($47,000)
3	Add 3B to Option 1	2B (2), 2C (3), 3A (1), **3B (1)**	($62,000)
4	Add 4A/4B to Option 1	2B (2), 2C (3), 3A (1), **4A+4B (1)**	($245,000)
5	Add 2A to Option 1	2B (2), 2C (3), 3A (1), **2A (1)**	($134,000)
6	Add additional 2B to Option 1	2B (**3**), 2C (3), 3A (1)	($68,000)
7	Add oceanographic monitoring to Option 1	2B (2), 2C (3), 3A (1)	($55,000)[1]
8	Add trawl survey staffing to Option 1	2B (2), 2C (3), 3A (1)	($120,000)

[1] The estimated expense for adding oceanographic monitoring would scale according to the number of regions included in the design. It is projected that with each additional region, expenses would increase by approximately $10,000.

Implications of FISS reductions in 2024

Proceeding with the reduced sampling in the revenue positive design (Figure 1.5) would have implications for data quality that affect estimates of stock trends and distribution together with biological inputs into the stock assessment.

The lack of sampling in IPHC Regulatory Areas 2A, 4A and 4B will lead to further increases in uncertainty above those projected for 2023 (first column, Table A.1), and we anticipate CVs between 20 and 35% for these areas. With no sampling in IPHC Regulatory Areas 3A and 3B, uncertainty in estimates from these areas will also increase, and we expect a CV outside the target range of ≤15% for IPHC Regulatory Area 3B (given that with reduced sampling in 2022, the CV was 14%). With a NOAA Fisheries trawl survey expected to take place in the Bering Sea in 2024, the CV for IPHC Regulatory Area 4CDE is not expected to increase outside the target range. Increased uncertainty in most areas will carry through into coastwide estimates, although at present we anticipate the coastwide WPUE and NPUE indices to have CVs that remain in the target range of ≤10%. Estimates of stock distribution will also have higher levels of uncertainty, and the lack of data from most of the range of Pacific halibut also increases the potential for bias in estimates of overall stock trends from 2023 to 2024.

This very limited spatial design will result in much less information available for the annual stock assessment and management supporting calculations such as stock distribution. The increased uncertainty in the index of abundance is likely to cause the assessment model to rely much more heavily on the commercial fishery catch-per-unit-effort index. Given current variability and uncertainty in the magnitude of younger year classes (2012 and younger), missing biological information in the core of the stock distribution (Biological Region 3) makes it unlikely that the stock assessment will detect a major change in year class abundance, either up or down. Although the basic stock assessment methods can remain unchanged, a much greater portion

of the actual uncertainty in stock trend and demographics will not be able to be quantified due to missing FISS data from such a large fraction of the Pacific halibut stock's geographic range.

RECOMMENDATIONS

That the Commission:

1) **NOTE** paper IPHC-2023-IM099-13 Rev_1, (Part 1) that presents potential FISS design options for 2024-26 and preliminary cost evaluations of 2024 potential designs;
2) **ENDORSE proceeding with the revenue neutral design for 2024 proposed here,** in order to cover all fixed headquarters costs, and to provide data for basic trend estimation and biological data for use in the 2024 stock assessment. Specifically, the Secretariat recommends fishing two charter regions in IPHC Regulatory Area 2B, three regions in IPHC Regulatory Area 2C and one region in IPHC Regulatory Area 3A (Option 1, Table 1.2; Figure 1.5), with added efficiencies as described above.

In addition, a minimum of two extensions are also recommended, dependent on the Commission's weighting of the corresponding objectives:

1) Further **prioritizing the collection of biological data** representing all four biological regions and reducing the potential for bias in trend estimates: Add modular options 4 and 3, which would provide minimal sampling in 4A/4B and in 3B (supplementing the single charter region included for 3A). This extension would require supplemental funding of US$307,000.
2) Further **prioritizing reliable estimates of stock distribution** for all IPHC Regulatory Areas, as well as biological data: Add modular options 2-5, which would allow for directly informed estimates of trend, demographics and stock distribution for all IPHC Regulatory Areas in 2024. This extension would require supplemental funding of US$488,000.

Part 2: Evaluation of block-based designs for 2024-28

PURPOSE

To provide the Commission with information and advice regarding potential Fishery-Independent Setline Survey (FISS) designs based on using blocks of stations with different target ranges of precision.

BACKGROUND

At the 2023 Work Meeting (WM2023), the Commission provided the following directive to the IPHC Secretariat relevant to this paper:

*The Commission **DIRECTED** the Secretariat to provide a five-year (2025-29) FISS design options paper, that includes the following elements for initial consideration at IM099:*

a. *Surveying using a 'block' design (rather than randomized within large areas) that would facilitate a rotational FISS of charter regions/Regulatory Areas, with some areas to be sampled more intensively but less frequently than in the past (perhaps realizing efficiencies that could decrease overall costs);*
b. *FISS that alternates year-on, year-off – analysis and implications;*
c. *Options that would maintain CVs at 15% and also other less conservative levels while maintaining the scientific integrity of the FISS;*
d. *Provide advice on the risks and bias that may result from the design described above, and what are considered tolerable levels of bias and risk, both by the Secretariat and other surveys.*

The coefficient of variation (CVs) is a relative measure of variability, calculated as the standard deviation of an estimate divided by the mean. In recent years, the IPHC has used a target range of CVs of ≤15% by IPHC Regulatory Area. To project CVs for mean O32 weight per unit effort (WPUE) for potential future designs, space-time models are fitted to observed survey data augmented with data generated from terminal year of the most recent space-time model run (in this case from 2022 as 2023 modelling is still in progress at the time of writing). As variability can change over time, projections become less reliable the further into the future we try to project. For this reason, we have projected CVs for potential designs for the three-year period 2024-26 period (2024-27 for alternating year designs) and inferred likely CVs for designs in subsequent years based on these results.

BLOCK DESIGNS

In 2019, IPHC Secretariat proposed a rotational block design (using FISS charter regions as blocks) for the following year for the core IPHC Regulatory Areas (2B, 2C, 3A and 3B) (IPHC-2019-IM095-07_Rev_1, Figure 4) to complement the similar subarea design proposed and adopted for areas at the ends of the stock (2A, 4A and 4B). The design recognized that complete spatial coverage was not necessary every year in order to maintain precision and bias goals, particularly given the ability of the space-time model to make predictions in unsampled regions that are informed by data collected nearby in time (especially the previous year) and space (that is, adjacent sampled regions). Each core area omitted 1-2 charter regions from sampling each year, with the intention being to rotate the unsampled regions over time. The block design was

not adopted, and a randomized design (with random selection of over 50% of stations from the full grid) was selected to maintain comprehensive spatial coverage in the core areas.

Block designs are potentially more efficient from an operational perspective than a randomized design, as they involve less running time between stations, possibly leading to cost reductions on a per station basis. The efficiency benefits are an important consideration in bringing forward the option of using block designs for the FISS in coming years.

As in 2019, the designs considered here will use IPHC FISS charter regions for the core areas (2B-3B) and efficient sub-areas for the ends of the range (2A, 4A-4CDE).

BASE BLOCK DESIGNS

We begin with a base block design which reduces sampling in the core areas of the stock to two charter regions per year for IPHC Regulatory Areas 2B, 2C and 3B (out of five, three and five regions respectively) and four charter regions in IPHC Regulatory Area 3A (out of eight regions). This represents somewhat fewer stations than in recent randomized designs, and the reduced annual spatial coverage is expected to lead to higher CVs than in recent years. Blocks in the core areas are rotated each year so that all blocks are sampled at least once over a three-year period. The repeating design makes it easy to infer approximate CVs by area in subsequent years as they will be similar to CVs in the terminal year once a full rotation has been completed.

A subarea design is maintained at the ends of the stock, but with less frequent sampling than previously proposed to allow CVs to exceed the ≤15% target range. All potential designs maintain some FISS sampling in each Biological Region in each year to provide at least some biological data for the annual stock assessment from each region.

The base block designs for 2024-26 are shown in Figures 2.1 to 2.3. Projected CVs for the terminal year (2026) of these designs are presented in Table 2.1 (the terminal year typically has the greatest CVs but is also most important for informing management decisions). Additional potential designs for 2027-28 are presented in Figures 2.4 and 2.5 to complete the five-year design period.

For the core areas, projected CVs were generally higher than in recent years (Table 2.1), but remain below 15% for IPHC Regulatory Areas 2B, 2C and 3A while reaching 16% for IPHC Regulatory Area 3B. Even with reduced spatial coverage, sampling all stations in the core over a three-year period is projected to provide sufficient information to the space-time model to ensure precise estimates of the O32 WPUE index. At the ends of the stock, CVs for IPHC Regulatory Areas 2A, 4A and 4B were projected to be between 15 and 20%, similar to recent years in which not all planned sampling was able to be undertaken. Biological Region CVs are projected to be 5-9% (with 4B at 16%), with a 5% CV for the coastwide mean.

REDUCED BLOCK DESIGNS

In order to allow for CVs closer to 20-25% by IPHC Regulatory Area, sampling would need to be reduced further from the base block designs described above. In particular, fewer charter regions would be sampled annually in core areas, or some IPHC Regulatory Areas would go unsampled each year (see below). Such sampling reductions would further reduce the representativeness of the data, increasing the likelihood that estimates of trends and stock distribution would be biased. Some Biological Regions would have no biological data in some years, making it more difficult for the assessment to detect a major change in year class abundance, either up or down.

To see what such designs might look like, Figures 2.6 to 2.8 show maps of designs in which either one (2B, 2C and 3B) or two (3A) charter regions are fished annually, meaning that a full

rotation requires at least five years to complete. For simplicity, sampling in other IPHC Regulatory Areas was unchanged from the base block design.

Projected CVs for the reduced block design are given in Table 2.1. For the core areas, CVs are projected to be 2-3 times what has been typical in recent years, and higher than projected for the base block design (with a slight exception for 3B). Biological Region CVs are projected to be 8-10% (except 4B at 17%), with a 5% CV for the coastwide mean.

Table 2.1. Projected CVs by IPHC Regulatory Area for mean O32 WPUE under alternative block designs discussed in this report, compared to CVs from recent implemented designs.

IPHC Regulatory Area	2019-23 CV (%)¥		Projected CV (%)		
	Range	Median	Base block design 2026	Reduced block design 2026	Alternating year design 2027
2A	13-22	18	19	19	31
2B	6-7	6	7	14	19
2C	4-6	5	6	10	16
3A	4-8	4	7	11	18
3B	7-14	8	16	15	21
4A	14-20	18	18	19	21
4B	16-26	19	16	17	26
4CDE	10-12	10	10‡	10‡	10

¥ CV in terminal year of time series.

‡ Inferred from other design evaluations.

ALTERNATING YEAR FISS DESIGNS

In alternating year designs, FISS sampling would occur only every other year, for example in 2024 and 2026, but not 2025 or 2027. For this exercise we took the base block designs in Figures 2.1 to 2.3 and assumed that they would be fished over 2024-28, with no sampling in odd years (including 2029). CVs were projected for the 2024-2027 period. CVs will be highest in unsampled terminal years, and therefore the projections for 2027 are shown in Table 2.1. Projected CVs are all greater than 15% except for IPHC Regulatory 4CDE which is assumed to have annual trawl sampling data. CVs for IPHC Regulatory Areas 2A and 4B and projected to exceed 25% in unsampled years. Biological Region CVs are projected to be 10-14% (except 4B at 26%), with an 8% CV for the coastwide mean.

It is important to note that fixed HQ staff costs of around $480,000 are incurred annually regardless of the actual survey design. This means that in unsampled years in an alternating year design such costs would be incurred without any FISS revenue to offset those costs. This

implies that revenue would need to be greater in years when sampling does occur to meet the FISS objective of long-term revenue neutrality (Table 1.1).

TOLERABLE LEVELS OF RISK AND BIAS

The base block design maintains good spatial coverage each year and complete spatial coverage in the core of the stock over a three-year period. While CVs are generally higher than recent values, estimates of O32 WPUE indices remain precise in the core and have acceptable precision elsewhere. Estimates of stock distribution computed from these indices would be expected to have similar levels of precision, sufficient for management decision making. Biological data used as input to the IPHC stock assessment will come from throughout the stock over a relatively short time frame, reducing the likelihood that the relative strength of important cohorts is estimated imprecisely or inaccurately. The indices of abundance by Biological Region and coastwide that are used in the stock assessment would continue to provide a reliable estimate of stock trend.

The reduced block design results in less precise estimates of density indices and stock distribution and provides poor spatial coverage in the core of the stock over short time periods. Such a design will lead to a high risk of bias in estimates of stock trends and distribution and a poorer understanding of changes in year class abundance from the stock assessment due to the reduced biological sampling.

In unsampled years, the alternating year design provides the least reliable estimates of the designs considered here, with no information on stock changes from the previous year and no biological data for the annual stock assessment. Thus, risk of bias in unsampled years in expected to be higher than the two alternative block designs which maintain some annual sampling in each Biological Region.

The ‘global average’ research survey CVs has been estimated to be approximately ~20%; however, this value includes estimated observation and process error (based on lack of fit in the stock assessments), and so is larger than the survey-only observation CVs projected in this report (Francis et al. 2003). In NOAA Fisheries trawl survey results in the Bering Sea (roughly analogous to one Biological Region for Pacific halibut), commercially important species showed a range of average annual model-based CVs, including: Pacific cod (5%), Walleye pollock (7%), Northern rock sole (6%), and yellowfin sole (5%) over 1982-2019 (DeFilippo et al. 2023). These values are comparable to the projected 5-9% CVs for IPHC Biological Regions that would be expected from the base block design (with the exception of Biological Region 4B), but lower than corresponding values for the reduced block and alternating year designs.

DISCUSSION

The IPHC Secretariat staff recommends using block designs for all future planning as a viable alternative to the randomised sampling currently in use in the core of stock. Block designs will increase efficiency by reducing vessel travel time among stations. Sampling effort should not be lower than the levels presented in the base block design in Figures 2.1 to 2.5. We note the general need for a base level of funding to ensure a minimally adequate scientific design and therefore do not recommend alternating year surveys, instead deploying at a minimum the revenue-neutral design to cover fixed costs and maintain staff. There may be additional data quality costs to an alternating year design due to higher anticipated turnover of staff and

therefore reduced availability of highly experienced staff capable of training new samplers in the field.

Revenue projections beyond one year are highly speculative. Therefore, base block design cost projections have been made as if each design were to be applied in 2024. Even modest changes in costs, price, or catch-rates can have a large effect on the net revenue of future FISS activity, as observed in the rapid changes from 2021 to 2023. The base block designs reported here reduce sampling in some high-cost areas, but also in some revenue positive areas. Therefore, **the Secretariat recommends that consistent supplementary funding of approximately $1.5 million per year would be needed to allow implementation of the base block designs reported here over 2024-2026.** We note that the revenue-positive design discussed in Part 1 of this report (Figure 1.5) is also a block design, but one that is not projected to require supplementary funding (allowing for the added efficiencies) in 2024.

The Secretariat notes that planned changes to the design and gear used for the NOAA Fisheries trawl survey in the Bering Sea will likely require additional calibration studies with the FISS, potentially beginning in 2026.

RECOMMENDATIONS

That the Commission:

1) **NOTE** paper IPHC-2023-IM099-13 Rev_1, (Part 2) that presents evaluation and discussion of potential block designs for the FISS;
2) **ENDORSE** the use of the base block design (Figures 2.1 to 2.5) or a block design with similar sampling effort as an alternative to FISS designs based on random sampling in the core of the stock;
3) **ENDORSE** maintaining sufficient FISS sampling to ensure a maximum annual CV of 25% in each IPHC Regulatory Area, decreasing to 15% as financial considerations allow, and including FISS biological sampling in all Biological Regions each year;
4) **NOTE** that stock assessment and MSE simulation analyses will be conducted in 2024 to further explore the effect on annual tactical and strategic decision-making of reduced FISS designs in the future. The Secretariat also requests clarification on whether the Commission has interest in supporting FISS designs that would provide IPHC Regulatory Area CVs comparable to the historical target (≤15%) to inform potential management procedures that rely on annual stock distribution estimates.

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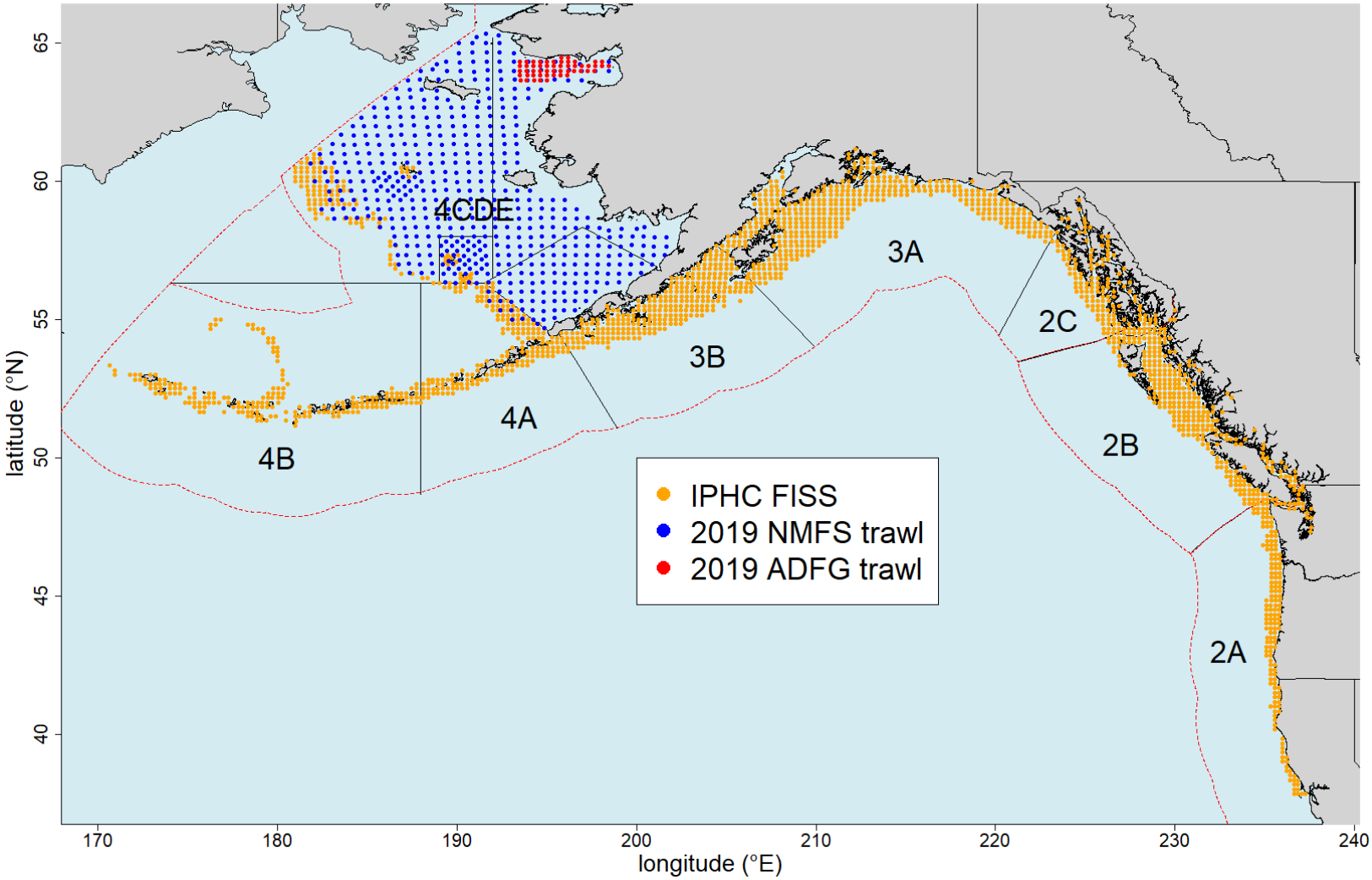


Figure 1.1. Map of the full 1890 station FISS design, with orange circles representing stations available for inclusion in annual sampling designs, and other colours representing trawl stations from 2019 NOAA and ADFG surveys used to provide complementary data for Bering Sea modelling.

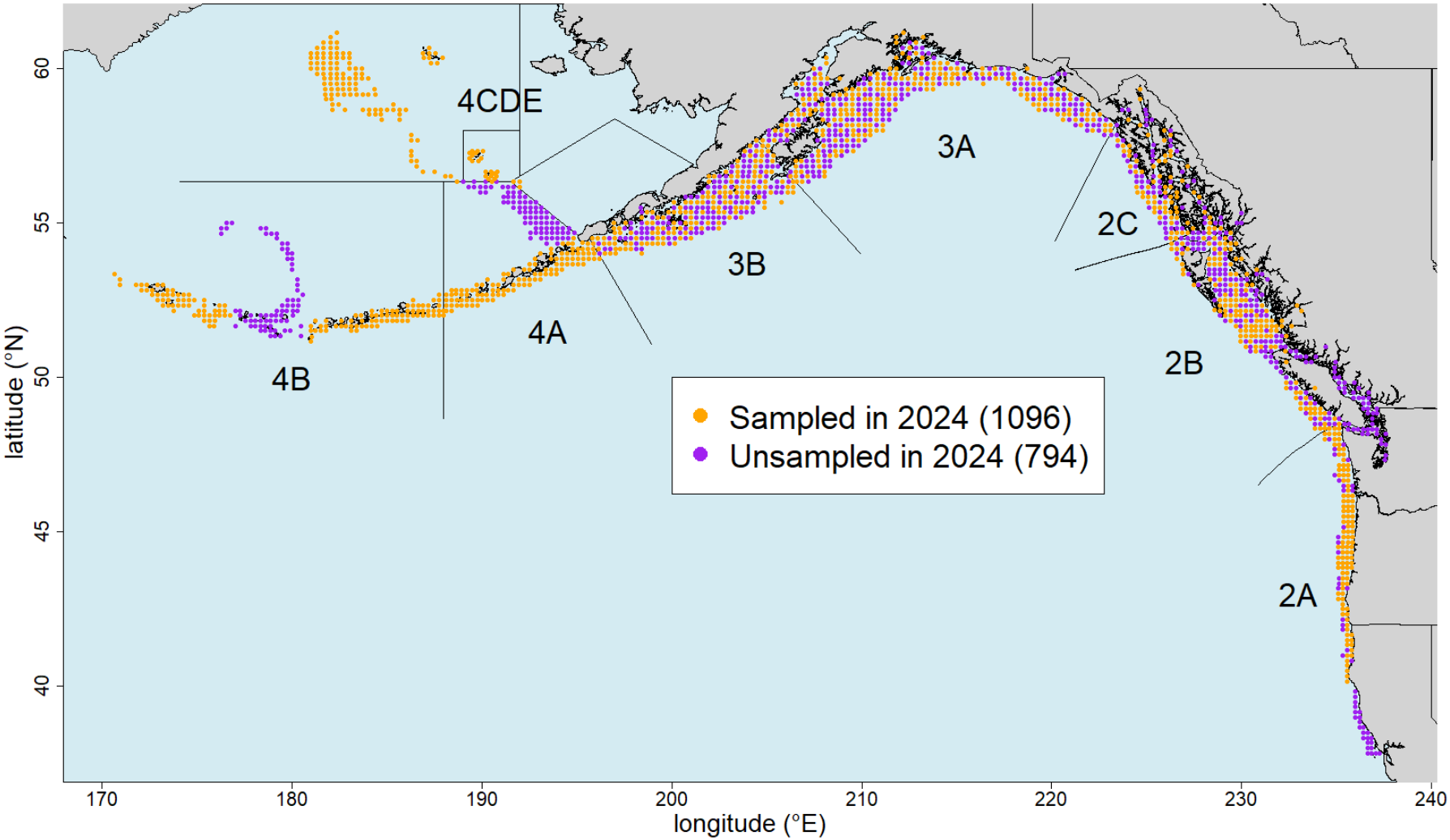


Figure 1.2. Potential FISS Design 1 in 2024 (orange circles) based on prioritization of the Primary Objective in Table 1. The design relies on randomized sampling in 2B-3B, and a subarea design elsewhere. Purple circles are optional for meeting data quality criteria.

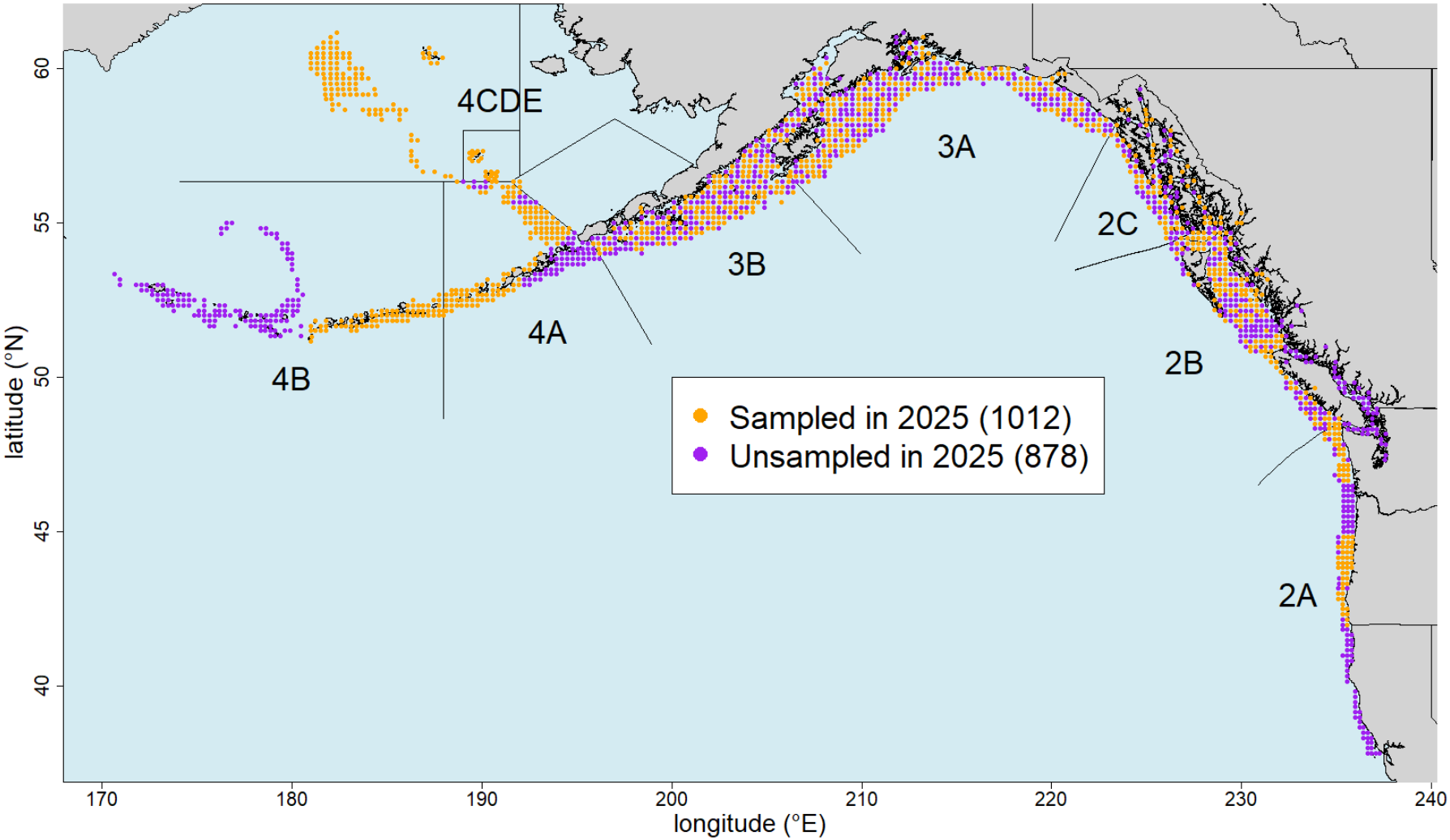


Figure 1.3. Potential FISS design in 2025 (orange circles) based on prioritization of the Primary Objective in Table 1. The design relies on randomized sampling in 2B-3B, and a subarea design elsewhere. Purple circles are optional for meeting data quality criteria.

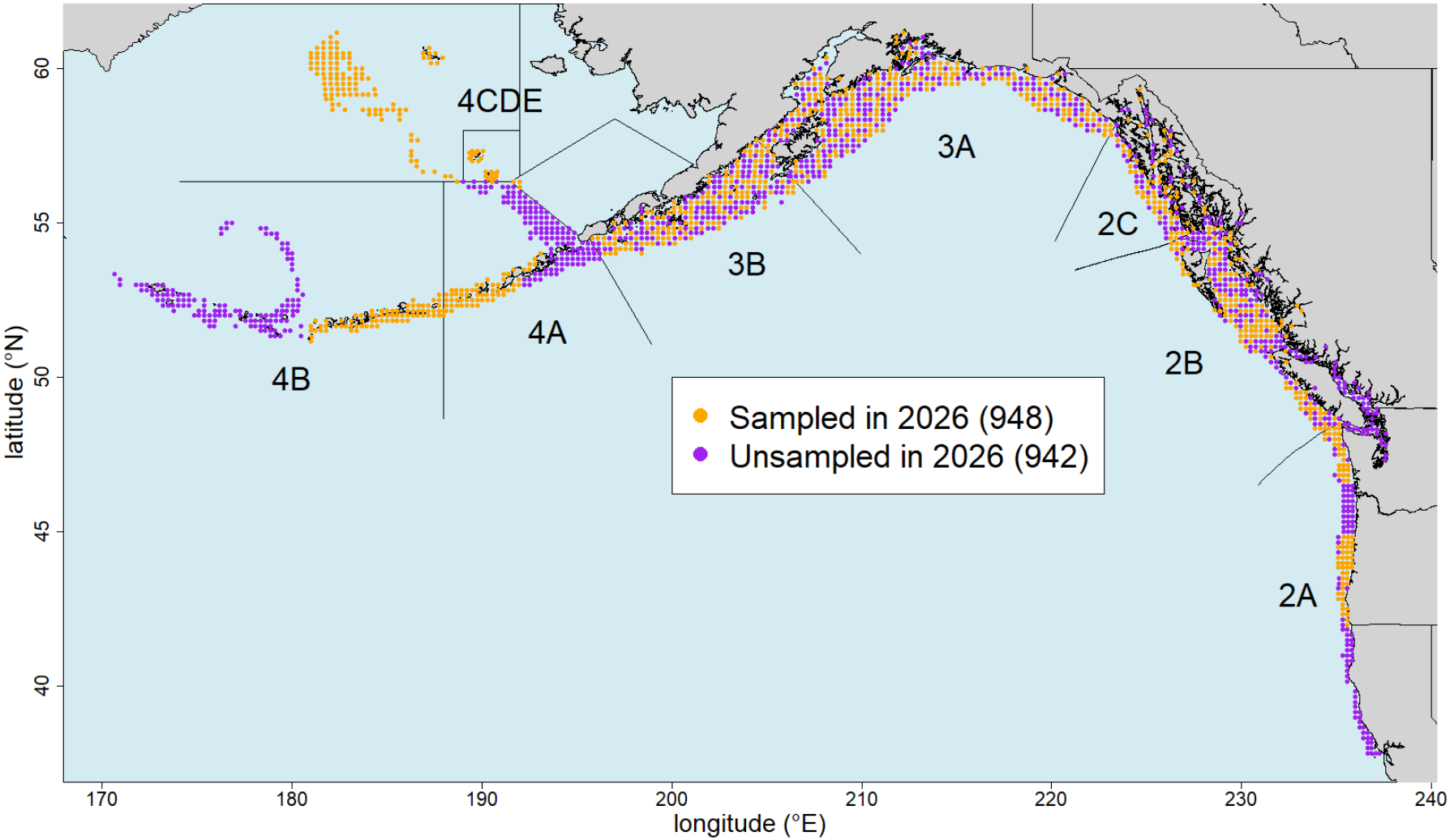


Figure 1.4. Potential FISS design in 2026 (orange circles) based on prioritization of the Primary Objective in Table 1. The design relies on randomized sampling in 2B-3B, and a subarea design elsewhere. Purple circles are optional for meeting data quality criteria.

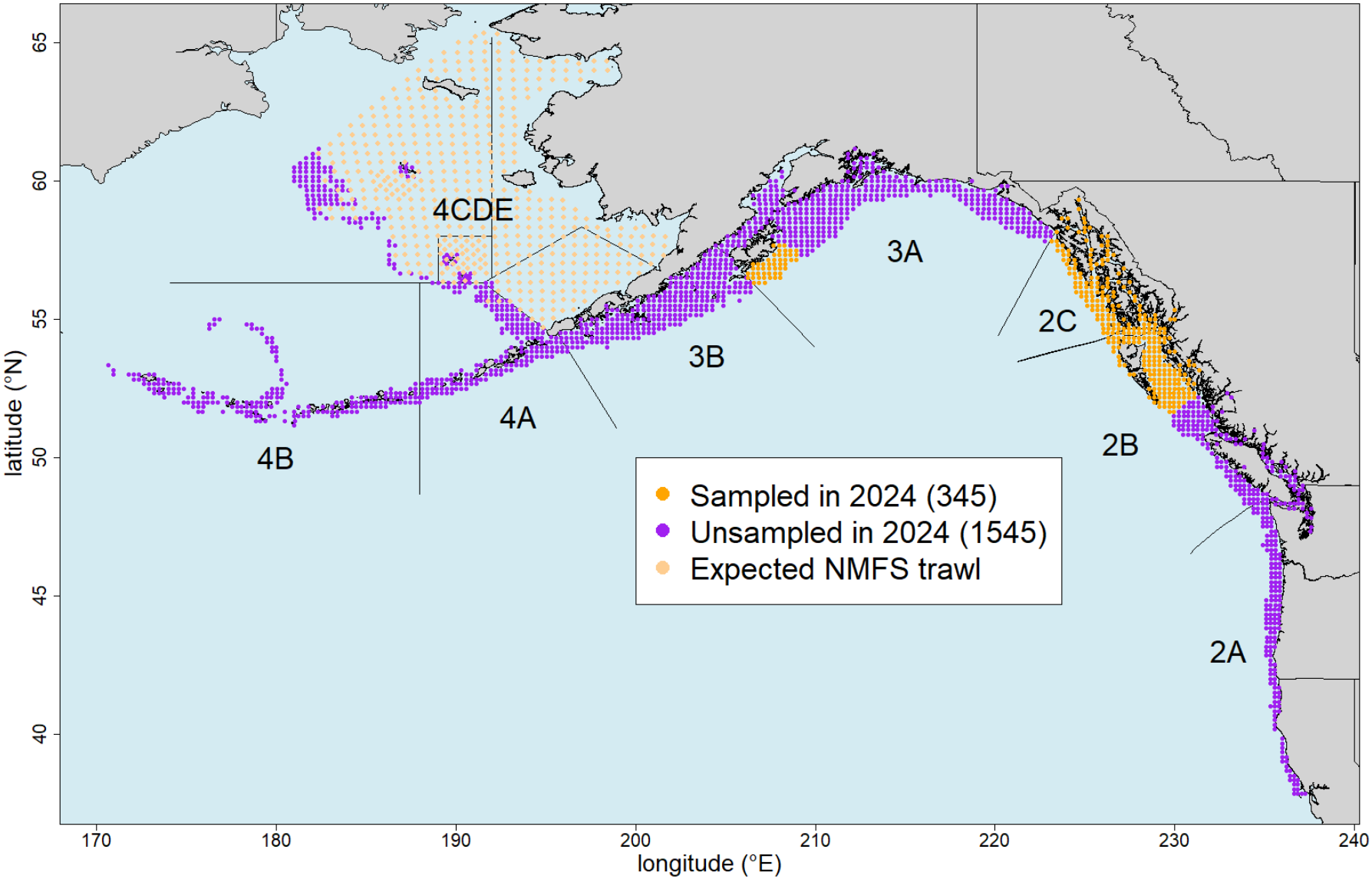


Figure 1.5. FISS design in 2024 (orange circles) based on prioritization of the Secondary Objective in Table 1. See text for more information.

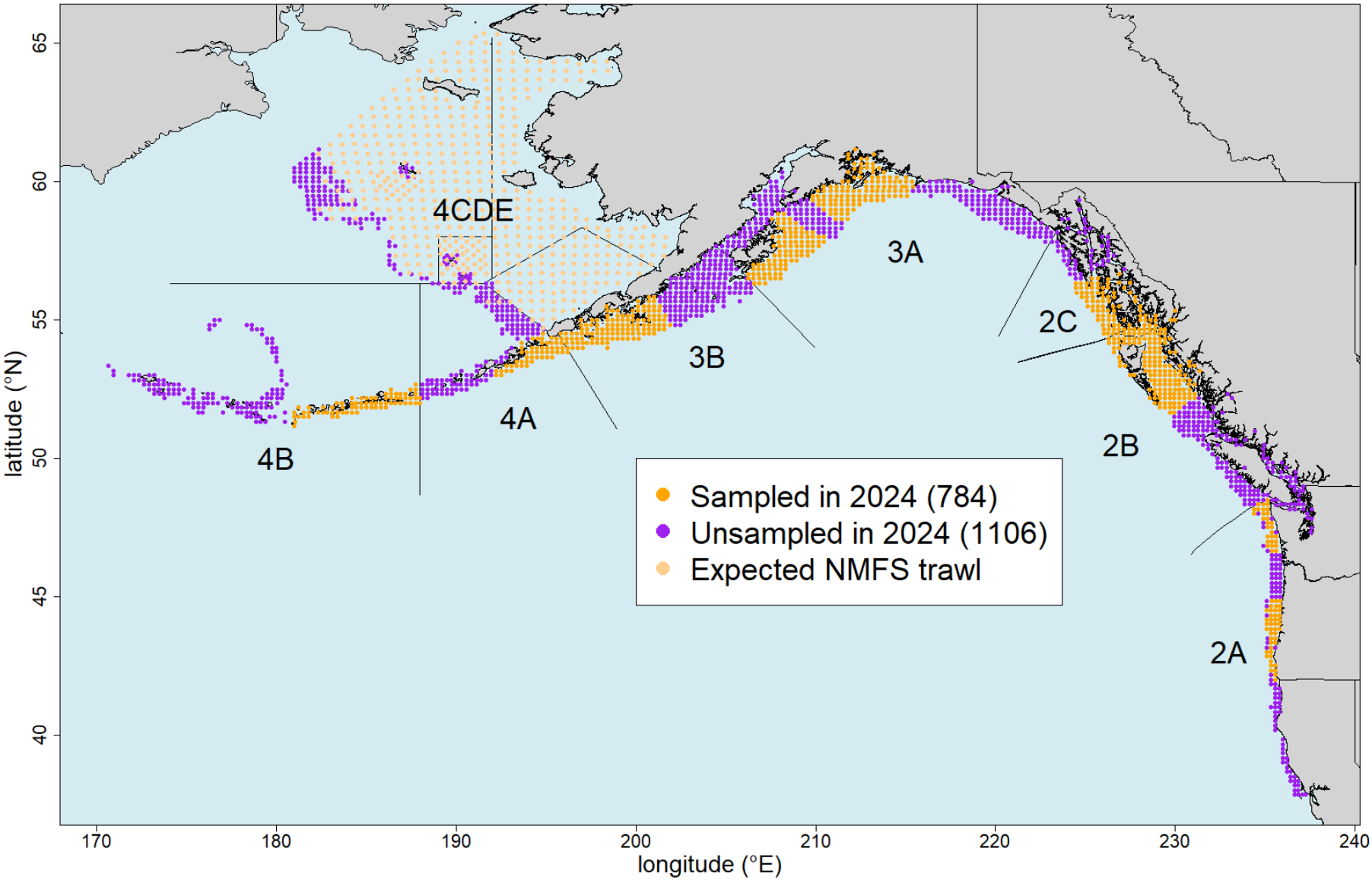


Figure 2.1. Base block design in 2024 (orange circles). Design is based on fishing 2-4 complete blocks of stations (charter regions) in the core areas (2B, 2C, 3A and 3B) and previously implemented subareas elsewhere.

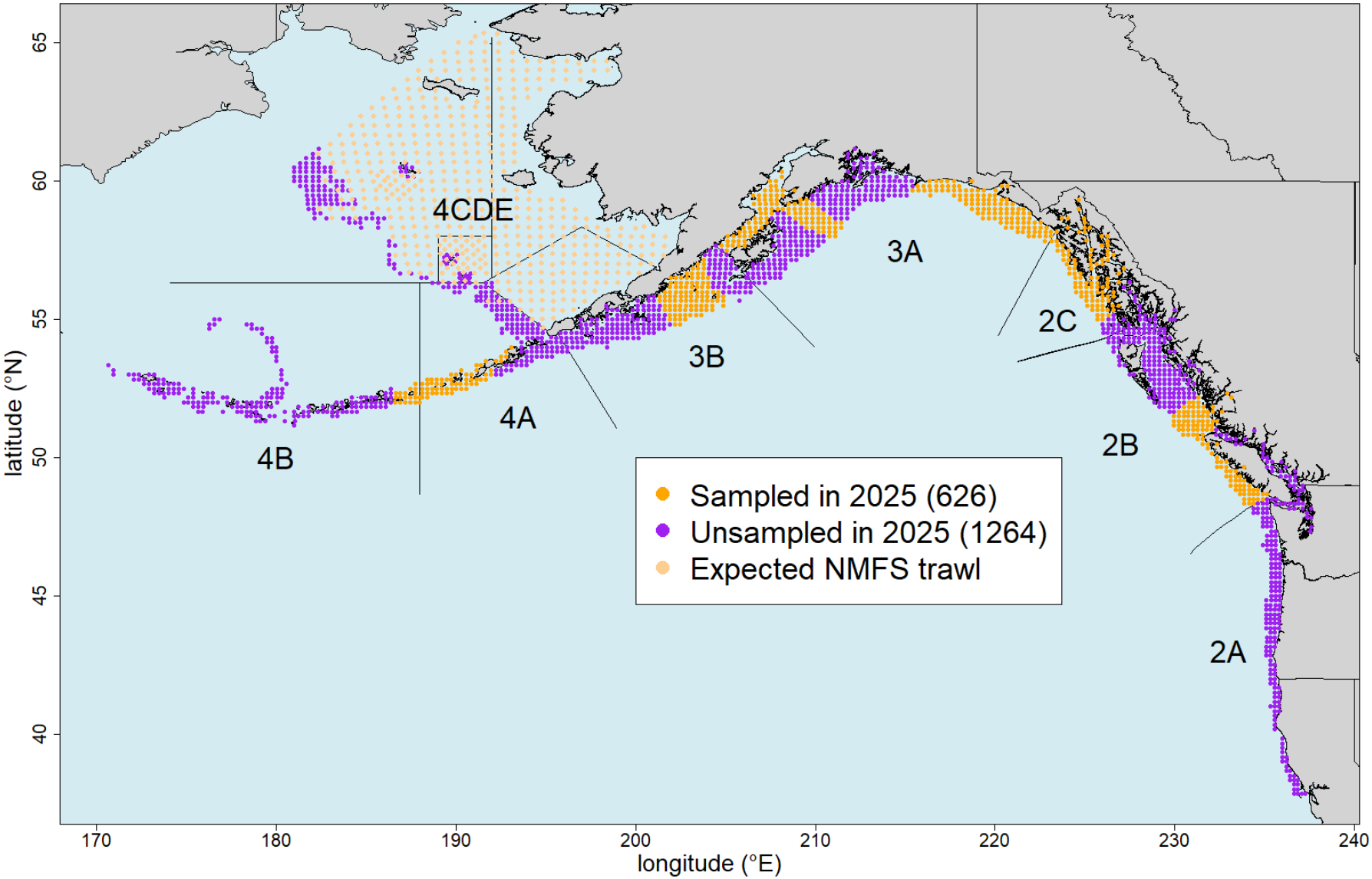


Figure 2.2. Base block design in 2025 (orange circles). Design is based on fishing 2-4 complete blocks of stations (charter regions) in the core areas (2B, 2C, 3A and 3B) and previously implemented subareas elsewhere.

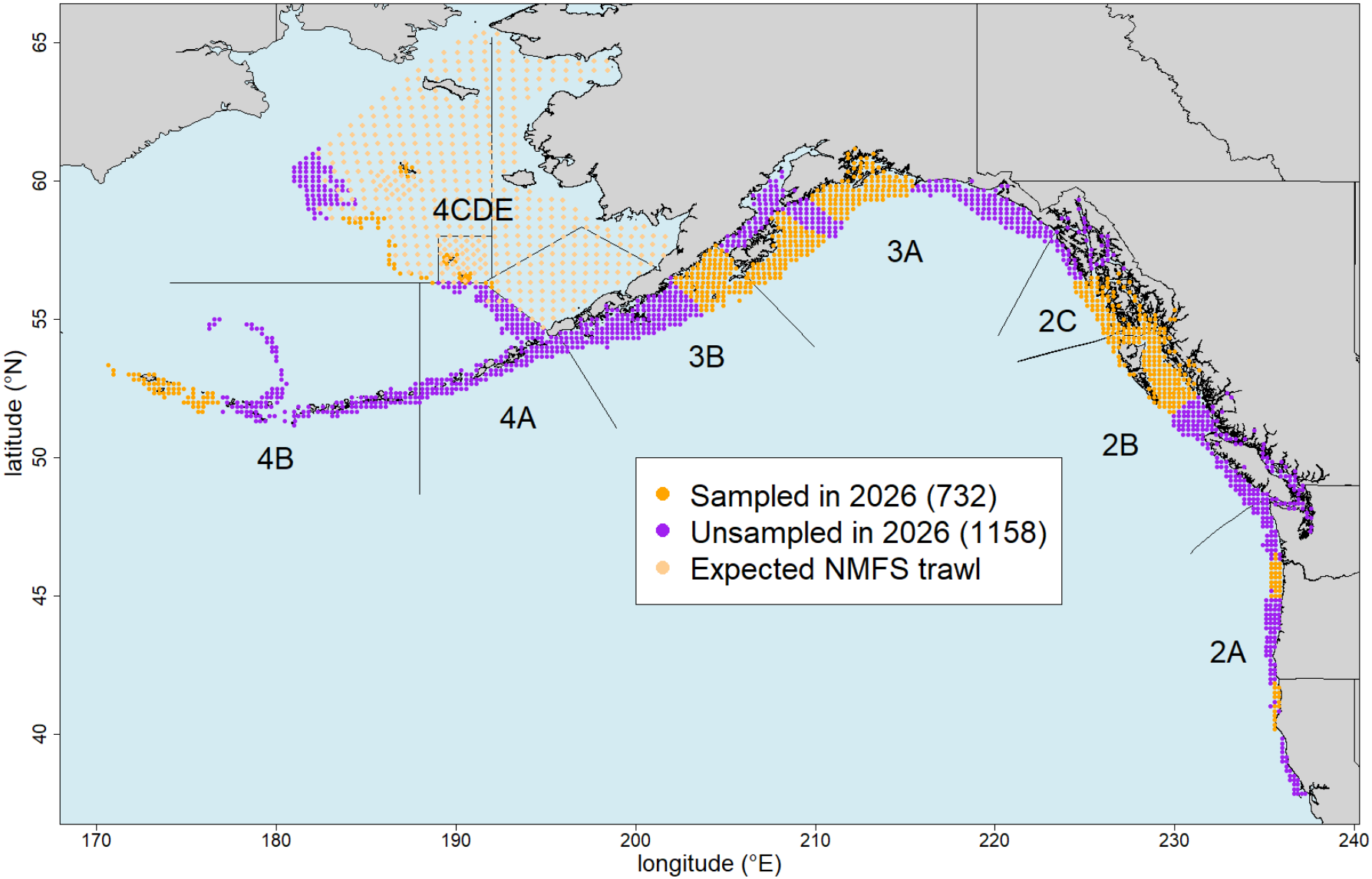


Figure 2.3. Base block design in 2026 (orange circles). Design is based on fishing 2-4 complete blocks of stations (charter regions) in the core areas (2B, 2C, 3A and 3B) and previously implemented subareas elsewhere.

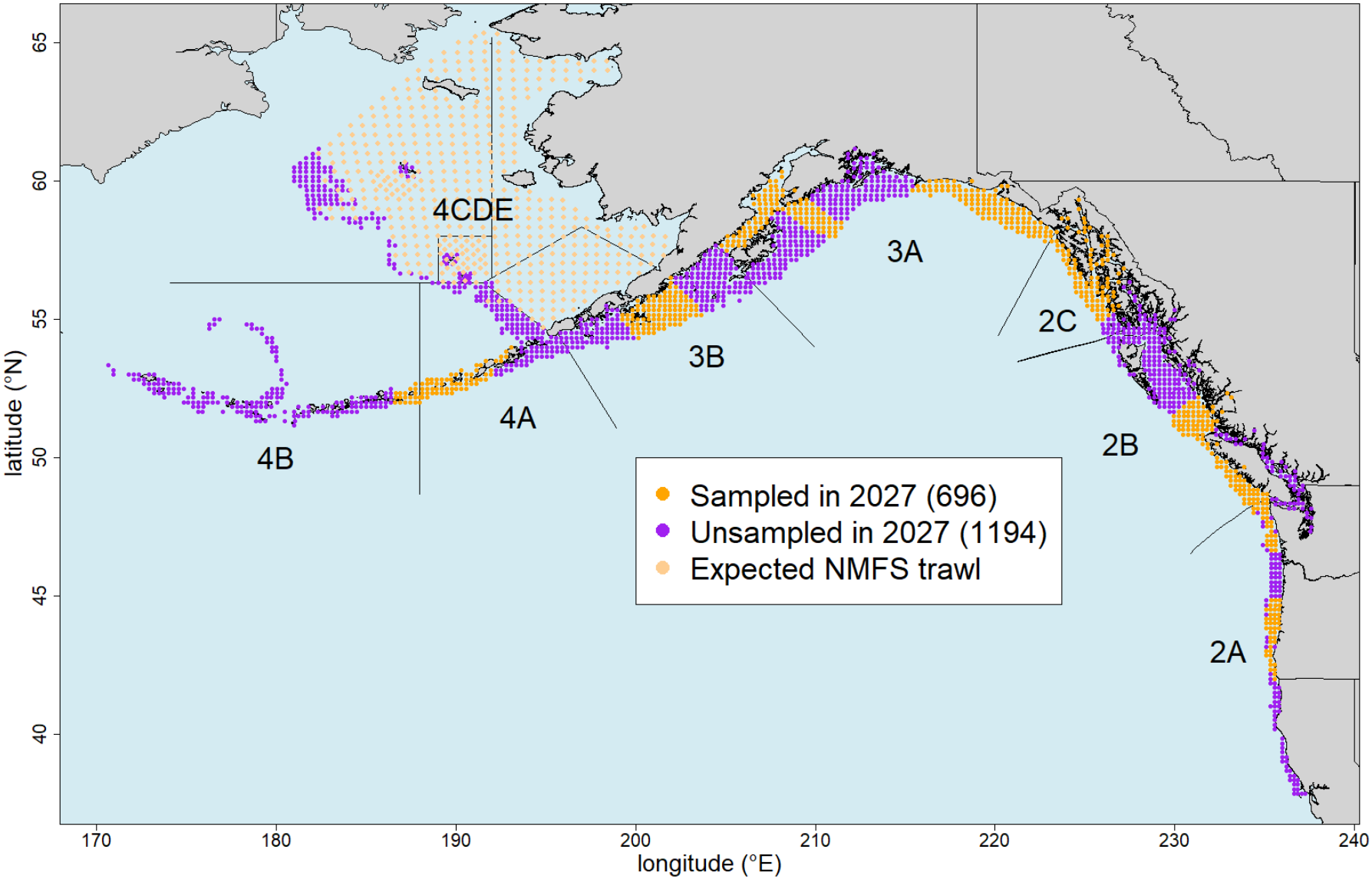


Figure 2.4. Base block design in 2027 (orange circles). Design is based on fishing 2-4 complete blocks of stations (charter regions) in the core areas (2B, 2C, 3A and 3B) and previously implemented subareas elsewhere.

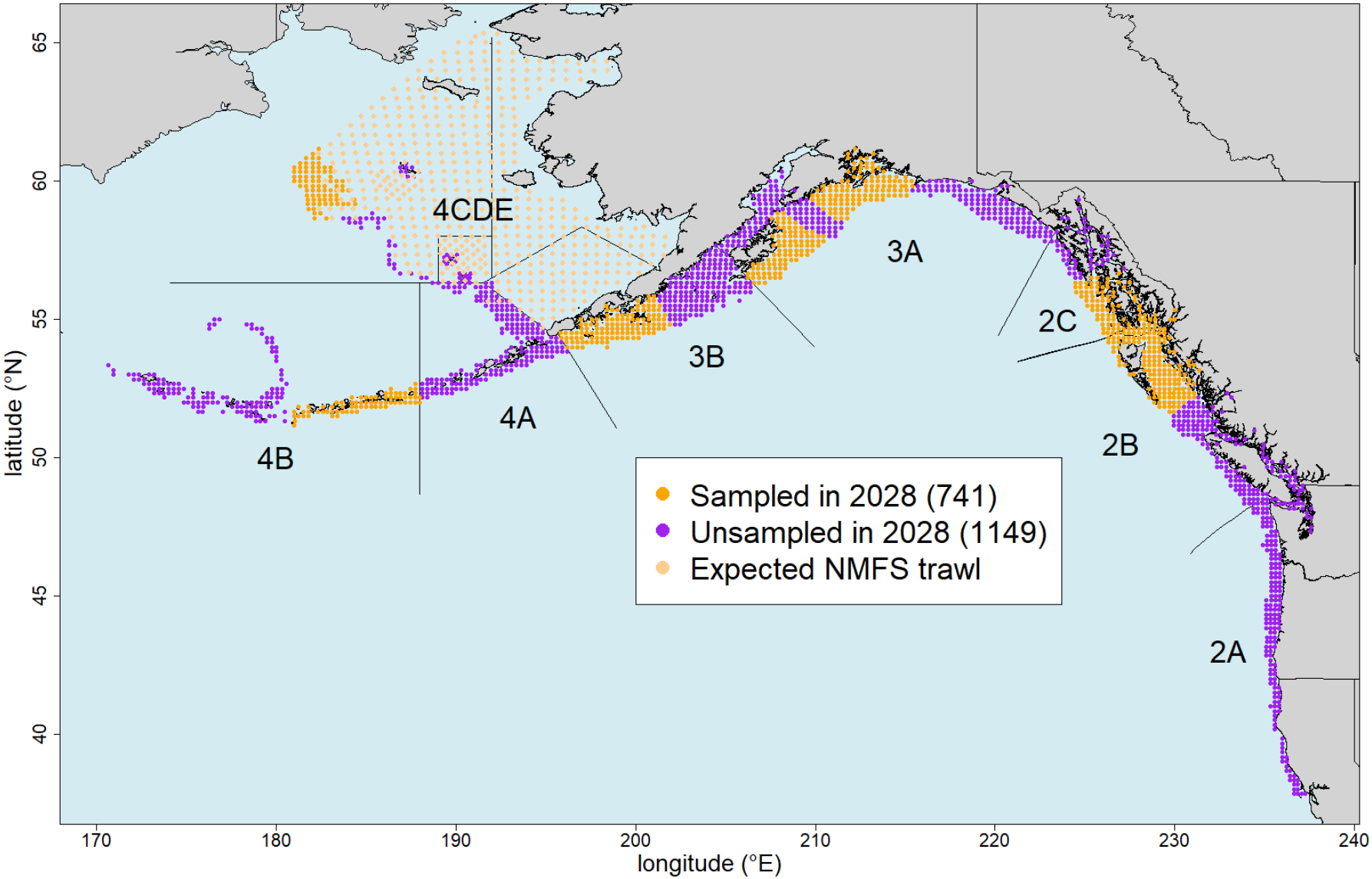


Figure 2.5. Base block design in 2028 (orange circles). Design is based on fishing 2-4 complete blocks of stations (charter regions) in the core areas (2B, 2C, 3A and 3B) and previously implemented subareas elsewhere.

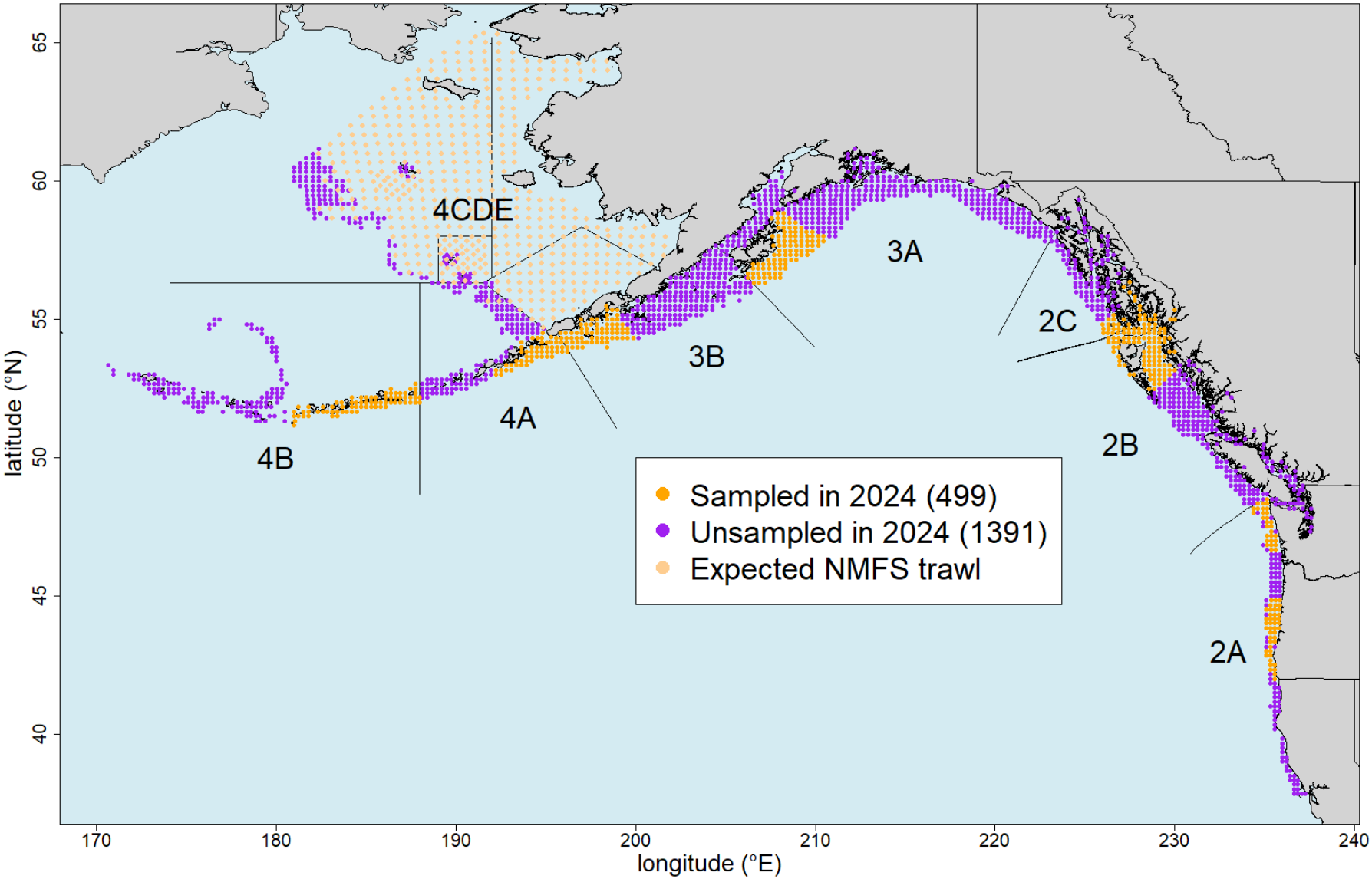


Figure 2.6. Reduced block design in 2024 (orange circles). Design is based on fishing 1-2 complete blocks of stations (charter regions) in the core areas (2B, 2C, 3A and 3B) and previously implemented subareas elsewhere.

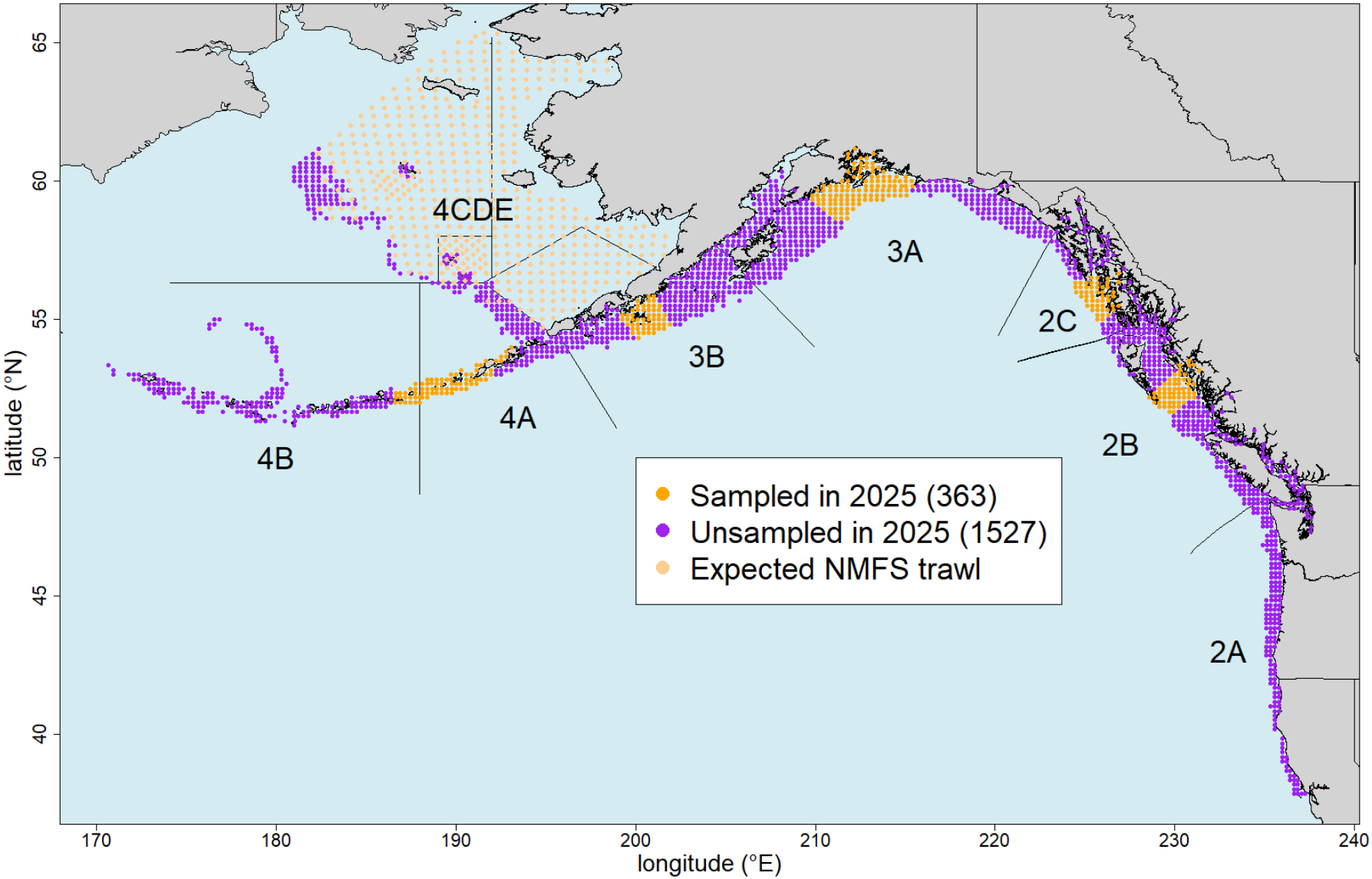


Figure 2.7. Reduced block design in 2025 (orange circles). Design is based on fishing 1-2 complete blocks of stations (charter regions) in the core areas (2B, 2C, 3A and 3B) and previously implemented subareas elsewhere.

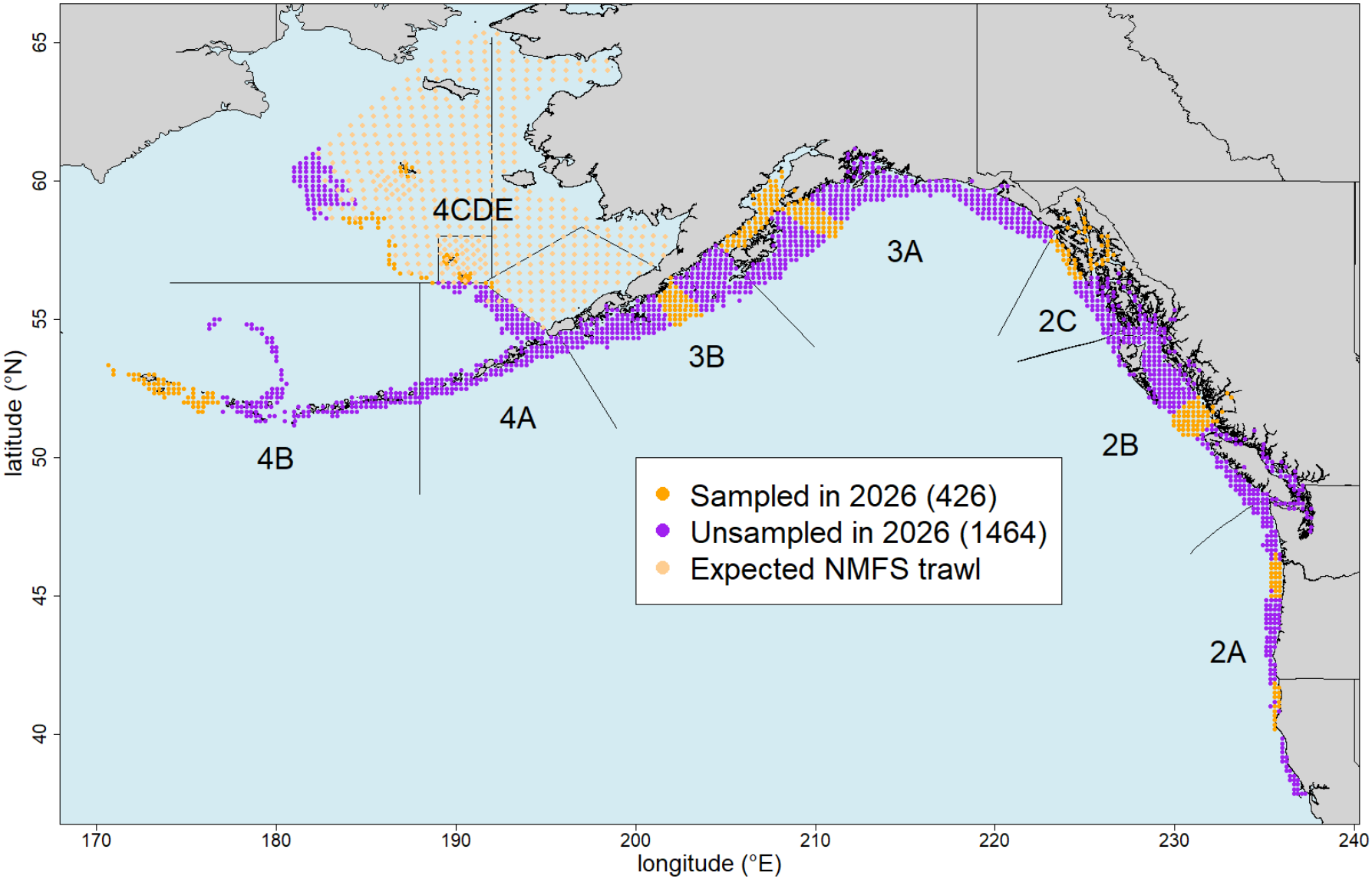


Figure 2.8. Reduced block design in 2026 (orange circles). Design is based on fishing 1-2 complete blocks of stations (charter regions) in the core areas (2B, 2C, 3A and 3B) and previously implemented subareas elsewhere.

Appendix A: Additional background information and scientific evaluation

BACKGROUND

The IPHC's Fishery-Independent Setline Survey (FISS) 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 IPHC Regulatory Area, computed as the average of WPUE of all Pacific halibut and for 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 for use in the stock assessment models.

FISS history 1993-2019

The IPHC has undertaken FISS activity since the 1960s. However, methods were not standardized to a degree (e.g., the bait and gear used) that allows for simple combined analyses until 1993. From 1993 to 1997, the annual design was a modification of a design developed and implemented in the 1960s, and involved fishing triangular clusters of stations, with clusters located on a grid (IPHC 2012). Coverage was limited in most years and was generally restricted to IPHC Regulatory Areas 2B through 3B. The modern FISS design, based on a grid with 10 nmi (18.5 km) spacing, was introduced in 1998, and over the subsequent two years was expanded to include annual coverage in parts of all IPHC Regulatory Areas within the depth ranges of 20-275 fathoms (37-503 m) in the Gulf of Alaska and Aleutian Islands, and 75-275 fathoms (137-503 m) in the Bering Sea (IPHC 2012). Annually-fished stations were added around islands in the Bering Sea in 2006, and in the same year, a less dense grid of paired stations was fished in shallower waters of the southeastern Bering Sea, providing data for a calibration with data from the annual National Marine Fishery Service (NMFS) bottom trawl survey (Webster et al. 2020).

Through examination of commercial logbook data and information from other sources, it became clear by 2010 that the historical FISS design had gaps in coverage of Pacific halibut habitat that had the potential to lead to bias in estimates derived from its data. These gaps included deep and shallow waters outside the FISS depth range (0-20 fathoms and 275-400 fathoms), and unsurveyed stations on the 10 nmi grid within the 20-275 fathom depth range within each IPHC Regulatory Area. This led the IPHC Secretariat to propose expanding the FISS to provide coverage of the unsurveyed habitat with United States and Canadian waters. In 2011 a pilot expansion was undertaken in IPHC Regulatory Area 2A, with stations on the 10 nmi grid added to deep (275-400 fathoms) and shallow (10-20 fathoms) waters, the Salish Sea, and other, smaller gaps in coverage (the 10 fathom limit in shallow waters was due to logistical difficulties in standardized fishing of longline gear in shallower waters). A second expansion in IPHC Regulatory Area 2A was completed in 2013, with a pilot California survey between latitudes of 40-42°N.

The full expansion program began in 2014 and continued through 2019, resulting in the sampling of the entire FISS design of 1890 stations in the shortest time logistically possible. The FISS

expansion program allowed us to build a consistent and complete picture of Pacific halibut density throughout its range in Convention waters. Sampling the full FISS design has reduced bias as noted above, and, in conjunction with space-time modelling of survey data (see below), has improved precision and fully quantified the uncertainty associated with estimates based on partial annual sampling of the species range. It has also provided us with a complete set of observations over the full FISS design (Figure 1) from which an optimal subset of stations can be selected when devising annual FISS designs. This station selection process began in 2019 for the 2020 FISS and continues with the current review of design proposals for 2024-26. Note that in the Bering Sea, the full FISS design does not provide complete spatial coverage, and FISS data are augmented with calibrated data from National Marine Fisheries Service (NMFS) and Alaska Department of Fish and Game (ADFG) trawl surveys (stations can vary by year – 2019 designs are shown in Figure 1). Both supplementary surveys have been conducted approximately annually in recent years.

Space-time modelling

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 approach used previously, as it made use of additional information within the survey data regarding the degree of spatial and temporal correlation in Pacific halibut density, along with information from covariates such as depth (see Webster 2016, 2017). It also allowed a more complete of accounting of uncertainty; for example, prior to the use of space-time modelling, uncertainty due to unsurveyed regions in each year was ignored in the estimation. Prior to the application of the space-time modelling, these unsampled regions were either filled in using independently estimated scalar calibrations (if fished at least once), or catch-rates at unsampled stations were assumed to be equal to the mean for the entire Regulatory Area. The IPHC's Scientific Review Board (SRB) has provided supportive reviews of the space-time modelling approach (e.g., IPHC-2018-SRB013-R), and the methods have been published in a peer-review journal (Webster et al. 2020). Similar geostatistical models are now routinely used to standardize fishery-independent trawl surveys for groundfish on the West Coast of the U.S. and in Alaskan waters (e.g., Thorson et al. 2015 and Thorson 2019). The IPHC space-time models are fitted through the R-INLA package in the R software.

FISS DESIGN SCIENTIFIC EVALUATION

Precision targets

In order to maintain the quality of the estimates used for the assessment and for estimating stock distribution to be consistent with historical performance, the IPHC Secretariat has set a target range of less than 15% for the coefficient of variation (CV) of mean O32 and all sizes WPUE for all IPHC Regulatory Areas. We also established precision targets of IPHC Biological Regions and a coastwide target (IPHC-2020-AM096-07), but achievement of the Regulatory Area targets has resulted in meeting targets for the larger geographic units.

The Commission-endorsed 2023 FISS design in IPHC Areas 4A and 4B did not receive viable bids, and our analysis therefore assumed a design with no 2023 sampling in these areas.

Table A.1 shows projected CVs following the implemented 2023 FISS, the potential 2024 FISS design, and following the full 2024-26 proposed designs. The reduced 2023 FISS in IPHC Regulatory Area 2A and the lack of a 2023 FISS in IPHC Regulatory Areas 4A and 4B will lead to CVs outside of the target range this year (19-26%, first column). However, if the potential 2024 design is implemented, CVs for these areas are projected to return to within the target range (9-12%, second column) following the 2024 FISS. If the full set of proposals for 2024-26 are implemented, we are projected to achieve CVs within the target range in all years after 2023.

Table A.1. Projected CVs (%) for 2023-26 for O32 WPUE estimated after completion of the implemented 2023 FISS, completion of the potential 2024 FISS design only, and completion of all potential FISS designs for 2024-26.

Reg. Area	2023 (After 2023 FISS)	2024 (After 2024 FISS)	2023 (After 2026 FISS)	2024 (After 2026 FISS)	2025 (After 2026 FISS)	2026 (After 2026 FISS)
2A	19	12	12	11	12	14
4A	21	10	14	9	9	12
4B	26	9	16	9	10	12

Reducing the potential for bias

In IPHC Regulatory Areas in which stations are not subsampled randomly (IPHC Regulatory Areas 2A, 4A and 4B), sampling a subset of the full data frame in any area or region brings with it the potential for bias. This is due to trends in the unsurveyed portion of a management unit (Regulatory Area or Biological Region) potentially differing from those in the surveyed portion. Therefore, we also examine how frequently part of an area (subarea) should be surveyed in order to reduce the likelihood of appreciable bias. For this, we use a threshold of a 10% absolute change in biomass percentage: our goal is to sample frequently enough so that each subarea's biomass proportion has a low chance of changing by more than 10% between successive surveys of the subarea. The 10% value was chosen to provide a threshold that was meaningful in terms of bias without either resulting in large unmonitored change - e.g., 20% or more - or change so small it would require annual sampling of all stations – e.g., 5% or less - to detect reliably.

At SRB021, we presented a new method for quantifying the risk of bias due to not sampling a particular subregion of an IPHC Regulatory Area for a specified number of years (see IPHC-2022-SRB021-06). The method uses samples from the posterior predictive distribution from the space-time modelling to estimate the probability of at least a 10% absolute change in a subarea's biomass proportion over a period of time equal to the number of years since it was last sampled. A detailed description of the analysis results is presented in IPHC-2023-SRB022-06. Results are summarized in Table A.2.

Table A.2. Summary of results of analysis of bias risk for IPHC Regulatory Areas that are sampled using subareas.

Reg Area	Subarea	Description	Last sampled	Risk of ≥10% change since last sampled	Recommendation
2A	1	High density north WA/central OR	2022	NA*	Annual sampling (core of 2A stock)
	2	Moderate density, south WA/north and south OR/north CA	2017-19	High	Sample 2024
	3	Deep and shallow/Salish Sea/south CA	2017-19	Low	Sample after 2026
4A	1	Western AI	2022	NA*	Annual sampling (core of 4A stock)
	2	Eastern AI	2019	High	Sample 2024
	3	Shelf Edge	2019	Low	Sample 2025
4B	1	West	2019	Moderate	Sample 2024
	2	Central	2022	Low	Sample after 2026
	3	East	2021	NA*	Near-annual sampling (core of 4B stock)

*Not evaluated for bias risk as annual or near-annual sampling is required to maintain CVs within target range.

To evaluate how well this subarea approach to projecting CVs has been working, a comparison was made between pre-FISS projections and post-sampling estimates for IPHC Regulatory Areas 2A, 4A and 4B. Projected CVs in all three areas were lower than those estimated once the observed 2022 data were incorporated into the modelling (Table A.3). The projections for 2022 were made prior to the start of the 2021 FISS. As noted in IPHC-2022-SRB020-05, the 2021 FISS in IPHC Regulatory Areas 4A and 4B did not complete all planned stations due to logistical issues. In both areas, the unfished stations covered some of the most productive habitat in recent years. This affected both the projections for 2021 and 2022, which assumed a complete FISS. Further, the western subregion of IPHC Regulatory Area 4B was planned to be sampled in 2022 but due to lack of viable charter bids, the FISS did not sample there.

Table A.3. Comparison of projected (in 2021) and estimated CVs (%) for O32 WPUE for 2022 by IPHC Regulatory Area.

Regulatory Area	2022 projected CV (%)	2022 estimated CV (%)
2A	14	16
4A	10	14
4B	14	19

The difference between projected and estimated CVs in IPHC Regulatory Area 2A was relatively small. Last year (IPHC-2022-SRB020-05) we noted an apparent increase in the underlying variability of Pacific halibut density in this area. The 2022 data did not show evidence for higher variability than other recent years, and the combined effect of 2021 and 2022 data was an estimated CV that was closer to the projection than last year.

Projected CVs were not calculated for other IPHC Regulatory Areas as they are not at present used to evaluate design proposals and all have been within the target range (≤15%) in recent years. Estimated CVs for O32 WPUE for the core IPHC Regulatory Areas of 2B, 2C, and 3A were all 6% in 2022, with a CV of 10% in IPHC Regulatory 4CDE. The CV for IPHC Regulatory Area 3B was 14%, but this was anomalous as it was due to unforeseen logistical issues leaving many stations unsampled. Typically, the CV is around 7% in this area.

Report on Current and Future Biological and Ecosystem Science Research Activities

PREPARED BY: IPHC SECRETARIAT (J. PLANAS, 30 OCTOBER 2023)

PURPOSE

To provide the Commission with a description of the biological and ecosystem science research projects conducted and planned by the IPHC Secretariat and contemplated within the Five-year Program of Integrated Research and Monitoring (2022-2026).

BACKGROUND

The main objectives of the Biological and Ecosystem Science Research at the 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.

The primary biological research activities at IPHC that follow Commission objectives are identified and described in the IPHC Five-Year Program of Integrated Research and Monitoring (2022-2026). These activities are summarized in five broad research areas designed to provide inputs into stock assessment and the management strategy evaluation processes (Appendix I), as follows:

1) Migration and Population Dynamics. Studies are aimed at improving current knowledge of Pacific halibut migration and population dynamics throughout all life stages in order to achieve a complete understanding of stock structure and distribution across the entire distribution range of Pacific halibut in the North Pacific Ocean and the biotic and abiotic factors that influence it.
2) Reproduction. Studies are aimed at providing information on the sex ratio of the commercial catch and to improve current estimates of maturity.
3) Growth. Studies are aimed at describing the role of factors responsible for the observed changes in size-at-age and at evaluating growth and physiological condition in Pacific halibut.
4) Mortality and Survival Assessment. Studies are aimed at providing updated estimates of discard mortality rates in the guided recreational fisheries and at evaluating methods for reducing mortality of Pacific halibut.
5) Fishing Technology. Studies are aimed at developing methods that involve modifications of fishing gear with the purpose of reducing Pacific halibut mortality due to depredation and bycatch.

DISCUSSION ON THE MAIN RESEARCH ACTIVITIES

1. Migration and Population Dynamics.

   The IPHC Secretariat is currently conducting studies on Pacific halibut juvenile habitat and movement through conventional wire tagging, as well as studies that incorporate genomics approaches in order to produce useful information on population structure and distribution

and connectivity of Pacific halibut. The relevance of research outcomes from these activities for stock assessment (SA) resides (1) in the introduction of possible changes in the structure of future stock assessments, as separate assessments may be constructed if functionally isolated components of the population are found (e.g. IPHC Regulatory Area 4B), and (2) in the improvement of productivity estimates, as this information may be used to define management targets for minimum spawning biomass by Biological Region. These research outcomes provide the second and third top ranked biological inputs into SA (Appendix II). Furthermore, the relevance of these research outcomes for the management and strategy evaluation process is in biological parametization and validation of movement estimates, on one hand, and of recruitment distribution, on the other hand (Appendix III).

1.1. Estimation of Pacific halibut juvenile habitat. The IPHC Secretariat recently completed a study to investigate the connectivity between spawning grounds and possible settlement areas based on a biophysical larval transport model (Sadorus et al., 2021). Although it is known that Pacific halibut, following the pelagic larval phase, begin their demersal stage as roughly 6-month-old juveniles, settling in shallow nursery (settlement) areas, near or outside the mouths of bays (Carpi et al., 2021), very little information is available on the geographic location and physical characteristics of these areas. In order to fill this knowledge gap, the IPHC Secretariat has initiated studies to identify potential settlement areas for juvenile Pacific halibut throughout IPHC Convention Waters. A first objective of this study is to create a map of suitable settlement habitat by combining available bathymetry information (e.g., benthic sediment composition and shoreline morphological data) and information on recorded presence of age-0, age-1 and age-2 Pacific halibut juveniles as well as absence of young Pacific halibut noted by various nursery habitat projects focused on other flatfish species. Data sources are currently being collected.

1.2. Wire tagging of U32 Pacific halibut. The patterns of movement of Pacific halibut among IPHC Regulatory Areas have important implications for management of the Pacific halibut fishery. The IPHC Secretariat has undertaken a long-term study of the migratory behavior of Pacific halibut through the use of externally visible tags (wire tags) on captured and released fish that must be retrieved and returned by workers in the fishing industry. In 2015, with the goal of gaining additional insight into movement and growth of young Pacific halibut (less than 32 inches [82 cm]; U32), the IPHC began wire-tagging small Pacific halibut encountered on the National Marine Fisheries Service (NMFS) groundfish trawl survey and, beginning in 2016, on the IPHC fishery-independent setline survey (FISS). As of 28 July 2022, 1,330 Pacific halibut have been tagged and released on the 2022 IPHC FISS but no tagging was conducted in the NMFS groundfish trawl surveys in 2022. Therefore, a total of 7,441 U32 Pacific halibut have been wire tagged and released on the IPHC FISS and 135 of those have been recovered to date. In the NMFS groundfish trawl surveys through 2019, a total of 6,421 tags have been released and, to date, 78 tags have been recovered.

1.3. Population genomics. Understanding population structure is imperative for sound management and conservation of natural resources. Pacific halibut in US and Canadian waters are managed as a single, panmictic population on the basis of tagging studies and historical (pre-2010) analyses of genetic population structure that failed to

demonstrate significant differentiation in the eastern Pacific Ocean. However, more recent studies have reported significant genetic population structure suggesting that Pacific halibut residing in the Aleutian Islands may be genetically distinct from other regions. Advances in genomic technology now enable researchers to examine entire genomes at unprecedented resolution. While genetic techniques previously employed in fisheries management have generally used a small number of markers (i.e. microsatellites, ~10-100), whole-genome scale approaches can now be conducted with lower cost and provide orders of magnitude more data (millions of markers). Using low-coverage whole genome resequencing we have the capability to examine genetic structure of Pacific halibut in IPHC Convention Waters with unprecedented resolution. By studying the genomic structure of spawning populations, genetic signatures of geographic origin can be established and, consequently, could be used to identify the geographic origin of individual Pacific halibut and, therefore, inform on the movement and distribution of Pacific halibut.

The main purpose of the present study is to conduct an analysis of Pacific halibut population structure in IPHC Convention waters using modern high-resolution genomic techniques. Recent studies have reported significant genetic population structure that suggest Pacific halibut residing in the Aleutian Islands may be genetically distinct from other regions. Genetic differentiation of the population on either side of Amchitka Pass was indicated, suggesting a possible basis for separating IPHC Regulatory Area 4B into two management subareas. However, these results were confounded by (1) the use of a small number of genetic markers and (2) the use of samples collected outside of the spawning season (i.e., winter) in some areas. These analyses employed summer-collected (i.e., non-spawning season) samples west of Amchitka Pass which may not be representative of the local spawning population, but rather a mixture of spawning groups on the feeding grounds. Therefore, it is advisable to re-assess those conclusions using samples collected during the spawning season and modern, high-resolution genomic techniques.

In January and February of 2020, the IPHC Secretariat conducted genetic sample collections on either side of Amchitka Pass (IPHC Regulatory Area 4B) during the spawning season to address the limitations of previous studies. These samples, in combination with previous samples collected during the spawning season (i.e., Bering Sea, Central Gulf of Alaska and waters off British Columbia) (Figure 1) will be used to re-evaluate stock structure of Pacific halibut in IPHC Convention waters. The temporal replicates at many of these locations will enable the IPHC Secretariat to evaluate the stability of genetic structure over time, ensuring confidence in the results. The IPHC Secretariat has recently produced a high-quality reference genome and has generated genomic sequences from 570 individual Pacific halibut collected from five geographic areas (Figure 1) using low-coverage whole-genome resequencing (lcWGR). Using the lcWGR approach, we have identified approximately 10.2 million single nucleotide polymorphisms (SNPs) that are currently being used to evaluate population structure at the highest resolution possible. Despite the very high resolution genomic data, our initial analyses of population structure using a genome-wide set of 4.7 million SNPs indicate very little spatial structure among the spawning groups sampled in IPHC convention waters. Since evolutionary processes may not act uniformly across the genome, current

work is aimed at identifying regions of the genome that contain outlier SNPs which may increase our power to characterize population structure and determine the source population for samples collected outside of the spawning season.

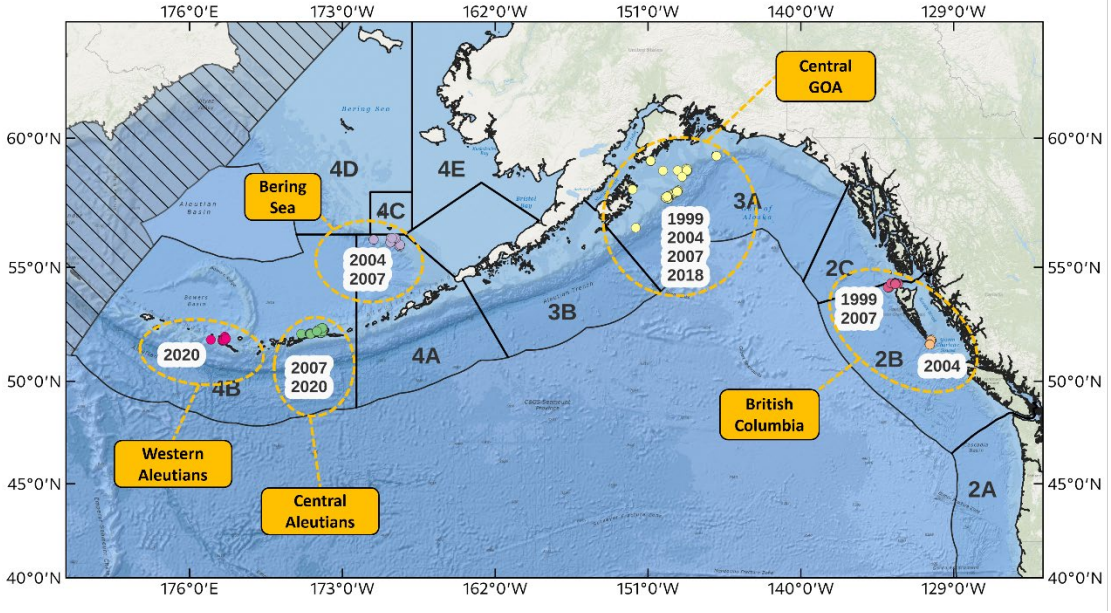


Figure 1. Map of sample collections made during the spawning season used for genomic analysis of population structure in Pacific halibut in the northeast Pacific Ocean.

2. Reproduction.

Research activities in this Research Area aim at providing information on key biological processes related to reproduction in Pacific halibut (maturity and fecundity) and to provide sex ratio information of Pacific halibut commercial landings. The relevance of research outcomes from these activities for stock assessment (SA) is in the scaling of Pacific halibut biomass and in the estimation of reference points and fishing intensity. These research outputs will result in a revision of current maturity schedules and will be included as inputs into the SA (Appendix II) and represent the most important biological inputs for stock assessment. The relevance of these research outcomes for the management and strategy evaluation process is in the improvement of the simulation of spawning biomass in the Operating Model (Appendix III).

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 to estimate spawning stock biomass. Currently used estimates of maturity at age using macroscopic visual criteria collected in the FISS indicate that the age at which 50% of female Pacific halibut are sexually mature is 11.6 years on average. However, female maturity schedules have not been revised in recent years and may be outdated. In addition, the currently used macroscopic visual criteria used to score female maturity in the field have an undetermined level of uncertainty and need to be contrasted with more accurate microscopic (i.e., histological) criteria. In order to address these issues, the IPHC Secretariat has conducted for the first time a thorough histological assessment of the temporal progression of female developmental stages and

reproductive phases throughout an entire reproductive cycle (Fish et al. 2020). The outcomes of these studies have paved the way for upcoming studies to update and improve the accuracy of maturity schedules based on histological-based data and to guide efforts towards assessing fecundity in Pacific halibut.

In brief, the results obtained by ovarian histological examination indicate that female Pacific halibut follow an annual reproductive cycle involving a clear progression of female developmental stages towards spawning within a single year. These results provide foundational information for upcoming studies aimed at updating maturity ogives by histological assessment and at investigating fecundity in Pacific halibut (Fish et al. 2022). One of the most important results obtained show that the period of time when gonad samples can be collected in the FISS (June-August) is an appropriate temporal window during which Pacific halibut females that are developing towards the spawning capable reproductive phase and, therefore, considered mature for stock assessment purposes, can be identified.

In 2022, the IPHC Secretariat initiated studies to revise maturity schedules in all four biological regions through histological (i.e., microscopic) characterization of maturity. For that purpose, the IPHC Secretariat collected ovarian samples for histology during the 2022 FISS. The FISS sampling resulted in a total of 1,023 ovarian samples collected coastwide for histological analysis, with 440 ovarian samples from Biological Region 2,351 samples from Biological Region 3, 181 from Biological Region 4, and 51 samples from Biological Region 4B (Figure 2). Ovarian samples have been processed for histology and IPHC Secretariat staff are currently finalizing scoring samples for maturity using histological maturity classifications as previously. Following this maturity classification criteria, all sampled Pacific halibut females will be assigned to either the mature or immature categories. IPHC Secretariat continued to collect ovarian samples in 2023 on the FISS. This will allow us to investigate both spatial and temporal differences in female Pacific halibut maturity. Due to the reduction in FISS design for 2023, sampling efforts only took place in IPHC Biological Regions 2 and 3. A total of 1,110 ovarian samples were collected for histological analysis, with 403 samples from Biological Region 2, and 707 samples from Biological Region 3 (Figure 2). Maturity ogives will be generated by age and length at a coastwide scale as well as at a biological region scale.

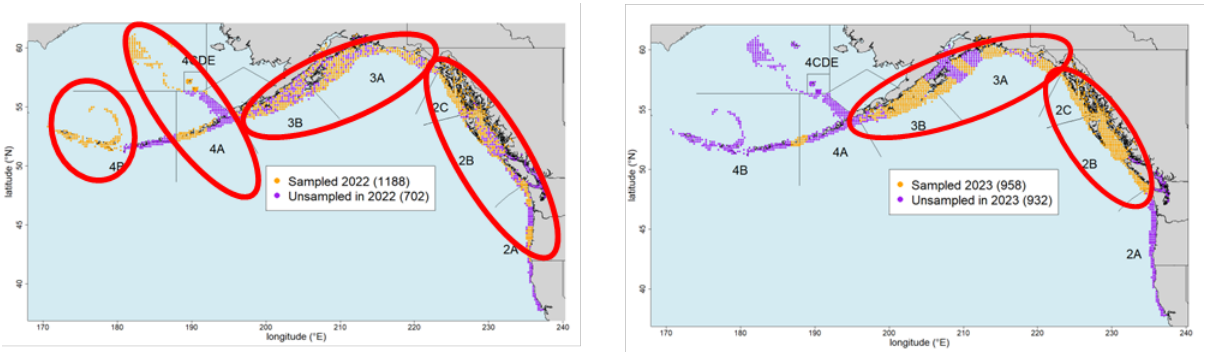


Figure 2. Maps of maturity sample collections made during the 2022 (left) and 2023 (right) FISS seasons.

An important existing knowledge gap regarding the reproductive biology of Pacific halibut is the current lack of understanding of fecundity-at-age and fecundity-at-size. Information on these two parameters could be used to replace spawning biomass with egg output as the metric of reproductive capability in the stock assessment and management reference points. The IPHC Secretariat has investigated different available methods for fecundity determinations and the auto-diametric method was selected as the method of choice (Witthames et al., 2009. *Fish. Bul*. 107:148-164). For this purpose, the IPHC Secretariat collected gonad samples for fecundity estimations during the 2023 FISS. IPHC Secretariat targeted Biological Region 3 for this collection, with a total of 456 gonad samples collected.

3. Growth.

Research activities conducted in this research area aim at providing information on somatic growth processes driving size-at-age in Pacific halibut. The relevance of research outcomes from these activities for stock assessment resides, first, in their ability to inform yield-per-recruit and other spatial evaluations for productivity that support mortality limit-setting, and, second, in that they may provide covariates for projecting short-term size-at-age and may help delineate between fishery and environmental effects, thereby informing appropriate management responses (Appendix II). The relevance of these research outcomes for the management and strategy evaluation process is in the improvement of the simulation of variability and to allow for scenarios investigating climate change (Appendix III).

The IPHC Secretariat has completed a study funded by the North Pacific Research Board (NPRB Project No. 1704; 2017-2020) to identify relevant physiological markers for somatic growth. This study resulted in the identification of 23 markers in skeletal muscle that were indicative of temperature-induced growth suppression and 10 markers in skeletal muscle that were indicative of temperature-induced growth stimulation. These markers represented genes and proteins that changed both their mRNA expression levels and abundance levels in skeletal muscle, respectively, in parallel with changes in the growth rate of Pacific halibut. A manuscript describing the results of this study is currently in preparation (Planas et al., in preparation).

In addition to temperature-induced growth manipulations, the IPHC Secretariat has conducted similar studies as part of NPRB Project No. 1704 to identify physiological growth markers that respond to density- and stress-induced growth manipulations. The respective justifications for these studies are that (1) population dynamics of the Pacific halibut stock could be affected by fish density, and (2) stress responses associated with capture and release of discarded Pacific halibut may affect subsequent feeding behavior and growth. Investigations related to the effects of density and stress exposure are still underway.

4. Mortality and Survival Assessment.

Information on all Pacific halibut removals is integrated by the IPHC Secretariat, providing annual estimates of total mortality from all sources for its stock assessment (SA). Bycatch and wastage of Pacific halibut, as defined by the incidental catch of fish in non-target fisheries and by the mortality that occurs in the directed fishery (i.e., fish discarded for sublegal size or for regulatory reasons), respectively, represent important sources of mortality that can result in significant reductions in exploitable yield in the directed fishery. Given that the incidental mortality from the commercial Pacific halibut fisheries and bycatch fisheries is

included as part of the total removals that are accounted for in the SA, changes in the estimates of incidental mortality will influence the output of the SA and, consequently, the catch levels of the directed fishery. Research activities conducted in this Research Area aim at providing information on discard mortality rates and producing guidelines for reducing discard mortality in Pacific halibut in the longline and recreational fisheries. The relevance of research outcomes from these activities for SA resides in their ability to improve trends in unobserved mortality in order to improve estimates of stock productivity and represent the most important inputs in fishery yield for SA (Appendix II). The relevance of these research outcomes for the management and strategy evaluation process is in fishery parametization (Appendix III).

For this reason, the IPHC Secretariat is conducting two research projects to investigate the effects of capture and release on survival and to improve estimates of DMRs in the directed longline and guided recreational Pacific halibut fisheries:

4.1. Evaluation of the effects of hook release techniques on injury levels and association with the physiological condition of captured Pacific halibut and estimation of discard mortality using remote-sensing techniques in the directed longline fishery.

After having reported on experimentally-derived estimates of discard mortality rate in the directed longline fishery (Loher et al., 2022), the second component of this study investigated the relationships among hook release techniques (e.g., gentle shake, gangion cutting, and hook stripping), injury levels, viability categories, stress levels and physiological condition of released fish, as well as the environmental conditions that the fish experienced during capture. Gentle shake and gangion cutting resulted in the same injury and viability outcomes with 75% of sublegal fish classified in the Excellent viability category, while the hook stripper produced the poorest outcomes (only 9% in the Excellent viability category). Hook stripping also resulted in more severe injuries, particularly with respect to tearing injuries, whereas gentle shake and gangion cutting predominantly resulted in a torn cheek, effectively the injury incurred by the hooking event. Physiological stress indicators (plasma levels of glucose, lactate, and cortisol) did not significant change with viability outcomes, except for higher lactate plasma levels in fish in the Dead viability category. Hematocrit was significantly lower in fish that were classified in the Dead viability category. Furthermore, 89% of fish classified as Dead were infiltrated by sand fleas, present in several sets in deeper and colder waters. Our results indicated that avoiding the use of hook strippers and minimizing soak times in areas known to have high sand flea activity result in better survival outcomes. These results have been summarized in a manuscript that has been submitted for publication in a peer-reviewed journal and that is currently under review.

4.2. Discard mortality rates of Pacific halibut in the charter recreational fishery.
Results from a recent study conducted in fish captured using guided recreational fishery practices yielded an estimated discard mortality rate of 1.35% (95% CI 0.00-3.95%) for Pacific halibut released in Excellent viability category that were captured and released using circle hooks. These results represent the first report of experimentally derived estimates of mortality of Pacific halibut captured and discarded in the recreational

fishery. As with the study on the directed commercial fishery (Section 4.1), work is currently being conducted to investigate the relationship of injury types, viability categories and survival of discarded fish with capture (e.g., environmental parameters, time on deck, hooking time, etc.) and physiological (e.g., stress) conditions.

5. Fishing Technology.

The IPHC Secretariat is conducting studies aimed at developing methods that involve modifications of fishing gear with the purpose of reducing Pacific halibut depredation and bycatch. Specific objectives in this area include 1) investigate new methods for whale avoidance and/or deterrence for the reduction of Pacific halibut depredation by whales (e.g., catch protection methods), and 2) investigate behavioral and physiological responses of Pacific halibut to fishing gear in order to reduce bycatch. Important management implications of these studies reside in improving estimations of mortality of Pacific halibut in the directed commercial fishery that will lead to improved estimates of stock productivity (Appendix II). Depending on the estimated magnitude of whale depredation, this may be included as another explicit source of mortality in the SA and mortality limit setting process.

5.1. Gear-based approaches to catch protection to minimize whale depredation in longline fisheries.

The IPHC Secretariat has conducted investigations on gear-based approaches to catch protection as a means for minimizing whale depredation in the Pacific halibut longline fisheries with funding from NOAA's Bycatch Research and Engineering Program (BREP) (NOAA Award NA21NMF4720534; Appendix IV). The objectives of this study have been to 1) work with fishermen and gear manufacturers, via direct communication and through an international workshop, to identify effective methods for protecting hook-captured flatfish from depredation; and 2) develop and pilot test simple, low-cost catch-protection designs that can be deployed effectively using current longline fishing techniques and on vessels currently operating in Convention waters.

From the outcomes of the first part of the study, two different types of catch protection devices were selected for field testing: one based on a modification of a commercial catch protection device (i.e., shuttle system), and one based on a modification of a slinky pot (i.e., shroud system) deployed on branchline gear.

- Shuttle system. Manufactured in Norway by Sago, two aluminum shuttle devices were modeled after the Sago Extreme device but 80% smaller in size (Figure 3). Their dimensions are 2.60 m (8.5 ft) long by 0.80 m (2.6 ft) in diameter, each weighing approximately 100 kg (220 lb.) when empty. Typically, these devices are set with the gear; however, for this study the units were deployed from the surface, during the haulback event. The device encounters the hooks and catch near the seabed, mechanically unhooks fish and entrains them in the storage area (Figure 3). After securing the catch, the device encounters a stopper and is hauled to the surface with fish inside (Figure 3).

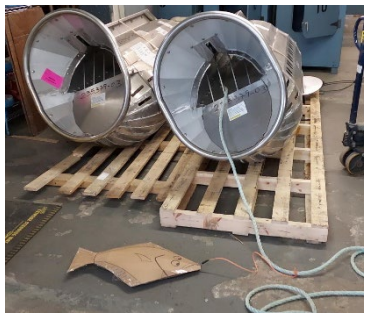
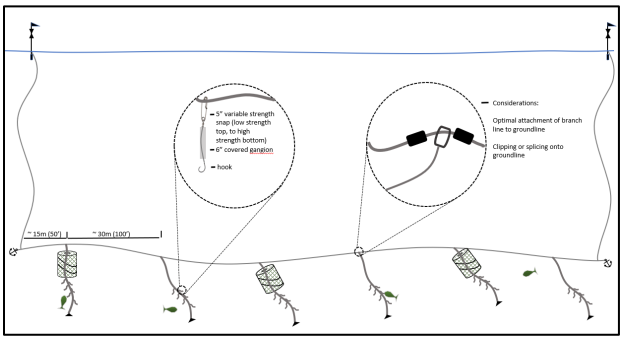
A)  B)  C) 

Figure 3. Images of the prototype shuttle devices used in this study in profile view (A), frontal view (B) and being hoisted onto the vessel during retrieval (C).

- Shroud system. Several shroud systems were constructed consisting of a modified 'slinky pot' with an opening on one end and a closed end cap on the other that is designed to slide down the branch covering the catch during hauling (Figure 4).

A) 

B) 

Figure 4. Schematic of shrouded branchline actively fishing on the seabed (A) and a shroud consisting of a modified 'slinky pot' showing end cap and openings (B).

The two different devices were tested off Newport, OR in May of 2023 on a 56' (17m) chartered fishing vessel with an open deck design and typical boom and winch capacity. The focus of the testing was to investigate (1) the logistics of setting, fishing, and hauling of the two pilot catch protection designs, and (2) the basic performance of the gear on catch rates and fish size compared to non-protected gear in the absence of whales.

Pilot testing with the shuttle device consisted of ten sets, each with two 100 hook skates, one acting as a control, and the other equipped with the shuttle. For the shroud system, pilot testing consisted of single sets with six branch lines of 48' affixed on 100' spacing along the groundline. Ten gangions and hooks were snapped to the branch lines on 4' spacing. Three branch lines had a shroud attached and three branch lines acted as controls. Data collected during the pilot testing of the two types of catch protection devices are currently being analyzed.

The IPHC Secretariat recently received funding (BREP, NOAA Award NA23NMF4720414; Appendix IV) for further testing of the shuttle concept in the presence of depredating Orcas in Alaskan waters. This work is planned for 2024 and will allow for further refinements (e.g., attachment protocols, gangion/hook strength),

statistical testing of catch rates, and catch composition (e.g., size ranges, species, catch volume) when using the devices, as well as allow for quantification of removals of fish from non-shuttle treatments by depredating whales.

RECOMMENDATION/S

That the Commission:

1) **NOTE** paper IPHC-2023-IM099-14, which provides a report on current and planned biological and ecosystem science and research activities contemplated in the IPHC's Five-Year Program of Integrated Research and Monitoring (2022-2026).

APPENDICES

Appendix I: Biological research areas in the 5-Year Program of Integrated Research and Monitoring (2022-2026) and ranked relevance for stock assessment and management strategy evaluation (MSE).

Appendix II: List of ranked research priorities for stock assessment

Appendix III: List of ranked research priorities for management strategy evaluation (MSE)

Appendix IV: Summary of awarded research grants current in 2023

APPENDIX I

Biological research areas in the 5-Year Program of Integrated Research and Monitoring (2022-2026) and ranked relevance for stock assessment and management strategy evaluation (MSE)

Research areas	Research activities	Research outcomes	Relevance for stock assessment	Relevance for MSE	Specific analysis input	SA Rank	MSE Rank	Research priorization
Migration and population dynamics	Population structure	Population structure in the Convention Area	Altered structure of future stock assessments	Improve parametization of the Operating Model	If 4B is found to be functionally isolated, a separate assessment may be constructed for that IPHC Regulatory Area	2. Biological input	1. Biological parameterization and validation of movement estimates and recruitment distribution	2
	Distribution	Assignment of individuals to source populations and assessment of distribution changes	Improve estimates of productivity		Will be used to define management targets for minimum spawning biomass by Biological Region	3. Biological input		2
	Larval and juvenile connectivity studies	Improved understanding of larval and juvenile distribution	Improve estimates of productivity		Will be used to generate potential recruitment covariates and to inform minimum spawning biomass targets by Biological Region	3. Biological input	1. Biological parameterization and validation of movement estimates	2
Reproduction	Histological maturity assessment	Updated maturity schedule	Scale biomass and reference point estimates	Improve simulation of spawning biomass in the Operating Model	Will be included in the stock assessment, replacing the current schedule last updated in 2006	1. Biological input		1
	Examination of potential skip spawning	Incidence of skip spawning			Will be used to adjust the asymptote of the maturity schedule, if/when a time-series is available this will be used as a direct input to the stock assessment			1
	Fecundity assessment	Fecundity-at-age and -size information			Will be used to move from spawning biomass to egg-output as the metric of reproductive capability in the stock assessment and management reference points			1
	Examination of accuracy of current field macroscopic maturity classification	Revised field maturity classification			Revised time-series of historical (and future) maturity for input to the stock assessment			1
Growth	Evaluation of somatic growth variation as a driver for changes in size-at-age	Identification and application of markers for growth pattern evaluation	Scale stock productivity and reference point estimates	Improve simulation of variability and allow for scenarios investigating climate change	May inform yield-per-recruit and other spatial evaluations of productivity that support mortality limit-setting		3. Biological parameterization and validation for growth projections	5
		Environmental influences on growth patterns			May provide covariates for projecting short-term size-at-age. May help to delineate between effects due to fishing and those due to environment, thereby informing appropriate management response			5
		Dietary influences on growth patterns and physiological condition			May provide covariates for projecting short-term size-at-age. May help to deleineate between effects due to fishing and those due to environment, thereby informing appropriate management response			5
Mortality and survival assessment	Discard mortality rate estimate: longline fishery	Experimentally-derived DMR	Improve trends in unobserved mortality	Improve estimates of stock productivity	Will improve estimates of discard mortality, reducing potential bias in stock assessment results and management of mortality limits	1. Fishery yield	1. Fishery parameterization	4
	Discard mortality rate estimate: recreational fishery				Will improve estimates of discard mortality, reducing potential bias in stock assessment results and management of mortality limits			4
	Best handling and release practices	Guidelines for reducing discard mortality			May reduce discard mortality, thereby increasing available yield for directed fisheries	2. Fishery yield		4
Fishing technology	Whale depredation accounting and tools for avoidance	New tools for fishery avoidance/deterence; improved estimation of depredation mortality	Improve mortality accounting	Improve estimates of stock productivity	May reduce depredation mortality, thereby increasing available yield for directed fisheries. May also be included as another explicit source of mortality in the stock assessment and mortality limit setting process depending on the estimated magnitude	1. Assessment data collection and processing		3

APPENDIX II

List of ranked research priorities for stock assessment

SA Rank	Research outcomes	Relevance for stock assessment	Specific analysis input	Research Area	Research activities
1. Biological input	Updated maturity schedule	Scale biomass and reference point estimates	Will be included in the stock assessment, replacing the current schedule last updated in 2006	Reproduction	Histological maturity assessment
	Incidence of skip spawning		Will be used to adjust the asymptote of the maturity schedule, if/when a time-series is available this will be used as a direct input to the stock assessment		Examination of potential skip spawning
	Fecundity-at-age and -size information		Will be used to move from spawning biomass to egg-output as the metric of reproductive capability in the stock assessment and management reference points		Fecundity assessment
	Revised field maturity classification		Revised time-series of historical (and future) maturity for input to the stock assessment		Examination of accuracy of current field macroscopic maturity classification
2. Biological input	Stock structure of IPHC Regulatory Area 4B relative to the rest of the Convention Area	Altered structure of future stock assessments	If 4B is found to be functionally isolated, a separate assessment may be constructed for that IPHC Regulatory Area	Migration and population dynamics	Population structure
3. Biological input	Assignment of individuals to source populations and assessment of distribution changes	Improve estimates of productivity	Will be used to define management targets for minimum spawning biomass by Biological Region		Distribution
	Improved understanding of larval and juvenile distribution		Will be used to generate potential recruitment covariates and to inform minimum spawning biomass targets by Biological Region		Larval and juvenile connectivity studies
1. Assessment data collection and processing	Sex ratio-at-age	Scale biomass and fishing intensity	Annual sex-ratio at age for the commercial fishery fit by the stock assessment	Reproduction	Sex ratio of current commercial landings
	Historical sex ratio-at-age		Annual sex-ratio at age for the commercial fishery fit by the stock assessment		Historical sex ratios based on archived otolith DNA analyses
2. Assessment data collection and processing	New tools for fishery avoidance/deterence; improved estimation of depredation mortality	Improve mortality accounting	May reduce depredation mortality, thereby increasing available yield for directed fisheries. May also be included as another explicit source of mortality in the stock assessment and mortality limit setting process depending on the estimated magnitude	Fishing technology	Whale depredation accounting and tools for avoidance
1. Fishery yield	Physiological and behavioral responses to fishing gear	Reduce incidental mortality	May increase yield available to directed fisheries	Fishing technology	Biological interactions with fishing gear
2. Fishery yield	Guidelines for reducing discard mortality	Improve estimates of unobserved mortality	May reduce discard mortality, thereby increasing available yield for directed fisheries	Mortality and survival assessment	Best handling practices: recreational fishery

APPENDIX III

List of ranked research priorities for management strategy evaluation (MSE)

MSE Rank	Research outcomes	Relevance for MSE	Research Area	Research activities
1. Biological parameterization and validation of movement estimates	Improved understanding of larval and juvenile distribution	Improve parametization of the Operating Model	Migration and population dynamics	Larval and juvenile connectivity studies
	Stock structure of IPHC Regulatory Area 4B relative to the rest of the Convention Area			Population structure
2. Biological parameterization and validation of recruitment variability and distribution	Assignment of individuals to source populations and assessment of distribution changes	Improve simulation of recruitment variability and parametization of recruitment distribution in the Operating Model		Distribution
	Establishment of temporal and spatial maturity and spawning patterns	Improve simulation of recruitment variability and parametization of recruitment distribution in the Operating Model	Reproduction	Recruitment strength and variability
3. Biological parameterization and validation for growth projections	Identification and application of markers for growth pattern evaluation	Improve simulation of variability and allow for scenarios investigating climate change	Growth	Evaluation of somatic growth variation as a driver for changes in size-at-age
	Environmental influences on growth patterns			
	Dietary influences on growth patterns and physiological condition			
1. Fishery parameterization	Experimentally-derived DMRs	Improve estimates of stock productivity	Mortality and survival assessment	Discard mortality rate estimate: recreational fishery

APPENDIX IV

Summary of awarded research grants current in 2023

Project #	Grant agency	Project name	PI	Partners	IPHC Budget ($US)	Management implications	Grant period
1	**Bycatch Reduction Engineering Program-NOAA**	Gear-based approaches to catch protection as a means for minimizing whale depredation in longline fisheries (NOAA Award Number NA21NMF4720534)	IPHC	Deep Sea Fishermen's Union, Alaska Fisheries Science Center-NOAA, industry representatives	$99,700	Mortality estimations due to whale depredation	November 2021 – October 2023
2	**North Pacific Research Board**	Pacific halibut population genomics (NPRB Award No. 2110)	IPHC	Alaska Fisheries Science Center-NOAA	$193,685	Stock structure	February 2022 – January 2024
3	**Bycatch Reduction Engineering Program-NOAA**	Full scale testing of devices to minimize whale depredation in longline fisheries (NOAA Award Number NA23NMF4720414)	IPHC	Alaska Fisheries Science Center-NOAA	$199,870	Mortality estimations due to whale depredation	November 2023 – April 2025
Total awarded ($)					**$493,255**		

IPHC Fishery Regulations: Proposals for the 2023-24 process

PREPARED BY: IPHC SECRETARIAT (B. HUTNICZAK; 27 OCTOBER 2023)

PURPOSE

To provide the Commission with an overview of the IPHC Fishery Regulations proposals that the IPHC Secretariat, Contracting Parties, and other stakeholders have submitted or indicated they intend to submit for consideration by the Commission in the 2023-24 process.

BACKGROUND

Recalling the IPHC Fishery Regulations proposals submission and review process instituted in 2017, this paper is intended to provide an indication of the fishery regulations proposals being submitted to the Commission in the 2023-24 process.

Fishery regulation proposals from the Contracting Parties and other stakeholders are typically received later in the process.

Note DEADLINES: The dates for submission of draft proposals for consideration by the Commission in the 2023-24 process are as follows:

- 99th Session of the IPHC Interim Meeting (IM099) is 31 October 2023;
- 100th Session of the IPHC Annual Meeting (AM100) is 23 December 2023.

DISCUSSION

A list of preliminary titles, subjects, and sponsors for IPHC Fishery Regulations proposals expected to be submitted as part of the 2023-24 process is provided in **Appendix I**.

RECOMMENDATION

That the Commission:

1) **NOTE** paper IPHC-2023-IM099-15, which provides the Commission with an overview of the IPHC Fishery Regulations proposals that the IPHC Secretariat, Contracting Parties, and other stakeholders have submitted or indicated they intend to submit for consideration by the Commission in the 2023-24 process.

APPENDICES

Appendix I: Preliminary titles, subjects, and sponsors for IPHC Fishery Regulations proposals expected to be submitted for consideration in the 2023-24 process.

APPENDIX I

Preliminary titles, subjects, and sponsors for IPHC Fishery Regulations proposals expected to be submitted for consideration in the 2023-24 process.

Ref. No.	Title	Brief description
IPHC Secretariat		
IPHC-2023-IM099-PropA1	Mortality and Fishery Limits (Sect. 5)	To provide clear documentation of mortality and fishery limits within the IPHC Fishery Regulations: Mortality and Fishery Limits (Sect. 5). *Mortality and fishery limits tables will be filled when the Commission adopts TCEYs for the individual IPHC Regulatory Areas.*
IPHC-2023-IM099-PropA2	Commercial Fishing Periods (Sect. 9)	To specify fishing periods for the directed commercial Pacific halibut fisheries within the IPHC Fishery Regulations: Commercial Fishing Periods (Sect. 9).
IPHC-2023-IM099-PropA3	Logs (Sect 19) – Update and alignment of log requirements	To update and align log requirements for Contracting Parties in the IPHC Fishery Regulations.
Contracting Parties		
IPHC-2023-IM099-PropB1 [expected for the AM]	Recreational (Sport) Fishing for Pacific Halibut – IPHC Regulatory Areas 2C, 3A, 3B, 4A, 4B, 4C, 4D, 4E (Sect. 29) - Charter Management Measures in IPHC Regulatory Areas 2C and 3A	**Proponent**: USA (NOAA Fisheries) To propose charter management measures in IPHC Regulatory Areas 2C and 3A reflective of mortality limits adopted by the IPHC and resulting allocations under the North Pacific Fishery Management Council (NPFMC) Pacific halibut Catch Sharing Plan.
Stakeholders		
Null		

DRAFT: Financial Statement for FY2023

PREPARED BY: IPHC SECRETARIAT (D. WILSON, 31 OCTOBER & 28 NOVEMBER 2023)

PURPOSE

To provide the Commission with a DRAFT end of year financial statement for FY2023 (financial period: 1 October 2022 to 30 September 2023), noting the accounts are still being finalised and audited for FY2023.

NOTE: Changes being implemented for US GAAP:

- Implementation of ASC 842, which is a new accounting standard requiring leases to be reported as right to use assets and liabilities on the Balance Sheet instead of rent and lease expense on the Income Statement. Time value of money is considered in the calculation and amortized over the life of the lease. This creates more expense reported at the beginning of the lease and less expense reported toward the end of the lease. Historically, lease expenses have been equal payment per the lease agreements.
- Proper period cut off for matching income and expense of grants. Historically, the Commission reported grant funds as revenue when the cash was received in the bank account. For FY23, grant revenue has been accrued for when the criteria was met, which is when costs covered under the grant agreement are expended. Due to the conversion to GAAP financial reporting, cash received during FY23 should have been reported as revenue in a prior year instead of FY23. A reclass entry has been prepared and provided to the audit firm to be made in the audit system and audit report. The amounts will remain in the Commission's books and records as the income had not been accrued in past periods. The timing of the AK Cost Recovery grant from NOAA was a significant factor as the amounts have not been funded in past periods and multiple periods were awarded in 2023. Cash amounts expected to be received in FY2024 have been accrued as of FY2023 when the costs were expended.

1. STATEMENT OF FINANCIAL POSITION - APPENDIX I, BALANCE SHEET

The total Assets at year-end closing totaled **US$6,092,183.71.**

The total equity or combined fund balance at year-end closing totaled **US$3,393,135.19.**

Fund equity balances at year end:

- General Fund (10): **US$706,071.80**
- Research Fund (20): **US$5,788.14**
- Statistics Fund (30): **-US$141,010.08**
- AK Cost Recovery (35): **US$1,491,412.83**
- FISS Fund (40): **-US$106,371.42**
- Reserve Fund (50): **US$1,437,243.92**

2. STATEMENT OF ACTIVITIES - APPENDIX II, INCOME STATEMENT

For FY2023, the IPHC total income was **US$12,512,053.83**, while the budgeted income was **US$11,251,679.80**. Appendix III provides the Income Statement by Fund.

Carryover from the previous fiscal year (FY2022) by Fund was as follows:

10 - General Fund: US$789,516.16
20 - Research Fund: -US$17,113.02
30 - Statistics Fund: -US$175,332.57
40 - FISS Fund: US$202,928.06
50 - Reserve Fund: US$928,918.35

The total carryover will be provided on the audited Statement of Activities which will be published on 22 December 2023.

3. STATEMENT OF FUNCTIONAL EXPENSES - APPENDIX II, BUDGET TO ACTUALS

The budget to actual report is provided in Appendix II.

The total expenditures were **US$10,853,349.90** which provided for a surplus in revenue over expenditures totalling **US$1,658,703.93**.

4. NOTES TO FINANCIAL STATEMENTS

For FY2023 we refer the Commission to paper IPHC-2023-FAC100-05 Report of the Independent auditors and Financial Statement (FY2023) for annotations to the Financial Statement, which is expected to be published no later than 23 December 2023.

RECOMMENDATION/S

That the Commission:

1) **NOTE** paper IPHC-2023-IM099-16 Rev_1 which includes the DRAFT Financial Statements and supporting documentation for the financial period 01 October 2022 to 30 September 2023 (FY2023).

APPENDICES

Appendix I: Balance Sheet (FY2023)

Appendix II: Income Statement and Budget to Actuals (FY2023)

Appendix III: Income Statement by Fund (FY2023)

Appendix I
Balance Sheet (FY2023): DRAFT

INTERNATIONAL PACIFIC HALIBUT COMMISSION

International Pacific Halibut Commission
Balance Sheet
as of 09/30/2023

Account Number	Account Name	Amount
Assets		
10000	Cash in Bank (Wells Fargo)	$2,827,913.14
11000	Accounts Receivable	$1,456,358.77
11200	Grants Recievable	$820,843.36
13000	Prepaid Expenses	$88,449.26
14000	Deposits	$6,380.77
15000	Furniture, Fixtures and Equipment	$40,859.00
15100	Work in progress	$31,320.00
15700	Lease Assets	$1,219,097.26
15888	Accumulated Amortization	$-394,223.28
15999	Accumulated Depreciation	$-4,814.57
Total Assets		$6,092,183.71
Liabilities		
20000	Purchase Card - US Bank	$17,395.97
20100	Travel Card - US Bank	$13,349.92
20200	AK Airlines Card - Bank of America	$587.06
21000	Accounts Payable	$507,239.77
21001	Accrued expenses	$5,440.26
21002	Deferred revenue	$72,371.00
22000	Payroll Tax Liabilities	$-12,357.43
22100	Payroll Benefit Liabilities	$1,238,990.49
22300	Payroll Reimbursement Clearing	$2,117.86
23300	Lease Liabilities	$850,921.21
23500	Interest Payable	$2,992.41
Total Liabilities		$2,699,048.52
Equity		
30100	10 - General	$706,071.80
30200	20 - Research	$5,788.14
30300	30 - Statistics	$-141,010.08
30350	35 - AK Cost Recovery	$1,491,412.83
30400	40 - FISS	$-106,371.42
30500	50 - Reserve	$1,437,243.92
Total Equity		$3,393,135.19
Total Liabilities + Total Equity		$6,092,183.71

Appendix II
Income Statement and Budget to Actuals (FY2023): DRAFT

INTERNATIONAL PACIFIC HALIBUT COMMISSION

International Pacific Halibut Commission
Income Statement
for the period of 10/01/2022 to 09/30/2023

Account Number	Account Name	Amount	Annual Budget
Income			
40000	Contracting Party Contributions	$5,172,167.00	$5,058,167.00
40050	IFC Pension	$0.00	$255,696.00
40055	Headquarters (Lease & Maintenance)	$489,250.00	$489,250.00
40060	Other Income	$71,292.26	$170,200.00
40100	Grants, Contracts & Agreements	$2,548,440.97	$853,849.30
40200	Interest Income	$15,315.52	$772.50
40350	Fish Sales	$4,127,213.30	$4,335,000.00
42000	Gain/Loss	$-370.22	$0.00
4998	Fund Transfer	$88,745.00	$88,745.00
Total Income		$12,512,053.83	$11,251,679.80
Expense			
50000	Salaries & Wages	$4,483,693.18	$4,437,665.82
50100	Benefits	$1,298,980.11	$1,681,928.37
50200	Training & Education	$56,627.36	$120,527.00
50300	Personnel Related Expenses	$10,827.43	$21,965.00
51000	Publications	$5,166.48	$13,100.00
51100	Mailing and Shipping	$110,617.16	$133,650.00
51200	Travel	$198,453.60	$301,819.73
51300	IPHC Meetings	$163,885.15	$128,500.00
51400	Technology	$106,240.10	$165,050.00
52000	Professional Fees	$152,150.50	$222,058.48
52100	Vessel Expenses	$428,328.88	$544,000.00
52200	Other Fees and Charges	$80,138.24	$87,500.57
52300	Leases and Contracts	$2,106,802.09	$1,770,183.00
54000	Communications	$37,670.95	$38,890.00
53000	Equipment Expense	$26,372.87	$42,100.00
53100	Supplies Expense	$880,003.91	$905,985.00
53200	Maintenance and Utilities	$51,818.95	$131,285.00
53300	Facility Rentals	$549,725.67	$476,062.64
55100	Other Expenses	$396.53	$0.00
55400	Capitalized Fixed Assets	$-6,493.00	$0.00
55410	Depreciation Expense	$3,847.31	$0.00
5998	Fund Transfer	$88,745.00	$88,745.00
56444	AR Adjustments	$19,351.43	$0.00
Total Expense		$10,853,349.90	$11,311,015.61
Net Income (Loss)		$1,658,703.93	$-59,335.81

Appendix III
Income Statement by Fund (FY2023): DRAFT

INTERNATIONAL PACIFIC HALIBUT COMMISSION

International Pacific Halibut Commission
Income Statement by Fund
for the period of 10/01/2022 to 09/30/2023

Account Number	Account Name	10 - General	20 - Research	30 - Statistics	35 - AK Cost Recovery	40 - FISS
Income						
40000	Contracting Party Contributions	$ 3,034,355.43	$ 887,685.80	$ 1,136,125.77	$ 0.00	$ 114,000.00
40055	Headquarters (Lease & Maintenance)	$ 489,250.00	$ 0.00	$ 0.00	$ 0.00	$ 0.00
40060	Other Income	$ 18,980.59	$ 6,936.82	$ 17,601.90	$ 20,535.37	$ 7,237.58
40100	Grants, Contracts & Agreements	$ 0.00	$ 223,544.61	$ 0.00	$ 2,290,607.36	$ 34,289.00
40200	Interest Income	$ 15,315.52	$ 0.00	$ 0.00	$ 0.00	$ 0.00
40350	Fish Sales	$ 0.00	$ 0.00	$ 0.00	$ 0.00	$ 4,127,213.30
42000	Gain/Loss	$ 229.66	$ 0.00	$ (225.59)	$ 0.00	$ (374.29)
4998	Fund Transfer	$ 88,745.00	$ 0.00	$ 0.00	$ 0.00	$ 0.00
Total Income		**$ 3,646,876.20**	**$ 1,118,167.23**	**$ 1,153,502.08**	**$ 2,311,142.73**	**$ 4,282,365.59**
Expense						
50000	Salaries & Wages	$ 1,619,453.76	$ 620,916.52	$ 784,473.82	$ 504,617.53	$ 954,231.55
50100	Benefits	$ 504,744.13	$ 227,219.51	$ 227,175.32	$ 184,311.74	$ 155,529.41
50200	Training & Education	$ 32,221.32	$ 1,316.72	$ 4,758.32	$ 10,011.12	$ 8,319.88
50300	Personnel Related Expenses	$ 1,527.43	$ 0.00	$ 900.00	$ 3,100.00	$ 5,300.00
51000	Publications	$ 4,037.36	$ 560.72	$ 148.03	$ 420.37	$ 0.00
51100	Mailing and Shipping	$ 5,005.03	$ 5,051.17	$ 1,199.52	$ 1,334.14	$ 98,027.30
51200	Travel	$ 56,596.04	$ 15,139.69	$ 6,652.83	$ 21,066.55	$ 98,998.49
51300	IPHC Meetings	$ 163,704.10	$ 0.00	$ 0.00	$ 0.00	$ 181.05
51400	Technology	$ 98,141.71	$ 348.00	$ 1,456.00	$ 0.00	$ 6,294.39
52000	Professional Fees	$ 147,952.11	$ 543.39	$ 0.00	$ 0.00	$ 3,655.00
52100	Vessel Expenses	$ 0.00	$ 0.00	$ 0.00	$ 0.00	$ 428,328.88
52200	Other Fees and Charges	$ 47,752.93	$ 0.00	$ 786.45	$ 8,650.95	$ 22,947.91
52300	Leases and Contracts	$ 4,272.51	$ 46,000.00	$ 1,359.42	$ 14,757.74	$ 2,040,412.42
54000	Communications	$ 34,775.24	$ 0.00	$ 384.50	$ 941.68	$ 1,569.53
53000	Equipment Expense	$ 0.00	$ 4,534.66	$ 637.25	$ 11,892.82	$ 9,308.14
53100	Supplies Expense	$ 39,349.09	$ 53,605.39	$ 690.32	$ 32,175.96	$ 754,183.15
53200	Maintenance and Utilities	$ 47,956.88	$ 2,228.88	$ 647.19	$ 0.00	$ 986.00
53300	Facility Rentals	$ 498,382.59	$ 0.00	$ 0.00	$ 32,653.53	$ 18,689.55
55100	Other Expenses	$ 396.53	$ 0.00	$ 0.00	$ 0.00	$ 0.00
55400	Capitalized Fixed Assets	$ 0.00	$ (6,493.00)	$ 0.00	$ 0.00	$ 0.00
55410	Depreciation Expense	$ 0.00	$ 1,525.89	$ 0.00	$ 0.00	$ 2,321.42
56444	AR Adjustments	$ 9,961.97	$ 0.00	$ 0.00	$ 0.00	$ 9,389.46
Total Expense		**$ 3,316,230.73**	**$ 972,497.54**	**$ 1,031,268.97**	**$ 825,934.13**	**$ 4,618,673.53**
Net Income (Loss)		**$ 330,645.47**	**$ 145,669.69**	**$ 122,233.11**	**$ 1,485,208.60**	**$ (336,307.94)**

Summary

Beginning Fund Balance	$ 789,516.16	$ (17,113.02)	$ (175,332.57)	$ 0.00	$ 202,928.06
+ Other Fund Balance Movements	$ (414,089.83)	$ (122,768.53)	$ (87,910.62)	$ 6,204.23	$ 27,008.46
+ Net Income / (Loss)	$ 330,645.47	$ 145,669.69	$ 122,233.11	$ 1,485,208.60	$ (336,307.94)
= Ending Fund Balance	**$ 706,071.80**	**$ 5,788.14**	**$ (141,010.08)**	**$ 1,491,412.83**	**$ (106,371.42)**

IPHC Fishery Regulations:

Mortality and Fishery Limits (Sect. 5)

PREPARED BY: IPHC SECRETARIAT (27 OCTOBER 2023)

PURPOSE

To provide clear documentation of mortality and fishery limits within the IPHC Fishery Regulations: Mortality and Fishery Limits (Sect. 5).

BACKGROUND

The Commission considers new and revised IPHC Fishery Regulations, including proposed changes to mortality and fishery limits, and makes changes as deemed necessary at each Annual Meeting. In the absence of changes being deemed necessary, the existing IPHC Fishery Regulations remain in effect.

In accordance with the IPHC Convention[1], the Contracting Parties may also implement fishery regulations that are more restrictive than those adopted by the IPHC.

This proposal is to amend IPHC Fishery Regulations Section 5, '*Mortality and Fishery Limits,'* to reflect Total Constant Exploitation Yield (TCEY) values adopted by the Commission and the applicable fishery sector limits resulting from those TCEY values according to existing Contracting Party domestic catch sharing arrangements.

DISCUSSION

Changes to IPHC Fishery Regulations Section 5, '*Mortality and Fishery Limits,'* provide clear documentation of the limits for fishery sectors within defined Contracting Party domestic catch sharing arrangements, which are themselves tied to the mortality distribution (TCEY) decisions of the Commission. This section includes a table of the TCEY values adopted by the Commission for clarity, and to emphasize the role of the TCEY values as the basis for the subsequent setting of sector allocations through the operation of the Contracting Parties' existing catch sharing arrangements. Both the TCEY and the fishery sector allocation table will be populated as TCEY decisions are made for each IPHC Regulatory Area by the Commission during the 100th Session of the IPHC Annual Meeting (AM100) in January 2024.

Benefits/Drawbacks: The benefit is a clear identification of fishery limits resulting from Commission decisions on distributed mortality (TCEY) values for each IPHC Regulatory Area. The potential drawback is a misconception that the resulting catch sharing arrangements and associated fishery limits are within the Commission's mandate, when in fact they are the

[1] The Convention between Canada and the United States of America for the Preservation of the [Pacific] Halibut Fishery of the Northern Pacific Ocean and Bering Sea.

responsibility of the Contracting Parties. The intention is to reinforce that distinction by clarifying which decisions are made by the Commission.

Sectors Affected: This proposal affects all sectors of the Pacific halibut fishery.

Appendix A provides details on the suggested regulatory language.

ADDITIONAL DOCUMENTATION

None

RECOMMENDATIONS

That the Commission:

1) **NOTE** regulatory proposal IPHC-2023-IM099-PropA1, which provides the Commission with an opportunity to recall the format of the IPHC Fishery Regulations: *Mortality and Fishery Limits* (Sect. 5), to be populated at the 100th Session of the IPHC Annual Meeting (AM100) in January 2024.

APPENDICES

Appendix A: Suggested regulatory language

APPENDIX A

SUGGESTED REGULATORY LANGUAGE

5. Mortality and Fishery Limits

(1) The Commission has adopted the following distributed mortality (TCEY) values:

IPHC Regulatory Area	Distributed mortality limits (TCEY) (net weight)	
	Tonnes (t)	Million Pounds (Mlb)
Area 2A (California, Oregon, and Washington)		
Area 2B (British Columbia)		
Area 2C (southeastern Alaska)		
Area 3A (central Gulf of Alaska)		
Area 3B (western Gulf of Alaska)		
Area 4A (eastern Aleutians)		
Area 4B (central and western Aleutians)		
Areas 4CDE (Bering Sea)		
Total		

(2) The fishery limits resulting from the IPHC-adopted distributed mortality (TCEY) limits and the existing Contracting Party catch sharing arrangements are as follows, recognising that each Contracting Party may implement more restrictive limits:

IPHC Regulatory Area	Fishery limits (net weight)	
	Tonnes (t)	Million Pounds (Mlb)*
Area 2A (California, Oregon, and Washington)		
Non-tribal directed commercial (south of Pt. Chehalis)		
Non-tribal incidental catch in salmon troll fishery		
Non-tribal incidental catch in sablefish fishery (north of Pt. Chehalis)		
Treaty Indian commercial		
Treaty Indian ceremonial and subsistence (year-round)		
Recreational – Washington		
Recreational – Oregon		
Recreational – California		
Area 2B (British Columbia) (combined commercial and recreational)		
Commercial fishery		
Recreational fishery		
Area 2C (southeastern Alaska) (combined commercial and guided recreational)		

Commercial fishery (includes XX Mlb landings and XX Mlb discard mortality)		
Guided recreational fishery (includes landings and discard mortality)		
Area 3A (central Gulf of Alaska) (combined commercial and guided recreational)		
Commercial fishery (includes XX Mlb landings and XX Mlb discard mortality)		
Guided recreational fishery (includes landings and discard mortality)		
Area 3B (western Gulf of Alaska)		
Area 4A (eastern Aleutians)		
Area 4B (central and western Aleutians)		
Areas 4CDE (Bering Sea)		
Area 4C (Pribilof Islands)		
Area 4D (northwestern Bering Sea)		
Area 4E (Bering Sea flats)		
Total		

* Allocations resulting from the IPHC Regulatory Area 2A Catch Share Plan are listed in *pounds*.

IPHC Fishery Regulations:

Commercial Fishing Periods (Sect. 9)

PREPARED BY: IPHC SECRETARIAT (27 OCTOBER 2023)

PURPOSE

To specify fishing periods for the directed commercial Pacific halibut fisheries within the IPHC Fishery Regulations: Commercial Fishing Periods (Sect. 9).

BACKGROUND

Each year, the International Pacific Halibut Commission (IPHC) selects fishing period dates for the directed commercial Pacific halibut fisheries in each of the IPHC Regulatory Areas. Historically, the first management measures implemented by the IPHC were to limit periods when fishing was allowed. Biological factors considered in the past when setting fishing period dates included migration and spawning considerations, neither of which is now used as a basis for determining fishing periods.

These dates have varied from year to year, and in recent years have allowed directed commercial fishing to begin sometime in March and end sometime in November or December for all IPHC Regulatory Areas with the exception of the IPHC Regulatory Area 2A.

DISCUSSION

The IPHC Secretariat proposes that the commercial fishing periods for all IPHC Regulatory Areas be set at AM100 following stakeholder input.

Moreover, with the transition of management authority of the IPHC Regulatory Area 2A non-tribal directed commercial Pacific halibut fishery from the IPHC to the Pacific Fishery Management Council (PFMC) and NOAA Fisheries (per final rule 87 FR 74322 published on 5 December 2022), the Commission no longer needs to consider setting dates for the 2A non-tribal directed commercial fishery and the dates will be set by the Contracting Party within the overall commercial fishing period dates.This is consistent with the IPHC Convention[1], which states that the Contracting Parties may implement fishery regulations that are more restrictive than those adopted by the IPHC.

Benefits/Drawbacks: This proposal clearly indicates that the decision on commercial fishing periods is within the Commission's mandate and the season dates can be changed annually. Moreover, it clarifies that more strict fishing periods can be implemented by the Contracting Parties.

Sectors Affected: Commercial Pacific halibut fisheries in each IPHC Regulatory Area.

Appendix A provides details on the suggested regulatory language.

[1] The Convention between Canada and the United States of America for the Preservation of the [Pacific] Halibut Fishery of the Northern Pacific Ocean and Bering Sea.

ADDITIONAL DOCUMENTATION

None

RECOMMENDATIONS

That the Commission:

1) **NOTE** regulatory proposal IPHC-2023-IM099-PropA2, which provides the Commission with an opportunity to recall the format of the IPHC Pacific Halibut Fishery Regulations: *Commercial Fishing Periods* (Sect. 9), to be filled at the 100th Session of the IPHC Annual Meeting (AM100) in January 2024.

APPENDICES

Appendix A: Suggested regulatory language

APPENDIX A
SUGGESTED REGULATORY LANGUAGE

9. Commercial Fishing Periods

(1) The fishing periods for each IPHC Regulatory Area apply where the fishery limits specified in section 5 have not been taken.

(2) Unless the Commission specifies otherwise, commercial fishing for Pacific halibut in all IPHC Regulatory Areas may begin no earlier in the year than 1200 local time on ~~10 March~~DD MMMM.

(3) All commercial fishing for Pacific halibut in all IPHC Regulatory Areas shall cease for the year at 1200 local time on ~~7 December~~DD MMMM.

(4) Regulations pertaining to the non-tribal directed commercial fishing[2] periods in the IPHC Regulatory Area 2A will be promulgated by NOAA Fisheries and published in the Federal Register. This fishery will occur between the dates and times listed in paragraphs (2) and (3) of this Section.

(5) Notwithstanding paragraph (4) of this Section, an incidental catch fishery[3] is authorized during the sablefish seasons in IPHC Regulatory Area 2A in accordance with regulations promulgated by NOAA Fisheries. This fishery will occur between the dates and times listed in paragraphs (2) and (3) of this section.

(6) Notwithstanding paragraph (4) of this Section, an incidental catch fishery is authorized during salmon troll seasons in IPHC Regulatory Area 2A in accordance with regulations promulgated by NOAA Fisheries. This fishery will occur between the dates and times listed in paragraphs (2) and (3) of this section.

[2] The non-tribal directed fishery is restricted to waters that are south of Point Chehalis, Washington, (46°53.30′ N. latitude) under regulations promulgated by NOAA Fisheries and published in the Federal Register.

[3] The incidental fishery during the directed, fixed gear sablefish season is restricted to waters that are north of Point Chehalis, Washington, (46°53.30′ N. latitude) under regulations promulgated by NOAA Fisheries at 50 CFR 300.63. Landing restrictions for Pacific halibut retention in the fixed gear sablefish fishery can be found at 50 CFR 660.231.

IPHC Fishery Regulations:

Logs (Sect 19) – Update and alignment of log requirements

PREPARED BY: IPHC SECRETARIAT (27 OCTOBER 2023)

PURPOSE

To update and align logs requirements for Contracting Parties in the IPHC Fishery Regulations.

BACKGROUND

IPHC Fishery Regulations stipulate that operators of Canadian and U.S.A.[1] vessels fishing for Pacific halibut must maintain an accurate log of Pacific halibut fishing operations. These operations are recorded in one of the approved logbooks and collected to support the Commission's objectives.

Detailed log requirements for date, location, amount of gear used, and amount of Pacific halibut taken daily appeared in the Pacific halibut regulations[2] as early as 1934, and later as a part of the section on *Statistical Return by Vessels* (since 1938) or *Licensing of Vessels* (since 1974). A detailed section on logs was introduced to the IPHC Fishery Regulations for the first time in 1984.

DISCUSSION

This proposal combines six components for Commission's consideration. Components can be adopted individually, offering the flexibility to adopt either the entire set or select specific elements as needed.

Component 1: Submission of missing logs

Differentiation in log requirements between Contracting Parties was introduced in 1998, when the log requirements were imposed on all Canadian vessels engaging in Pacific halibut fishing, regardless of the vessel size. The requirement for U.S.A. vessels remains applicable to vessels that have an overall length of 26 feet (7.9 meters) or greater. At the same time, an additional requirement was imposed on Canadian vessels that read as follows:

> "*The log referred to in paragraph (4)* [applicable to Canadian vessels fishing for Pacific halibut] *shall be* […]
> (f) *mailed to the Department of Fisheries and Oceans (yellow copy) and IPHC (white copy) within seven days of offloading*." (Section 16, par. 5)

[1] Applicable to U.S.A. vessels that have an overall length of 26 feet (7.9 meters) or greater. See IPHC Fishery Regulations 2023, Sect. 19(1).
[2] At the time, titled International Fisheries Commission Pacific Halibut Fishery Regulations.

A version of this requirement with minor wording modification[3] remains in the current (2023) regulations at Section 19, par. 7:

> "*The log referred to in paragraph (5)* [applicable to Canadian vessels fishing for Pacific halibut] *shall be* […]
> (f) *submitted to the Commission within seven days of the final offload if not previously collected by a Commission employee*." (Section 19, par. 7)

In contrast to the requirements for Canadian vessels, under the current regulations, the submission of missing logbook data is not required from U.S.A. vessel operators, unless it is specifically requested by the Commission. Currently, logs are collected by authorized representatives of the IPHC at the time of landing. If there is no Commission representative present at the offload site, and the logs were not collected or voluntarily submitted by the operators by the end of the season, the Commission issues "missing log letters" to vessel operators to collect the missing data.[4] The letters request missing information under the authority of Section 19, par. 3(d), which stipulates that logs shall be "open to inspection by any authorized officer or any authorized representative of the Commission upon demand."

The proposed change to regulations will clarify that logs not previously collected by the Commission must be submitted to the Commission within a specific number of days after the close of the season. The intention of this added clarity and specificity is to prevent data gaps in the information used for various IPHC products, for example, the Pacific halibut stock assessment.

Should the proposed change be adopted, the IPHC will develop an information webpage that will clarify how information recorded in each eligible logbook (see Section 19, par. 1) shall be transmitted to the Commission if it is not collected by an authorized representative of the Commission upon offload. The proposed change will also address situations where logbook data is already transmitted to the Commission in an alternative way, for example, per formal agreement with an agency that is collecting information reported in a non-IPHC issued eligible logbook (see, for example, a recently signed Data Sharing Agreement with NOAA West Coast Region).

Component 2: Consistent reporting requirements

The IPHC Secretariat proposes consistent requirements with respect to reporting fishing location (using latitude and longitude coordinates) and daily activity (reporting by set instead of by day). The proposed changes to Section 19, par. 2(c) and 2(e) will ensure consistency of the submitted data, rendering it more usable for IPHC products. Alternative reporting permitted by the existing regulations relies on an outdated approach and does not align with the fields in the logbook forms approved by the IPHC and listed in Section 19, par. 1.

[3] Since 2000, IPHC was requiring the yellow copy of the logbook instead of the white copy. In 2001, a clarification was added that yellow copy was to be sent to the Commission only "*if not collected by an International Pacific Halibut Commission employee*" (Section 16, par. 7(g)). In 2017, the wording "*mailed*" was replaced with a more flexible "*submitted*" provision (Section 16, par. 7(g)).

[4] Outstanding logs may be collected by the representative of the Commission during the proceeding offload. Number of logs are also sent to the Commission throughout the year, although this is not formally required by the IPHC Fishery Regulations. It is a common practice to send missing logs ahead of the Secretariat's prompt at the end of the fishing season.

Component 3: List of eligible logbooks

The IPHC Secretariat reviewed the list of eligible logbooks for U.S.A. vessels fishing for Pacific halibut (see Section 19, par. 1 and Appendix B) and confirmed that the Alaska hook-and-line logbook provided by Petersburg Vessel Owners Association is out of print.[5] The proposed change includes removal of a legacy provision that is no longer in use. The revised regulatory language also uses the updated name of the logbook provided by IPHC (IPHC Pacific halibut logbook), updated name of the NOAA Daily Fishing Logbook (aligning it with the name provided on NOAA Fisheries website and in line with 50 CFR 679.5(c)(3)(i)(B)), added equivalent applicable to catcher/processors (Catcher/Processor Longline and Pot Gear Daily Cumulative Production Logbook), reorders the list and moves the most applicable logbooks to the top, and splits Area 2A-specific provisions for consistent use of lists in paragraphs.

Component 4: Writing in the logs

The IPHC Secretariat proposes adding a paragraph to Section 19 that highlights the importance of writing that is clear and legible for data entry. While electronic monitoring is becoming more prevalent, it is important to note that vessel operators who opt for traditional paper logbooks are responsible for providing information that can be efficiently transferred to the IPHC database for use in IPHC products.

Component 5: Electronic logbooks approved by NOAA Fisheries

NOAA Fisheries have a third-party vendor beta testing an electronic logbook in Alaska serving as a replacement for Catcher Vessel Longline and Pot Gear Daily Fishing Logbook (DFL). This logbook may be approved for full use for the 2024 fishing season. One of the requirements for approval is the integration with eLandings. The suggested language will provide clarity that equivalent of approved logbook (in this case, DFL) in electronic format approved by NOAA Fisheries, but not necessarily provided by NOAA Fisheries, is eligible for reporting Pacific halibut. This component is conditional on cooperation between the IPHC and the vendor (Deckhand) on the integration of the tested system into the IPHC process, in particular with respect to convenient access to data by the Commission representatives present at the offload site. Discussions are ongoing and feasibility update will be provided to the Commission before the Annual Meeting.

Component 6: Electronic logbooks approved by IPHC

The IPHC is discussing with the same vendor (Component 5) introducing the electronic equivalent of IPHC Pacific halibut logbook. Should the discussion be successful and the data-sharing process vetted, the suggested regulatory language would offer the flexibility of approving electronic logbook for users of the IPHC paper-based logbooks. Approval of any electronic equivalent of IPHC logbook will be conditional on the vender accommodating IPHC data verification process, including convenient access to data by the Commission representatives present at the offload site and post-season data access.

Benefits/Drawbacks: The benefit of the suggested regulatory change (Component 1) is a clear indication that data not collected by the IPHC at the time of landing must still be submitted to the Commission. A clear process is expected to reduce the need for missing logs letters over time. Furthermore, this regulatory proposal would lead to more standardization in IPHC data reporting (Component 2), remove legacy provisions (Component 3), and make explicit that data provided

[5] Confirmed by Megan O'Neil, Petersburg Vessel Owner's Association Executive Director.

in logbooks must be usable (Component 4). Lastly, adding flexibility to allow the use of the electronic logbooks approved by NOAA Fisheries (Component 5) or IPHC (Component 5) will prevent the need for duplicative effort when reporting Pacific halibut for operators who intend to utilize third-party vendor electronic logbooks. Potential drawbacks include any burden imposed on vessel operators who are accustomed to reporting their Pacific halibut operations by day or using direction and distance from a point of land for location, although this has been identified as minimal (Component 2).

Sectors Affected: This proposal directly affects mainly commercial Pacific halibut fishery in all U.S.A. IPHC Regulatory Areas (only component 4 would be applicable to all vessels). However, all sectors and regions stand to benefit from better informed IPHC products, for example, the Pacific halibut stock assessment.

Appendix A provides details on the suggested regulatory language.

Appendix B provides details on logbooks approved by the IPHC for U.S.A. vessels.

ADDITIONAL DOCUMENTATION

None

RECOMMENDATIONS

That the Commission:

1) **NOTE** draft of the regulatory proposal IPHC-2023-IM099-PropA3, which updates and aligns log requirements for Contracting Parties in the IPHC Fishery Regulations.

APPENDICES

Appendix A: Suggested regulatory language.

Appendix B: Logbooks approved by the IPHC for U.S.A. vessels.

APPENDIX A

SUGGESTED REGULATORY LANGUAGE

19. Logs

(1) The operator of any U.S. vessel fishing for Pacific halibut that has an overall length of 26 feet (7.9 meters) or greater shall maintain an accurate log of Pacific halibut fishing operations.

(2) The operator of a vessel fishing in waters in and off Alaska must use one of the following logbooks: [Component 3]

(a) IPHC Pacific halibut logbook (or logbook previously provided by IPHC) or IPHC-approved electronic equivalent [Component 6];

(b) ~~the Groundfish/IFQ~~ Catcher Vessel Longline and Pot Gear Daily Fishing Logbook or Catcher/Processor Longline and Pot Gear Daily Cumulative Production Logbook, in electronic or paper form, provided or approved by NOAA Fisheries [Component 5];

(c) ~~the Alaska~~ hook-and-line logbook provided by ~~Petersburg Vessel Owners Association or~~ Alaska Longline Fishermen's Association; or

(d) ~~the~~ Alaska Department of Fish and Game (ADFG) longline-pot logbook.

(3) The operator of a vessel fishing in IPHC Regulatory Area 2A must use either: [Component 3]

(a) IPHC Pacific halibut logbook (or logbook previously provided by IPHC) or IPHC-approved electronic equivalent [Component 6];

(b) ~~the~~ Oregon Department of Fish and Wildlife (ODFW) Fixed Gear Logbook; or

(c) Pacific Coast Groundfish non-trawl logbook provided by NOAA Fisheries.

(~~2~~4) The logbooks referred to in paragraphs (~~1~~2) and (3) must include the following information:

(a) the name of the vessel and the State (ADFG, WDFW, ODFW, or CDFW) or Tribal ID number;

(b) the date(s) upon which the fishing gear is set or retrieved;

(c) the latitude and longitude coordinates [Component 2] ~~or a direction and distance from a point of land~~ for each set ~~or day~~;

(d) the number of skates deployed or retrieved, and number of skates lost; and

(e) the total weight or number of Pacific halibut retained for each set [Component 2] ~~or day~~.

(~~3~~5) The logbooks referred to in paragraphs (~~1~~2) and (3) shall be:

(a) maintained on board the vessel;

(b) updated not later than 24 hours after 0000 (midnight) local time for each day fished and prior to the offloading or sale of Pacific halibut taken during that fishing trip;

(c) retained for a period of two years by the owner or operator of the vessel;

(d) open to inspection by an authorized officer or any authorized representative of the Commission upon demand; ~~and~~

(e) kept on board the vessel when engaged in Pacific halibut fishing, during transits to port of landing, and until the offloading of all Pacific halibut is completed~~.~~; [Component 1] and

(f) submitted to the Commission within 30 days of the season closing date if not previously collected by an authorized representative of the Commission or otherwise made available to the Commission.

[…]

(11) [Component 4] Writing in a log referred to in this Section shall be clear and legible.

APPENDIX B

LOGBOOKS APPROVED BY THE IPHC FOR U.S.A. VESSELS

No	Logbook	Approved since	Notes
1.	IPHC Pacific halibut logbook (or logbook previously provided by IPHC)[1]	1998	
2.	Groundfish/Individual Fishing Quota (IFQ) Longline and Pot Gear Daily Fishing Logbook provided by NOAA Fisheries (DFL logbook)[2]	1998	Accepted for reporting in 1997[3] Electronic format allowed since 2016
3.	Alaska hook-and-line logbook provided by Petersburg Vessel Owners Association	1998	Out of print (confirmed by PVOA)
4.	Alaska hook-and-line logbook provided by Alaska Longline Fishermen's Association	1998	
5.	Alaska Department of Fish and Game (ADFG) longline-pot logbook	2001	
6.	Oregon Department of Fish and Wildlife (ODFW) Fixed Gear Logbook	2012	
7.	Pacific Coast Groundfish non-trawl logbook provided by NOAA Fisheries	2023	
8.	WDFW Voluntary Sablefish Logbook	2008	Discontinued in 2023

(1) Printed with various headings since 1998; *IPHC Pacific halibut logbook* heading since 2019.
(2) Initially written into the regulations as "groundfish daily fishing logbook provided by NMFS."
(3) Until 1996, the regulations required accurate log of all Pacific halibut fishing operations, but did not specify the format. In 1997, regulations stipulated that "log can be recorded in the groundfish daily fishing logbooks provided by NMFS," but specific logbooks became a requirement only in 1998.

Stakeholder comments on IPHC Fishery Regulations or published regulatory proposals

PREPARED BY: IPHC SECRETARIAT (B. HUTNICZAK; 27 OCTOBER 2023)

PURPOSE

To provide the Commission with a consolidated document containing comments from stakeholders on IPHC Fishery Regulations or published regulatory proposals submitted to the Commission for its consideration at the 99th Session of the IPHC Interim Meeting (IM099).

BACKGROUND

The IPHC Secretariat has continued to make improvements to the Fishery Regulations portal on the IPHC website, which includes instructions for stakeholders to submit comments to the Commission for its consideration. Specifically:

> "*Informal statements or comments on IPHC Fishery Regulations or published regulatory proposals can be submitted using the form below up until the day before the IPHC Session. Submitted comments will be collated into a single document and provided to the Commissioners at the IPHC Session.*"

Comments may be submitted using the IPHC Stakeholder Comment Form.

DISCUSSION

Table 1 provides a list of the stakeholder comments which are provided in full in the Appendices. The IPHC Secretariat does not provide commentary on the statements, but simply collates them in this document for the Commission's consideration.

Table 1. Statements from stakeholders received by noon on 3 October 2023.

Appendix No.	Title and author	Date received
Appendix I	Fabian Grutter	3 October 2023
Appendix II	Shawn McManus, Deep Sea Fishermen's Union of the Pacific	25 October 2023
Appendix III	TBD	

APPENDICES

As listed in Table 1.

APPENDIX I

Statement by Fabian Grutter

Section of IPHC Fishery Regulations or regulatory proposal reference the comment will refer to	NA
Submitted comment	

Fabian Grutter
1302 Sawmill Cr. Rd. #40
Sitka, AK 99835
907-752-0100

9/20/2023

International Pacific Halibut Commission
2320 West Commodore Way, STE 300
Seattle, WA 98199

Dear Halibut Commission,

I am writing to you today because of my concern for the serious decline that I am seeing in the halibut population. Every summer I see more out of state boats, faster charter boats, and more illegal activity associated with the substance Halibut harvest and the excessively high legal catch limits. We need more ADF&G and NOAA enforcement behind this; especially in the outer reach areas such as the back side of Baranoff Island in Sitka.

I am a lifelong resident of Sitka Alaska. My father and I purchased halibut quota in the mid 1990's. I have fished out of a 19' skiff catching 10,000 pounds of halibut every summer. As I slowly purchased more quota in the early 2000's, I grew my boat size to a 34' gillnetter. At one time my quota was 15,000 Lbs., and it is now down to 7,000. This is a serious reduction due to the decline in halibut.

There are a few things I would like to propose to the Halibut commission. First, higher fines for the sport charter fisherman, subsistence, personal use, and sport residents. Second, we need to lower the resident daily quota for halibut from 2 to 1. The subsistence quota should be 3 halibut on a boat at a time with a limit of 5 halibut per person per year.

If something is not done soon, there is not going to be many more halibut left. Halibut is a slow growing fish and does not quickly replenish its population. Now is our time to act.

Thank you for listening to my testimony and proposal. Seeing the declines in halibut since I started fishing in the 1990's is a huge concern and needs to be addressed.

Sincerely,

Fabian Grutter

APPENDIX II

Statement by Shawn McManus, Deep Sea Fishermen's Union of the Pacific

Section of IPHC Fishery Regulations or regulatory proposal reference the comment will refer to	NA
Submitted comment	In the event that a FISS is not conducted in an IPHC Regulatory Area(s), the TAC for the un-surveyed Regulatory Area(s) shall not be increased using extrapolated historical FISS data for the following fishing season. For example, in 2021 there were no FISS conducted in any of the Area 4 Regulatory Areas. Yet, despite the lack of current FISS in those Regulatory Areas, the TAC was increased in many of those Areas using extrapolated FISS data for the 2022 fishing season. Those same Regulatory Areas are again lacking FISS for 2023. We are concerned that the lack of annual FISS data does not provide the critical up to date data necessary to increase and effectively manage a Regulatory Area(s) TAC. In fact, from a conservation and sustainability standpoint, without the annual FISS data, we are hardly comfortable with a TAC status quo for the affected Regulatory Area(s). The abovementioned problem is seen as a harvest control rule. "No IPHC Regulatory Area shall see an increase in TAC without an annual FISS which indicates the action of raising the TAC is warranted"

APPENDIX III

Statement by xx

Section of IPHC Fishery Regulations or regulatory proposal reference the comment will refer to	
Submitted comment	

IPHC data products – progress report

PREPARED BY: IPHC SECRETARIAT (B. HUTNICZAK; 28 NOVEMBER 2023)

PURPOSE

To provide the Commission with an overview of steps taken to improve the overall quality and usability of publicly available IPHC data products.

BACKGROUND

Distribution of Pacific halibut information is a primary goal of the International Pacific Halibut Commission (IPHC). Historically conducted through print publication, the IPHC's website, www.iphc.int, is now the principal method of information dissemination.

DISCUSSION

The intent of the IPHC is to allow free access to all non-confidential information pertaining to Pacific halibut. Static data tables have been published by the International Pacific Halibut Commission Secretariat since the organisation's inception. Beginning in 2018, interactive tools such as Tableau and R Shiny have been utilised to better visualise the data collected by the IPHC and to increase user engagement at the IPHC website.

Initial offerings included visualisations featuring the IPHC's Fishery-Independent Setline Survey (FISS) data.

- Fishery-Independent Setline Survey (FISS) – Raw Survey Data
- FISS – Pacific Halibut Data
- FISS CPUE
- FISS Biologicals
- FISS Performance
- FISS All Species number per unit of effort (NPUE)

Following FISS' lead, additional online applications have been added to the IPHC website, including:

- IPHC Space-Time Explorer
- Management Strategy Evaluation (MSE) Explorer
- Year to date directed commercial landings
- Pacific halibut economic impact visualization tool

Most recently, time series datasets (TSDs), including modelled output from the Secretariat, historical removals data, commercial landings data, and biological data have been published as data visualisations. The interactive nature of the visualisations allows users to focus on the information both temporally and spatially. The TSDs previously published as simple flat files have also been upgraded with more-comprehensive metadata and citation information. Existing data products will be updated by the IPHC Secretariat as warranted and new interactives published when available. The TSD collection now also has a new more user-friendly interface (Appendix I).

Information not currently available at www.iphc.int can be requested using an online Data Request Form available at https://www.iphc.int/forms/data-request/. The procedures outlined in IPHC Data Confidentiality Policy and Data Sharing Procedures dictate how requests are handled. Non-confidential products are made available to the general public via the IPHC website while confidential requests are communicated directly with the requester via secure format when approved. The status of a data requests, as well as the online resolutions if available, can be found at IPHC Data Request Tracker.

RECOMMENDATION

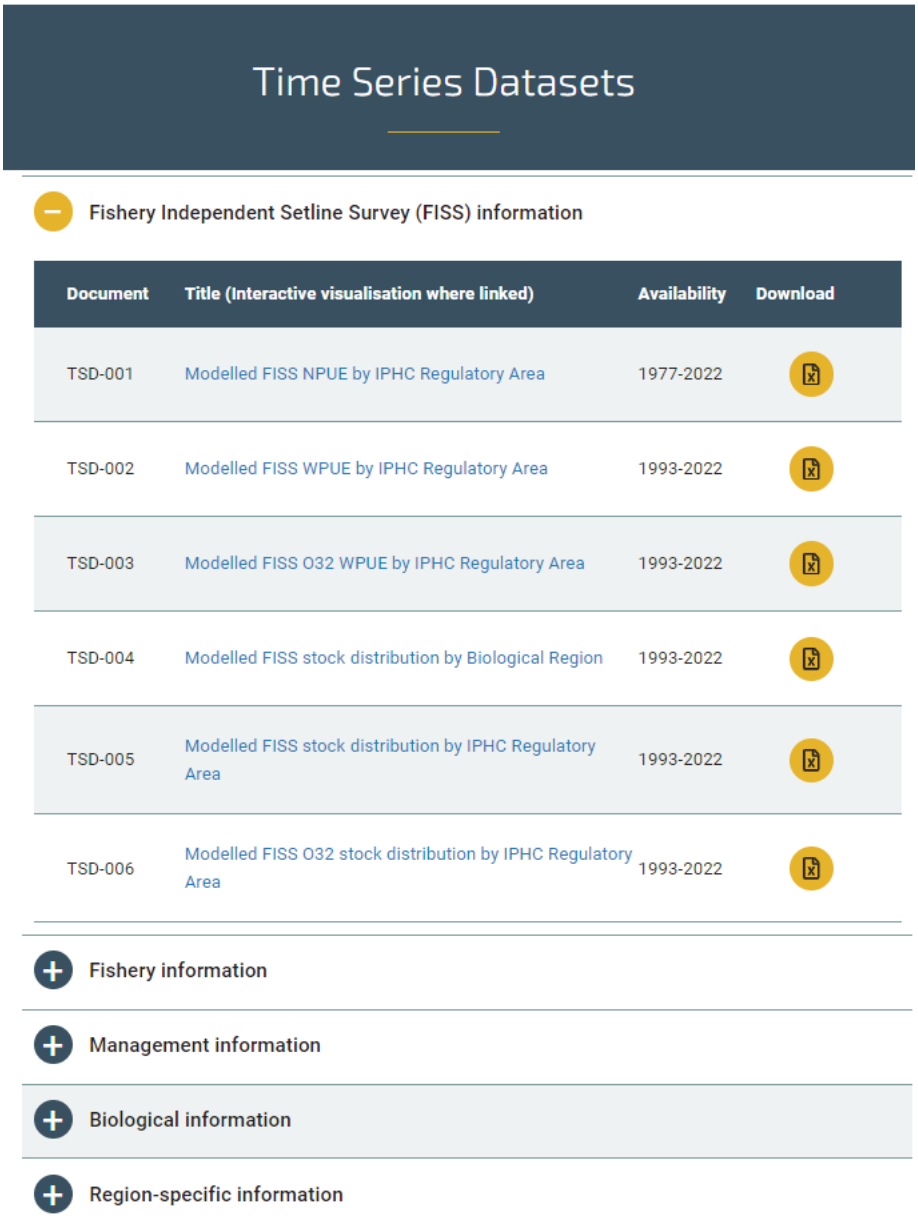
That the Commission:

1) **NOTE** paper IPHC-2023-IM099-INF02, which provides the Commission with an overview of steps taken to improve the overall quality and usability of publicly available IPHC data products.

APPENDICES

Appendix I: Time Series Datasets collection new interface

APPENDIX I
Time Series Datasets collection new interface



Time Series Datasets

− Fishery Independent Setline Survey (FISS) information

Document	Title (Interactive visualisation where linked)	Availability	Download
TSD-001	Modelled FISS NPUE by IPHC Regulatory Area	1977-2022	
TSD-002	Modelled FISS WPUE by IPHC Regulatory Area	1993-2022	
TSD-003	Modelled FISS O32 WPUE by IPHC Regulatory Area	1993-2022	
TSD-004	Modelled FISS stock distribution by Biological Region	1993-2022	
TSD-005	Modelled FISS stock distribution by IPHC Regulatory Area	1993-2022	
TSD-006	Modelled FISS O32 stock distribution by IPHC Regulatory Area	1993-2022	

+ Fishery information

+ Management information

+ Biological information

+ Region-specific information

National Report template

PREPARED BY: IPHC SECRETARIAT (B. HUTNICZAK; 28 NOVEMBER 2023)

PURPOSE

To provide the Commission with an opportunity to review the proposed template for the National Report.

BACKGROUND

The Commission has directed the IPHC Secretariat to update the format of National Reports that each Contracting Party (CP) submits annually ahead of the IPHC Annual Meeting Session.

DISCUSSION

The proposed National Report template is available in Appendix I. This document is provided to facilitate the discussion on the National Report content.

The template is designed to streamline the development of the National Report and enhance consistency across CPs. The proposed content closely aligns with the annual submissions from both Canada and USA but focuses on improved organization for more straightforward comparison. At the same time, the template maintains flexibility to accommodate information that each CP deems important to share. This initiative aims to simplify reporting by each CP and promote greater uniformity in reporting practices.

RECOMMENDATION

That the Commission:

1) **NOTE** paper IPHC-2023-IM099-INF03, which provides the Commission with an opportunity to review the proposed template for the National Report.

APPENDICES

Appendix I: Proposed National Report template.

National Report: Canada / United States of America

PREPARED BY: AGENCY (DATE)

Please submit this document as a Word (.doc) version to the IPHC Secretariat.
AM100 deadline is 23 December 2023.

PURPOSE

To provide an overview of the Pacific halibut fisheries in 2023 in the IPHC Convention waters and the national waters of Canada/the United States of America.

Contracting party: Canada / United States of America

Reporting agency:

Contact person: name, email address (if multiple, specify sector)

SUMMARY

Provide a high-level overview of key findings across all fisheries sectors, summarizing sector-specific highlights and management priorities described in this report.

Use this section also to provide a general information on allocation distribution between sectors and any carryover adjustments. The following sections request sector-specific information. However, exclude information on the process of distribution mortality limits (TCEY) between IPHC Regulatory Areas decided at the Commission level.

Note: consider using a table or figure to illustrate allocation distribution between sectors.

COMMERCIAL FISHERIES OVERVIEW

Regulatory framework

Provide a brief description of the legal and regulatory context for the commercial sector, detailing recent changes and policy initiatives.

Include information about the directed commercial fishery, as well as incidental fisheries allowed to retain Pacific halibut.

Monitoring

Provide a brief description of the data collection programs in place for the commercial sector, detailing recent improvements when applicable.

Discuss here also any technological developments in place that may be affecting the data collection, for example, new electronic monitoring programs.

Fishery statistics

Provide summary statistics relevant for the sector. This should include:

- Allocation – including any carryovers implemented
- Landings and discard mortality –including relevant details on the delivery form (fresh, frozen, live), by domestically-used management areas when applicable
- Fleet structure and capacity – gear use, number of licensed vessels, number of issued licenses, number of quota holders etc.
- Processing-related statistics, including wholesale volume and value

For landings and discard mortality statistics, include details on adopted estimation methods. This can be added as an appendix – see section Appendices.

Compliance with regulations and enforcement

Provide here a brief compliance report for the sector. Summarize enforcement priorities, enforcement actions and identified violations. Focus on quantitative details that can be compared over time. Ensure descriptions are succinct.

Note: enforcement actions can be summarized as a table, preferably in a format that can be easily compared over time.

Sector-specific challenges and context items

Provide a brief description of sector-specific challenges, including also broader context items that were seen to have a significant impact on the sector.

This may include environmental policies such as development of marine protected areas overlapping with Pacific halibut fishing grounds, policies affecting the market, environmental challenges such as marine heat waves, etc.

RECREATIONAL FISHERIES OVERVIEW

Regulatory framework

Provide a brief description of the legal and regulatory context for the recreational sector, detailing recent changes and policy initiatives. Specify if there are regional variations.

Provide details on management measures applicable this year (season dates, bag limits, size limits, etc.) and any in-season actions changing the management measures.

Monitoring

Provide a brief description of the data collection programs in place for the recreational sector, detailing recent improvements when applicable.

Discuss here also any technological developments in place that may be affecting the data collection, for example, new electronic monitoring programs.

Fishery statistics

Provide summary statistics relevant for the sector. This should include:

- Allocation – including any carryovers implemented
- Effort - number of issued licenses, effort in angler-days, etc.
- Landings and discard mortality – including landings under programs allowing quota leasing from the commercial sector, by domestically-used management areas when available
- Landings or mortality patterns – if available, by month
- Recreational age or length frequencies, if available

For landings and discard mortality statistics, include details on adopted estimation methods. This can be added as an appendix – see section Appendices.

Compliance with regulations and enforcement

Provide here a brief compliance report for the sector. Summarize enforcement priorities, enforcement actions and identified violations. Focus on quantitative details that can be compared over time. Ensure descriptions are succinct.

Note: enforcement actions can be summarized as a table, preferably in a format that can be easily compared over time.

Sector-specific challenges and context items

Provide a brief description of sector-specific challenges, including also broader context items that were seen to have a significant impact on the sector.

SUBSISTENCE FISHERIES OVERVIEW

Regulatory framework

Provide a brief description of the legal and regulatory context for the subsistence fisheries, detailing recent changes and policy initiatives.

Monitoring

Provide a brief description of the data collection programs in place for the subsistence fisheries, detailing recent improvements when applicable.

Fishery statistics

Provide summary mortality statistics relevant for the sector. Include details on adopted estimation methods. This can be added as an appendix – see section Appendices.

NON-DIRECTED COMMERCIAL DISCARD MORTALITY OVERVIEW

Regulatory framework

Provide a brief description of the legal and regulatory context for the non-directed discard mortality of Pacific halibut in fisheries not allowed Pacific halibut retention, detailing recent changes and policy initiatives. Include information about any programs that may offer exceptions for retention (e.g., SeaShare program in Alaska).

Monitoring

Provide a brief description of the data collection programs in place for the non-directed discard mortality, detailing coverage and recent improvements when applicable.

Discuss here also any technological developments in place that may be affecting the data collection, for example, new electronic monitoring programs.

Fishery statistics

Provide summary statistics for non-directed discard mortality for fisheries with estimates available. If available, summarize also non-directed discard length frequencies. Include details on adopted estimation methods. This can be added as an appendix – see section Appendices.

Identify fisheries known to catch Pacific halibut for which non-directed discard mortality estimates are not available.

OTHER

Utilize this section to highlight any other activities relevant to Pacific halibut management. This can include development of aquaculture, new fisheries, relevant research, etc.

RECOMMENDATIONS

That the Commission:

1) NOTE paper IPHC-2023-AM100-NR0X which provides the Commission with an overview from [AGENCY NAME] of the Pacific halibut fisheries in 2023 in the IPHC Convention waters and the national waters of Canada/the United States of America.

RESOURCES

Provide relevant links.

APPENDICES

Add as needed, delete when not applicable.

Appendix I

XX

Appendix II

XX

Appendix III

XX