IPHC-2025-CB095-00
Last Update: 30 January 2025

95th Session of the IPHC Conference Board (CB095) – *Compendium of meeting documents*

28-30 January 2025, Vancouver, BC, Canada

Commissioners

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IPHC-2025-CB095-01

Last updated: 17 January 2025

DRAFT: AGENDA FOR THE 95th SESSION OF THE IPHC CONFERENCE BOARD (CB095)

Date: 28-30 January 2025
Location: Vancouver, BC, Canada
Venue: Pan Pacific Hotel
Time (PST): 28th: 14:00-17:30; **29th**: 09:00-17:30; **30th**: 0800-10:30)
Co-Chairperson: Mr Jim **Lane** (Canada); Ms Linda **Behnken** (United States of America)
Vice-Chairperson: Mr Brian **Ritchie** (USA)

Notes:

- ***Document deadline****: 29 December 2024 (30 days prior to the opening of the Session)*
- *All sessions are open to observers and the general public.*

1. **OPENING OF THE SESSION** (Co-Chairpersons)
    - 1.1 Accreditation of CB Membership (2021-25): new members

2. **ADOPTION OF THE AGENDA AND ARRANGEMENTS FOR THE SESSION** (Co-Chairpersons)

3. **IPHC SECRETARIAT INFORMATIONAL SESSION**
    - 3.1 Mortality Limits and TCEY (I. Stewart)
    - 3.2 MSE Update (A. Hicks)
    - 3.3 FISS 2025 (R. Webster)
    - 3.4 Other topics

4. **FISHING PERIODS: SEASON OPENING AND CLOSING DATES**

5. **MORTALITY LIMITS** (Co-Chairpersons)
    - 5.1 Coastwide perspectives
    - 5.2 Regulatory Area perspectives
    - 5.3 Distribution Strategy – discussion/recommendations
    - 5.4 TCEY Recommendations

6. **IPHC FISHERY REGULATIONS: PROPOSALS FOR THE 2024-25 PROCESS**
    - 6.1 IPHC Secretariat fishery regulation proposals (B. Hutniczak)
    - 6.2 Contracting Party fishery regulation proposals (Contracting Parties)
    - 6.3 Other Stakeholder fishery regulation proposals (Stakeholders)

7. **INCIDENTAL CATCH (BYCATCH**) (Co-Chairpersons)

8. **OTHER BUSINESS** (Co-Chairpersons)
    - 8.1 Election of Co-Chairpersons
    - 8.2 Election of Vice-Chairpersons (as necessary)

9. **REVIEW OF THE DRAFT AND ADOPTION OF THE REPORT OF THE 95th SESSION OF THE IPHC CONFERENCE BOARD (CB095)** (Co-Chairpersons; IPHC Secretariat)

IPHC-2025-CB095-02

Last updated: 17 January 2025

LIST OF DOCUMENTS FOR THE 95th SESSION OF THE IPHC CONFERENCE BOARD (CB095)

Meeting documents	Title	Availability
IPHC-2025-CB095-01	Agenda for the 95th Session of the IPHC Conference Board (CB095)	✓ 16 Oct 2024 ✓ 17 Jan 2025
IPHC-2025-CB095-02	List of Documents for the 95th Session of the IPHC Conference Board (CB095)	✓ 16 Oct 2024 ✓ 28 Dec 2024 ✓ 17 Jan 2025

The following are documents before the 101st Session of the IPHC Annual Meeting (AM101). Direct links have been added as they become available.

Meeting documents	Title	Availability
IPHC-2025-AM101-08 Rev_2	Fisheries data overview (2024) (B. Hutniczak, H. Tran, T. Kong, K. Sawyer van Vleck. & K. Magrane)	✓ 12 Dec 2024 ✓ 14 Jan 2025
IPHC-2025-AM101-10	Space-time modelling of survey data (R. Webster)	✓ 12 Dec 2024
IPHC-2025-AM101-11	Data overview and stock assessment for Pacific halibut (*Hippoglossus stenolepis*) at the end of 2024 (I. Stewart, A. Hicks, R. Webster, D. Wilson)	✓ 10 Dec 2024
IPHC-2025-AM101-12	IPHC Management Strategy Evaluation and Harvest Strategy Policy (A. Hicks, I. Stewart, & D. Wilson)	✓ 09 Dec 2024
IPHC-2025-AM101-13	Stock projections and harvest decision table for 2025-2027 (I. Stewart & A. Hicks)	✓ 10 Dec 2024
IPHC-2025-AM101-14	2025 and 2026-29 FISS designs (R. Webster, I. Stewart, K. Ualesi, T. Jack, & D. Wilson)	✓ 12 Dec 2024
IPHC-2025-AM101-16 Rev_1	IPHC Fishery Regulations: Proposals for the 2024-25 process (B. Hutniczak)	✓ 13 Dec 2024 ✓ 28 Dec 2024
IPHC-2025-AM101-17	IPHC Interim: Harvest Strategy Policy (2024) (A. Hicks, I. Stewart, D. Wilson)	✓ 09 Dec 2024
IPHC Fishery Regulation proposals for 2025		
IPHC Secretariat Fishery Regulation proposals for 2025		
IPHC-2025-AM101-PropA1	IPHC Fishery Regulations: Mortality and Fishery Limits (Sect. 5)	✓ 09 Dec 2024
IPHC-2025-AM101-PropA2	IPHC Fishery Regulations: Commercial Fishing Periods (Sect. 9)	✓ 09 Dec 2024

IPHC-2025-AM101-PropA3	IPHC Fishery Regulations: Minor amendments	✓ 27 Dec 2024
Contracting Party Fishery Regulation proposals for 2025		
IPHC-2025-AM101-PropB1	IPHC Fishery Regulations: Recreational (Sport) Fishing for Pacific Halibut – IPHC Regulatory Areas 2C, 3A, 3B, 4A, 4B, 4C, 4D, 4E (Sect. 28) (Charter Management Measures in IPHC Regulatory Areas 2C and 3A (USA))	✓ 20 Dec 2024
Other Stakeholder Fishery Regulation proposals for 2025		
IPHC-2025-AM101-PropC1	IPHC Fishery Regulations: Commercial Fishing Periods (Sect. 9) – year-round commercial Pacific halibut fishery in IPHC Regulatory Area 2B (R. Hauknes)	✓ 09 Dec 2024
IPHC-2025-AM101-PropC2	IPHC Fishery Regulations: Application of Commercial Fishery Limits (Sect. 12) – addressing concerns regarding localized depletion around St. Matthew Island (S. McManus)	✓ 10 Dec 2024
IPHC-2025-AM101-PropC3	IPHC Fishery Regulations: Mortality and Fishery Limits (Sect. 5) - TCEY in Regulatory Area 2A (T. Greene)	✓ 23 Dec 2024
IPHC-2025-AM101-PropC4	***Other proposal (Non-IPHC Fishery Regulations)***: Rebuilding Plan for Pacific halibut (M. Laukitis)	✓ 27 Dec 2024
IPHC-2025-AM101-PropC5	IPHC Fishery Regulations: Mortality and Fishery Limits (Sect. 5) – definition of reaction to overfishing (M. Milne)	✓ 28 Dec 2024
Information papers		
IPHC-2025-AM101-INF01 Rev 1	Stakeholder Statements on IPHC Fishery Regulations or published regulatory proposals (B. Hutniczak)	✓ 13 Dec 2024 ✓ 27 Dec 2024
IPHC-2025-AM101-INF02	The IPHC mortality projection tool for 2025 mortality limits (I. Stewart)	✓ 10 Dec 2024
IPHC-2025-AM101-INF04	Using Management Strategy Evaluation to investigate the effects of fishing and the environment on Pacific halibut (A. Hicks)	✓ 17 Jan 2024

Fisheries Data Overview (2024)

PREPARED BY: IPHC SECRETARIAT (B. HUTNICZAK, H. TRAN, T. KONG, K. SAWYER VAN VLECK, K. MAGRANE; 12 DECEMBER 2024; 14 & 30 JANUARY 2025)

PURPOSE

To provide an overview of the 2024 Pacific halibut removals, including the status of mortality reported against fishery limits adopted by the Commission and outlined in the IPHC Fishery Regulations (2024). Data provided in this paper include current and end-of-year projections as of 8 January 2025.

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-2025-AM101-11) and other analyses. The data are compiled by the IPHC Secretariat and include data from federal and state agencies of each Contracting Party. All 2024 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 includes 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 [Pacific] 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. Estimates of 2024 mortality reported against mortality limits (TCEYs) by IPHC Regulatory Area and U26 non-directed discards (as of 8 January 2025).

IPHC Regulatory Area	Mortality limits (net weight)		Mortality (net weight)		Percent
	Tonnes (t)	Pounds (lb)	Tonnes (t)	Pounds (lb)	(%)
IPHC Regulatory Area 2A	748	1,650,000	652	1,438,391	87.2
IPHC Regulatory Area 2B	2,935	6,470,000	2,874	6,336,801	97.9
IPHC Regulatory Area 2C	2,626	5,790,000	2,585	5,698,709	98.4
IPHC Regulatory Area 3A	5,153	11,360,000	4,740	10,448,832	92.0
IPHC Regulatory Area 3B	1,565	3,450,000	1,398	3,081,758	89.3
IPHC Regulatory Area 4A	730	1,610,000	461	1,016,132	63.1
IPHC Regulatory Area 4B	567	1,250,000	181	399,490	32.0
IPHC Regulatory Area 4CDE and Closed Area	1,678	3,700,000	926	2,042,120	55.2
Subtotal (TCEY)	**16,003**	**35,280,000**	**13,817**	**30,462,233**	86.3
Non-directed commercial discard mortality (U26)	708	1,560,000	884	1,948,000	124.9
Total	**16,710**	**36,840,000**	**14,701**	**32,410,233**	88.0

Table 2. Estimates of 2024 mortality reported against fishery limits (FCEY) and mortality projections by IPHC Regulatory Area (as of 8 January 2025).

IPHC Regulatory Area	Fishery limit / projection[1] (net weight)		Mortality to date[1] (net weight)		Pct (%) attained
	Tonnes (t)	Pounds (lb)	Tonnes (t)	Pounds (lb)	(%)
Area 2A (California, Oregon, and Washington)	**748.43**	**1,650,000**	**652.44**	**1,438,391**	**87.2**
Domestic mortality limits (FCEY)					
Non-treaty directed commercial fishery	113.10	249,338	107.58	237,164	95.1
Non-treaty incidental catch in salmon troll fishery	19.96	44,001	13.77	30,363	69.0
Non-treaty incidental catch in sablefish fishery[2]	22.68	50,000	15.70	34,624	69.2
Treaty Indian commercial fishery	224.20	494,280	220.24	485,554	98.2
Treaty Indian ceremonial and subsistence (year-round)	9.17	20,220	9.17*	20,220*	100.0
Recreational – Washington	131.61	290,158	132.67	292,482	100.8
Recreational – Oregon	128.72	283,784	91.49	201,695	71.1
Recreational – California	17.34	38,220	9.27	20,427	53.4
Projections (non-FCEY)[3]					
Directed commercial discard mortality	49.90	110,000	26.01	57,335	52.1
Recreational discard mortality	--	--	2.05	4,528	--
Non-directed commercial discard mortality (O26)	36.29	80,000	24.49	54,000	67.5
IPHC fishery-independent setline survey and research[4]	--	--	0.00	0	--
Non-TCEY mortality					
Non-directed commercial discard mortality (U26)	0.00	0	3.18	7,000	--
Area 2B (British Columbia)	**2,934.74**	**6,470,000**	**2,874.32**	**6,336,801**	**97.9**
Domestic mortality limits (FCEY)					
Directed commercial fishery landings	2,145.49	4,730,000	2,008.12	4,427,154	93.6
Recreational fishery	376.48	830,000	378.46	834,358	100.5
Recreational fishery (XRQ - Experimental Quota)[5]	--	--	8.75	19,281	--
Projections (non-FCEY)[3]					
Directed commercial discard mortality	81.65	180,000	89.05	196,324	109.1
Recreational discard mortality	13.61	30,000	15.15	33,400	111.3
Subsistence	185.97	410,000	183.70	405,000	98.8
Non-directed commercial discard mortality (O26)	131.54	290,000	134.26	296,000	102.1
IPHC fishery-independent setline survey and research[4]	--	--	56.83	125,284	--
Non-TCEY mortality					
Non-directed commercial discard mortality (U26)	18.14	40,000	19.05	42,000	105.0

IPHC Regulatory Area	**Fishery limit / projection[1] (net weight)**		**Mortality to date[1] (net weight)**		**Pct (%) attained**
	Tonnes (t)	**Pounds (lb)**	**Tonnes (t)**	**Pounds (lb)**	**(%)**
Area 2C (southeastern Alaska)	**2,626.30**	**5,790,000**	**2,584.89**	**5,698,709**	**98.4**
Domestic mortality limits (FCEY)					
Directed commercial fishery landings	1,587.57	3,500,000	1,391.20	3,067,067	87.6
Directed commercial discard mortality	49.90	110,000	63.57	140,149	127.4
Metlakatla (Annette Island Reserve)	--	--	17.36	38,274	--
Guided recreational fishery	367.41	810,000	382.11	842,402	104.0
Guided recreational fishery (GAF)[5]	--	--	67.01	147,739	--
Projections (non-FCEY)[3]					
Unguided recreational fishery	485.34	1,070,000	457.94	1,009,578	94.4
Subsistence	113.40	250,000	114.53	252,492	101.0
Non-directed commercial discard mortality (O26)	27.22	60,000	19.05	42,000	70.0
IPHC fishery-independent setline survey and research[4]	--	--	72.12	159,008	--
Non-TCEY mortality					
Non-directed commercial discard mortality (U26)	--	--	0.00	0	--
Area 3A (central Gulf of Alaska)	**5,152.81**	**11,360,000**	**4,739.51**	**10,448,832**	**92.0**
Domestic mortality limits (FCEY)					
Directed commercial fishery landings	3,429.16	7,560,000	3,115.77	6,869,106	90.9
Directed commercial discard mortality	244.94	540,000	271.71	599,025	110.9
Guided recreational fishery	857.29	1,890,000	729.26	1,607,735	85.1
Guided recreational fishery (GAF)[5]	--	--	2.50	5,509	--
Projections (non-FCEY)[3]					
Unguided recreational fishery	449.06	990,000	397.89	877,191	88.6
Subsistence	54.43	120,000	55.18	121,642	101.4
Non-directed commercial discard mortality (O26)	113.40	250,000	146.06	322,000	128.8
IPHC fishery-independent setline survey and research[4]	--	--	21.15	46,624	--
Non-TCEY mortality					
Non-directed commercial discard mortality (U26)	81.65	180,000	162.39	358,000	198.9
Area 3B (western Gulf of Alaska)	**1,564.89**	**3,450,000**	**1,397.86**	**3,081,758**	**89.3**
Domestic mortality limits (FCEY)					
Directed commercial fishery landings	1,351.71	2,980,000	1,193.89	2,632,077	88.3
Projections (non-FCEY)[3]					
Directed commercial discard mortality	108.86	240,000	110.02	242,556	101.1
Recreational fishery	4.54	10,000	2.15	4,729	47.3
Subsistence	4.54	10,000	4.75	10,475	104.8
Non-directed commercial discard mortality (O26)	99.79	220,000	77.56	171,000	77.7
IPHC fishery-independent setline survey and research[4]	--	--	9.49	20,921	--
Non-TCEY mortality					
Non-directed commercial discard mortality (U26)	40.82	90,000	60.33	133,000	147.8
Area 4A (eastern Aleutians)	**730.28**	**1,610,000**	**460.91**	**1,016,132**	**63.1**
Domestic mortality limits (FCEY)					
Directed commercial fishery landings	580.60	1,280,000	320.52	706,622	55.2
Projections (non-FCEY)[3]					
Directed commercial discard mortality	18.14	40,000	17.14	37,790	94.5
Recreational fishery	4.54	10,000	2.97	6,556	65.6
Subsistence	0.00	0	1.89	4,164	--
Non-directed commercial discard mortality (O26)	122.47	270,000	118.39	261,000	96.7
IPHC fishery-independent setline survey and research[4]	--	--	0.00	0	--
Non-TCEY mortality					
Non-directed commercial discard mortality (U26)	58.97	130,000	50.80	112,000	86.2

IPHC Regulatory Area	**Fishery limit / projection[1] (net weight)**		**Mortality to date[1] (net weight)**		**Pct (%) attained**
	Tonnes (t)	**Pounds (lb)**	**Tonnes (t)**	**Pounds (lb)**	**(%)**
Area 4B (central and western Aleutians)	**566.99**	**1,250,000**	**181.21**	**399,490**	**32.0**
Domestic mortality limits (FCEY)					
Directed commercial fishery landings	494.42	1,090,000	130.08	286,784	26.3
Projections (non-FCEY)[3]					
Directed commercial discard mortality	4.54	10,000	1.58	3,488	34.9
Recreational fishery	--	--	0.00	0	--
Subsistence	--	--	0.10	218	--
Non-directed commercial discard mortality (O26)	63.50	140,000	49.44	109,000	77.9
IPHC fishery-independent setline survey and research[4]	--	--	0.00	0	--
Non-TCEY mortality					
Non-directed commercial discard mortality (U26)	4.54	10,000	5.44	12,000	120.0
Areas 4CDE and Closed Area	**1,678.29**	**3,700,000**	**926.29**	**2,042,120**	**55.2**
Domestic mortality limits (FCEY)					
Directed commercial fishery landings	934.40	2,060,000	368.21	811,769	39.4
Projections (non-FCEY)[3]					
Directed commercial discard mortality	36.29	80,000	13.99	30,834	38.5
Recreational fishery	--	--	0.00	0	--
Subsistence[6]	4.54	10,000	5.82	12,828	--
Non-directed commercial discard mortality (O26)	703.07	1,550,000	535.24	1,180,000	76.1
IPHC fishery-independent setline survey and research[4]	--	--	3.03	6,689	--
Non-TCEY mortality					
Non-directed commercial discard mortality (U26)	503.49	1,110,000	582.41	1,284,000	115.7
Total	**16,002.74**	**35,280,000**	**13,817.43**	**30,462,233**	**86.3**
Directed commercial fishery landings	11,498.56	25,350,000	9,495.53	20,934,059	82.6
Recreational fishery	2,825.88	6,230,000	2,679.65	5,907,610	94.8
Subsistence	376.48	830,000	375.14	827,039	99.6
Non-directed commercial discard mortality (O26)	1,297.27	2,860,000	1,104.50	2,435,000	85.1
IPHC fishery-independent setline survey and research[4]	--	--	162.62	358,526	--
Non-directed commercial discard mortality (U26)	707.60	1,560,000	883.60	1,948,000	124.9

** Subject to update in January 2025.*

[1] Totals by IPHC Regulatory area include all TCEY components, i.e. exclude non-directed commercial discard mortality (U26).

[2] North of Pt. Chehalis; 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 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] Includes U32 CDQ landings retained for personal consumption and not accounted as commercial CDQ landings in IPHC Regulartory Areas 4D and 4E.

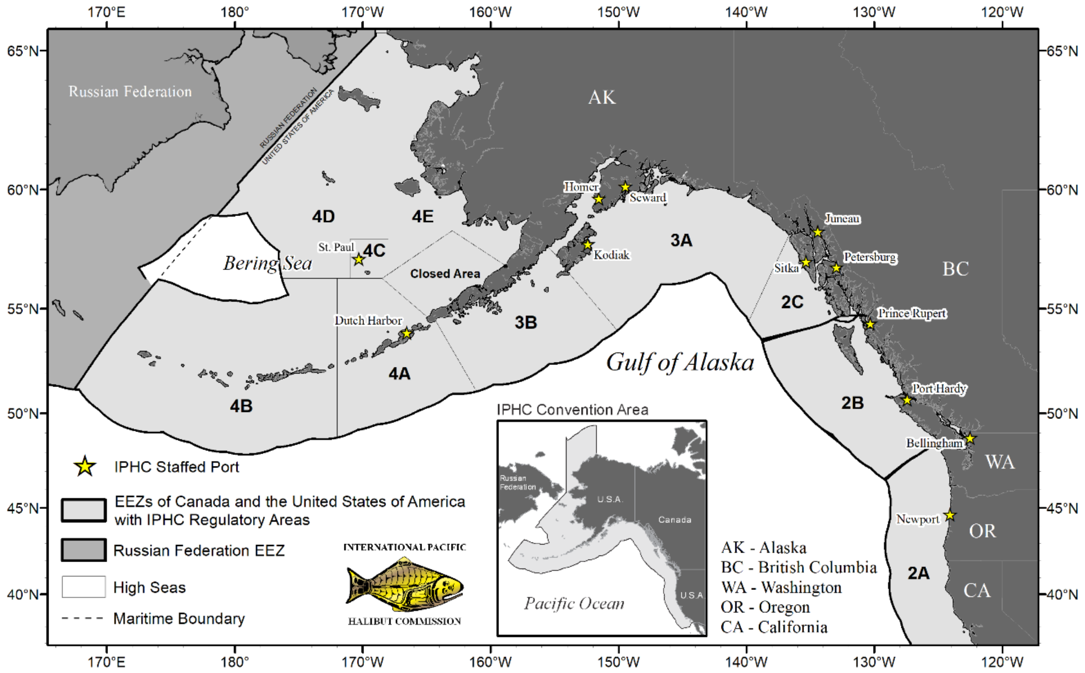


Figure 1. IPHC Convention Area and associated IPHC Regulatory Areas.

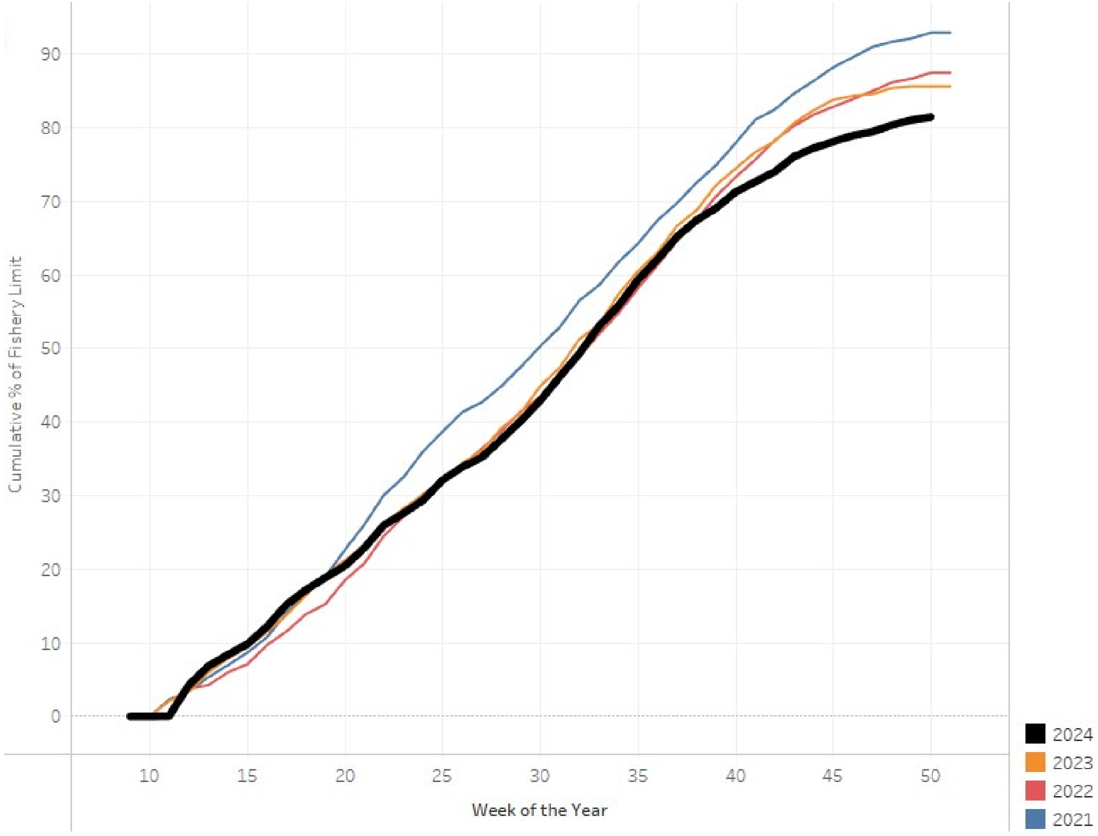


Figure 2. Cumulative percentage of directed commercial Pacific halibut limit landed by week.

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 (*Anoplopoma fimbria*) 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.

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 6:00 local time on 15 March and closed at 23:59 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 (15 March to 7 December 2024). 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 08:00 and ended on the following Thursday at 18:00 local time and was further restricted by fishing period limits. The fishery closed for the remainder of the year after the fifth opening that commenced on 24 September, 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, 2019-2024 (d = days; h = hours).

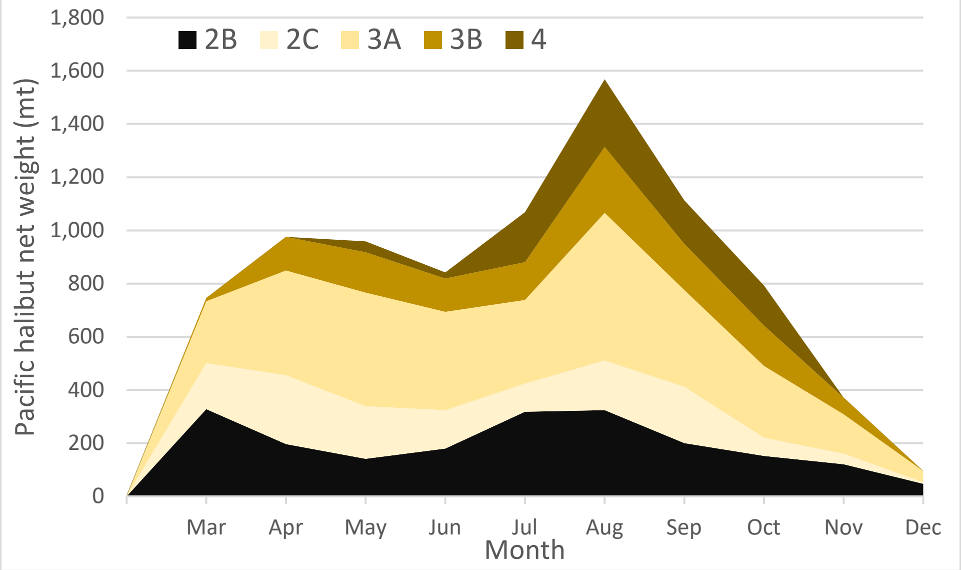
IPHC Regulatory Area	Year					
	2024	2023	2022	2021	2020	2019
Canada: 2B	15 Mar-7 Dec (267 d)	10 Ma-7 Dec (272 d)	6 Mar-7 Dec (276 d)	6 Mar-7 Dec (276 d)	14 Mar-7 Dec (268 d)	15 Mar-14 Nov (244 d)
USA: 2A Treaty Indian	15 Mar-19 Jun (24 h) (Unrestricted) 15 Mar-19 Jun (93.5 h) (Restricted) 24 Jun-31 Jul (2x 41 h) (Restricted) 24 Jun-31 Jul (24 h) (Unrestricted) 9 Aug-30 Sep (6x24 h) (Restricted)	10 Mar-10 Jun (55 h) (Unrestricted) 10 Mar-31 May (122 h) (Restricted) 1 Jun-31 Jul (2x 24 h) (Restricted) 17 Jun-31 Jul (20 h) (Unrestricted) 1 Sep-15 Oct (2x24 h) (Restricted)	6 Mar-31 May (55 h) (Unrestricted) 6 Mar-31 May (122 h) (Restricted) 3 Jun-30 Sep (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	25-27 Jun 9-11 Jul 6-8 Aug 27-29 Aug 24-26 Sep (58 h each)	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-30 Sept (182 d) Sablefish 1 Apr-7 Dec (250 d)	Salmon 1 Apr-31 Oct (213 d) Sablefish 1 Apr-7 Dec (250 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 WA: 15 Apr-30 Sep (168 d) OR: 15 Apr-31 Oct (199 d) CA: 1 Aug-30 Sep (60 d) Sablefish 1 Apr- 15 Nov (228 d)	Salmon WA, CA: 20 Apr- 30 Sep (163 d) OR: 20 Apr- 31 Oct (194 d) Sablefish 1 Apr-31 Oct (213 d)
USA: Alaska (2C, 3A, 3B, 4A, 4B, 4CDE)	15 Mar-7 Dec (267 d)	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 2024 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 2024 directed commercial fishery landings were spread over ten months (March – December) of the year in Canada and the USA (Figure 3). On a month-to-month comparison, March took the lead as the busiest month for total poundage (16%) landed from IPHC Regulatory Area 2B. On a month-to-month comparison, August was the busiest month for total poundage (19%) from Alaska, USA. A year-to-date visualization is also available on the IPHC website.



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

Figure 3. 2024 directed commercial landings (tonnes, net weight, preliminary) of Pacific halibut for individual quota fisheries by IPHC Regulatory Area and month.

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

The 2024 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 sablefish, and Treaty Indian) of 357 tonnes (787,705 pounds) was 6% below the fishery limit. The total non-treaty directed commercial landings of 108 tonnes (237,164 pounds) was 5% under of the fishery limit of 113 tonnes (249,338 pounds) after five 58-hour openers. The fishing period limits by vessel size class for each opening in 2024 are listed in Table 4.

The salmon troll fishery season was open from 1 April to 30 September in Oregon and Washington (CA closed) with an allowable incidental landing ratio of one Pacific halibut per two Chinook (*Onchorhynchus tshawytscha*), plus an additional Pacific halibut per landing, and a vessel trip limit of 35 fish. Total landings of 14 tonnes (30,363 pounds) were 31% under the fishery limit of 20 tonnes (44,001 pounds).

Incidental Pacific halibut retention during the limited-entry sablefish fishery was open from 1 April to 7 December. The initial allowable landing ratio was 0.06 tonnes (130 pounds) of Pacific halibut to 0.45 tonnes (1,000 pounds) of sablefish, with an allowance for up to two additional Pacific halibut in excess of the ratio limit. On 22 October, an in-season action increased the allowable ratio to 0.07 tonnes (150 pounds) of Pacific halibut to 0.45 tonnes (1,000 pounds) of sablefish, still permitting up to two additional Pacific halibut in excess of the ratio limit. The total landings of 16 tonnes (34,624 pounds) were 31% under the fishery limit 23 tonnes (50,000 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:

- The unrestricted fishery occurred between 15 March and 19 June. A total of 101 tonnes (222,216 pounds) were landed.

- The restricted fishery occurred between 15 March and 19 June. A total of 44 tonnes (96,414 pounds) were landed.
- There were two late-season openers: one from 24 June to 31 July and another from 9 August to 30 September. A total of 76 tonnes (166,924 pounds) were landed.

Estimated overall total landings of 220 tonnes (485,554 pounds) were 2% under the fishery limit 224 tonnes (494,280 pounds).

Table 4. The fishing periods and limits (tonnes, dressed, head-on with ice/slime) by vessel class used in the 2024 directed commercial fishery in IPHC Regulatory Area 2A.

Vessel Class		Commercial fishing periods (dates) & limits (t)				
Letter	**Feet**	**25-27 Jun**	**9-11 Jul**	**6-8 Aug**	**27-29 Aug**	**24-26 Sep**
A, B and C	1-35	0.8	0.8	0.45	0.64	0.82
D and E	36-45	1.4	1.4	0.45	0.64	0.82
F and G	46-55	1.7	1.7	0.45	0.64	0.82
H	56+	2.0	2.0	0.45	0.64	0.82

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 133 in 2024. In addition, Pacific halibut can be landed as incidental catch in other licensed groundfish fisheries. In 2024, this occurred from a total of 58 licences from other fisheries. The 2024 directed commercial landings represented 2,008 tonnes (4,427,154 pounds) of Pacific halibut. Additionally, 9 tonnes (19,281 pounds) were leased from commercial quota to the recreational sector.

Directed commercial trips from IPHC Regulatory Area 2B were delivered into 12 different ports in 2024. The ports of Port Hardy (including Coal Harbour and Port McNeill) and Prince Rupert/Port Edward received the highest volume accounting for 96% of the commercial landings. Prince Rupert and Port Hardy each received 48% of the directed commercial landings. All IVQ deliveries were landed in IPHC Regulatory Area 2B. In 2024, a total of 20 Canadian vessels landed frozen, head-off Pacific halibut for a total of 18 tonnes (40,197 pounds) over 30 landings. Live landings resulted in a total landed weight of <1 tonne (657 pounds).

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 shares (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 2024, RAM reported that 2,219 persons/entities held QS.

The total 2024 landings from the IFQ/CDQ Pacific halibut fishery for the waters off Alaska through 7 December 2024 were 6,520 tonnes (14,373,425 pounds), 22% under the directed commercial fishery landings limit. By IPHC Regulatory Area, the directed commercial landings were under the fishery limit by 12% for Area 2C, 9% for Area 3A, 12% for Area 3B, 45% for Area 4A, 74% for Area 4B (IFQ/CDQ), and 61% for 4CDE (IFQ/CDQ).

Homer received approximately 25% (1,620 tonnes or 3,570,994 pounds) of the Alaskan directed commercial landings, making it the port that received the greatest landed volume in 2024. Kodiak received the second largest landing volume at 12% (768 tonnes or 1,693,109 pounds) of the Alaskan commercial landings. In Southeast Alaska, the two largest landing volumes were received in Petersburg and Sitka, with their combined landings representing 15% of the directed commercial Alaskan landings (943 tonnes or 2,079,003 pounds). The Alaskan QS catch that was landed in Bellingham, WA was less than 2%.

Directed commercial sector mortality was 21% under the commercial sector limit (includes directed commercial discard mortality in IPHC Regulatory Areas 2C and 3A).

In Alaska, 7 tonnes (16,000 pounds) of Pacific halibut were caught with pot gear and landed within the directed commercial fishery, representing 0.1% 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 14 two-day openings between 5 April and 4 October for total landings of 17 tonnes (38,274 pounds). The fishery closed on 6 October.

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 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 vessel's 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 2024 recreational removals of Pacific halibut, including discard mortality, was estimated at 2,680 tonnes (5,907,610 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.

Recreational Landings

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

The 2024 IPHC Regulatory Area 2A recreational allocation was 278 tonnes (612,162 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 23 tonnes (50,000 pounds) were allocated to the incidental Pacific halibut catch in the commercial sablefish fishery in Washington. This subdivision resulted in 132 tonnes (290,158 pounds) being allocated to Washington subareas, 129 tonnes (283,784 pounds) to Oregon subareas and 17 tonnes (38,220 pounds) to California.[1] The IPHC Regulatory Area 2A recreational harvest totaled 233 tonnes (WA, OR and CA; 514,604 pounds), 16% under the recreational fishery limit. Recreational fishery harvest

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[1] Since 2024, in IPHC Regulatory Area 2A, the USA (NOAA Fisheries) may take in-season action to reallocate the recreational fishery limits between Washington, Oregon, and California after determining that such action will not result in exceeding the overall IPHC Regulatory Area 2A recreational fishery limit and that such action is consistent with any domestic catch sharing plan.

seasons by subareas varied and were managed in season with fisheries open in Washington from 4 April to 30 September, in Oregon from 1 May to 31 October, and in California from 1 May to 15 November.

Canada – IPHC Regulatory Area 2B (British Columbia)

IPHC Regulatory Area 2B operated under a 126 cm (49.6 inch) maximum size limit and one Pacific halibut had to be between 90 and 126 cm (35.4 - 49.6 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 (FN0084). Effective 1 April, the maximum size limit remained unchanged; however, the daily possession limit was updated to allow either one fish between 85 and 126 cm (33.5 - 49.6 inch) or two fish under 85 cm (33.5 inch) (FN0238). The fishery closed on 9 October (FN1042). The IPHC Regulatory Area 2B recreational harvest was 1% over the recreational fishery limit of 376 tonnes (830,000 pounds).

Recreational landings in British Columbia are also allowed under Pacific Region Experimental Recreational [Pacific] Halibut Program (XRQ).

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

In IPHC Regulatory Area 2C, charter anglers were permitted to retain one Pacific halibut per day. From 1 February to 14 July, retained Pacific halibut had to be either 40 inches or smaller, or 80 inches or larger. From 15 July to 31 December, retained Pacific halibut had to be 36 inches or smaller, or 80 inches or larger. Pacific halibut retention was not allowed on Fridays from 19 July to 13 September.

In IPHC Regulatory Area 3A, charter anglers were allowed to retain two Pacific halibut per day, with only one fish exceeding 28 inches. If only one Pacific halibut was retained, it could be any size. Charter vessels were limited to one fishing trip per day when retaining Pacific halibut, and Pacific halibut retention was prohibited on Wednesdays.

In addition, a Guided Angler Fish (GAF) program allows recreational harvesters to land fish that are leased from commercial fishery quota shareholders for the current season.

Recreational Discard Mortality

Pacific halibut discarded for any reason experience some level of 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 [Pacific] Halibut Registration Certificates (SHARC).

The coastwide subsistence estimate for 2024 was 375 tonnes (827,039 pounds) (Table 2). This includes U32 fish retained for personal consumption in the Alaskan CDQ fishery (excluded from commercial CDQ landings statistics), reported directly to the IPHC in accordance with Section 14 of the IPHC Fishery Regulations (2024). Historical subsistence removals are also available at the IPHC website.

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, with exception of U32 fish retained by CDQ groups, are accounted for as commercial catch and are not included here.

USA - IPHC Regulatory Area 2A (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 9 tonnes (20,220 pounds) were retained as C&S.

Canada - IPHC Regulatory Area 2B (British Columbia)

The source of Pacific halibut subsistence harvest in British Columbia is the First Nations FSC fishery. The IPHC receives some logbook and landing data for this harvest from the DFO, but those data have not been adequate for the IPHC to make an independent estimate of the FSC fishery harvest. DFO estimated the First Nations FSC harvest to be 136 tonnes (300,000 pounds) annually until 2006, and since 2007, the yearly estimate has been provided as 184 tonnes (405,000 pounds).

USA - IPHC Regulatory Areas 2C, 3, and 4 (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 applicants must obtain a SHARC license. 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. Since 2018, this survey has been conducted on a biennial schedule rather than annually. The 2023 estimates have been carried forward for 2024, except for Regulatory Area 4CDE, which has been updated. Estimates for all Regulatory Areas 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 2024 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 in Naknek. BBEDC reported the landing of one U32 Pacific halibut <1 tonne (12 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 reported 24 U32 Pacific halibut weighing <1 tonne (179 pounds) 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 2024 are provided in Table 2. Historical data are also available on the IPHC website.

Estimating Non-Directed Commercial Discard Mortality

Non-directed commercial discard mortality (CDM)

Estimates of non-directed CDM of Pacific halibut are provided by Contracting Party agencies. The amounts are estimates because not all fisheries are monitored at 100%, and it is not assumed that all discarded Pacific halibut fail to survive. The IPHC relies upon information supplied by observer programs run by Contracting Party agencies for non-directed CDM estimates in most fisheries. Non-IPHC research survey information is used to generate estimates of non-directed CDM in the few cases where fishery observations are unavailable.

Non-directed Commercial Discard Mortality by Area

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, which operates observer programs off the USA West Coast.

Canada – IPHC Regulatory Area 2B (British Columbia)

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

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 (*Gadus macrocephalus*) 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 CDM include pot fisheries for red and golden king crab (*Paralithodes camtschaticus*, *Lithodes aequispinus*), and tanner crab (*Chionoecetes bairdi*). Information is provided periodically by ADF&G, and the estimate was rolled forward from 2022 to 2024.

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 CDM 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 CDM, but data from these state-managed fisheries are currently unavailable.

Estimates of non-directed CDM in IPHC Regulatory Area 3 reflect different levels of observer coverage by gear and type of fishing trip. 2023 coverage rates varied from 100% to 15% of the estimated discarded groundfish pounds by gear and fishery (Table 4-4 in AFSC 2024). Trawl vessels in the Gulf of Alaska non-pelagic trawl fisheries have a high likelihood of encountering Pacific halibut and are responsible for the majority of the Pacific halibut bycatch. There are three general categories for these trawl vessels, which receive varying rates of catch monitoring. In 2023 in the Gulf of Alaska, 100% of the non-pelagic catcher/processor catch was monitored; 100% of the catch by non-pelagic catcher vessels in the Central Gulf Rockfish Program was monitored; and 42% of the remaining catch of non-pelagic catcher vessels was monitored. In total, 87% of the non-pelagic trawl catch in the Gulf of Alaska was monitored for bycatch in 2023.

There has long been concern that non-directed CDM estimates for non-pelagic trawl catcher vessels in IPHC Regulatory Area 3 have greater uncertainty and potential bias compared to those from other areas and sectors with higher coverage rates (e.g., catcher/processors). However, this concern has now diminished and applies only to the remaining 13% of the unobserved portion of the non-pelagic trawl fleet in the Gulf of Alaska.

In July 2024, NMFS adopted rules to implement an electronic monitoring (EM) program for pelagic trawl pollock catcher vessels and tender vessels delivering to processors in the Gulf of Alaska (Amendment 114). EM essentially monitors the catch from trawl nets which may not be handled until delivery to a processor where observers monitor and record 100% of the catch. NOAA Fisheries indicated that the program evaluation improved Pacific halibut non-directed discards accounting, specifically in the Western Gulf of Alaska pollock fishery. NOAA Fisheries intends to expand the EM program to the Central Gulf of Alaska Rockfish Program in the near future.

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) AND OTHER IPHC RESEARCH

In 2024, 163 tonnes (358,526 pounds) of Pacific halibut were landed from the FISS and other IPHC research, including the fecundity study. Totals landed from each IPHC Regulatory Area are provided in Table 2.

NON-IPHC RESEARCH REMOVALS

In 2024, four IPHC research permits were issued to NOAA to allow the harvest of Pacific halibut while conducting their Aleutian Islands and Eastern Bering Sea standardised bottom trawl surveys. A fifth research permit was issued to the Makah Tribe (Makah Fisheries Management) for tag research. A total of 10 Pacific halibut were reported captured and released.

REMOVALS OUTSIDE THE IPHC CONVENTION AREA

The latest Food and Agriculture Organization (FAO) statistics for Pacific halibut capture production outside the IPHC Convention Area (2022) indicate catches by Russia amounting to 2,004 tonnes (live weight), or 12% of the global total.

RECOMMENDATION

That the Commission:

1) **NOTE** paper IPHC-2025-AM101-08 Rev_2 that provides the Commission with an overview of the 2024 Pacific halibut removals, including the status of mortality reported against fishery limits adopted by the Commission and outlined in the IPHC Fishery Regulations (2024).

Space-time modelling of survey data

PREPARED BY: IPHC SECRETARIAT (R. A. WEBSTER; 12 DECEMBER 2024)

PURPOSE

To provide results of the space-time modelling of Pacific halibut survey data for the period 1993-2024.

BACKGROUND

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, 2024), but in the Bering Sea also integrates data from the National Oceanic and Atmospheric Administration (NOAA) - Fisheries annual trawl survey and the Alaska Department of Fish and Game's (ADFG) 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.

In 2024, 50% of sets used pink salmon as bait, with the remaining sets using the standard chum salmon bait. Models therefore accounted for bait differences and output was standardized to chum baits. In IPHC Regulatory Areas 2B and 2C, "vessel captain stations" were allowed, in which vessel captains could choose to fish up to one third of their sets at a location that is optimal in terms of catch rates or revenue. Models were fitted with and without these stations to determine if their inclusion in the modelling was likely to lead to biased estimates.

Data inputs to the space-time modelling were updated with 2024 data from the IPHC's FISS along with data from NOAA and ADFG's Bering Sea trawl surveys. As in 2023, the FISS was implemented with reduced spatial coverage (Figure 1), with sampling only in high-catch rate regions in IPHC Regulatory Areas 2B, 2C, 3A and 3B, along with sampling along the central Bering Sea shelf edge and Bering Sea island stations. The NOAA trawl survey also had a reduced footprint in 2024 relative to recent years, with no sampling in the northern Bering Sea.

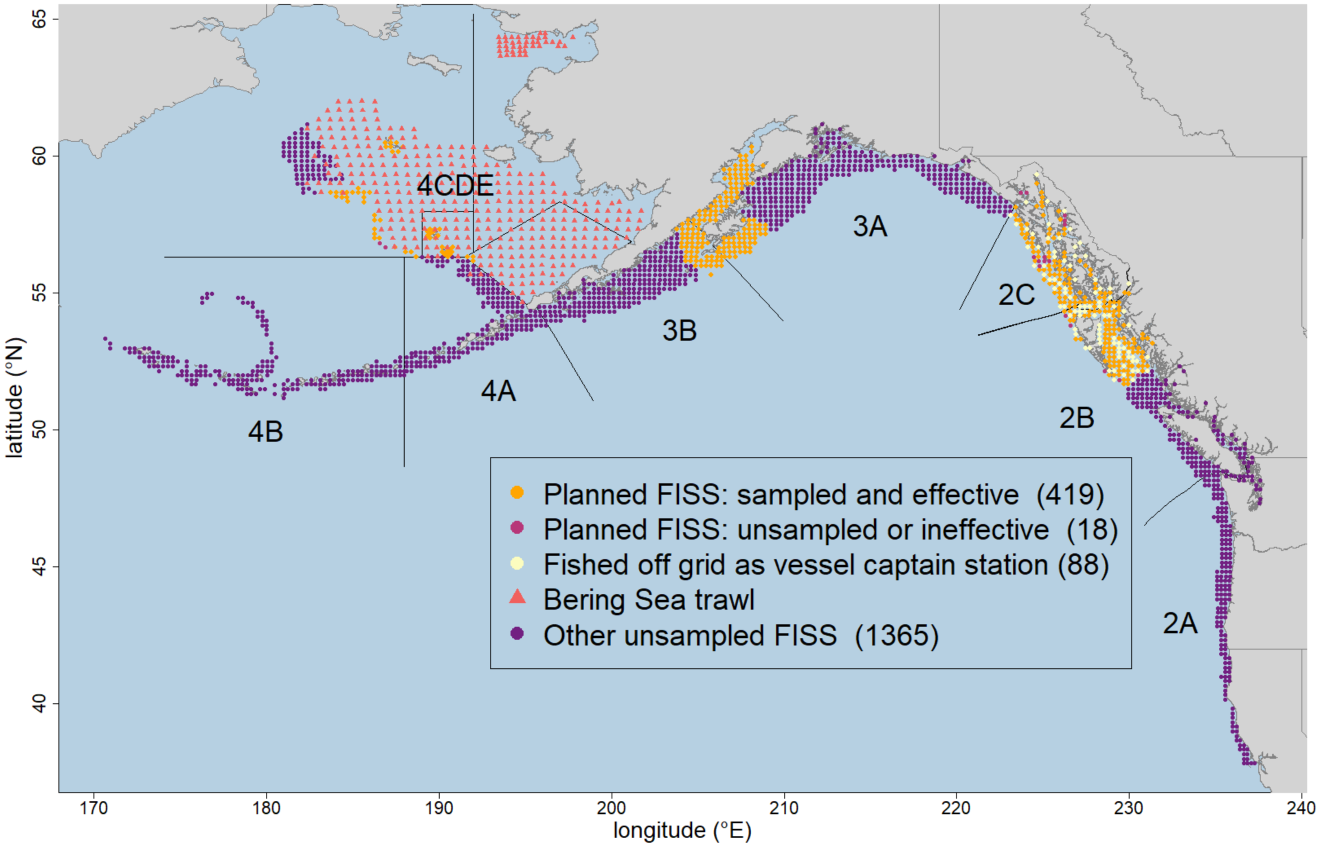

Figure 1. Map of 2024 sampled survey stations with data used in the space-time modelling (orange circles for FISS, red triangles for trawl), along with planned but ineffective FISS stations, FISS grid stations fished off grid as vessel captain stations (see text) and other unsampled FISS stations.

RESULTS OF SPACE-TIME MODELLING IN 2024

Figure 2 shows the time series estimates of O32 WPUE (most comparable to fishery catch-rates) over the 1993-2024 period included in the 2024 space-time modelling. Coastwide, we estimate a decline in the index since 2023 of 9% (95% credible interval: −17% to −1%), largely due to a 19% estimated decline in IPHC Biological Region 3. Coastwide indices of all sizes WPUE (Figure 3) and all sizes NPUE (Figure 4) were estimated to be relatively stable, with changes of −2% (−11% to +7%) and +3% (−7% to +14%) from 2023-24. Note Biological Region 4B has had no sampling since 2022: the degree of change in the index is highly uncertain and the estimated changes presented in Figures 2-4 are likely to be biased. Results for IPHC Regulatory Areas are shown in Appendix A.

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.

Ratios of the catch rate of pink salmon to chum salmon were estimated within the models for all sampled IPHC Regulatory Areas in 2024. These values are presented in Table 1. Except for O32 WPUE in IPHC Regulatory Area 2C, these ratios are all estimated to be less than 1, implying lower catch rates for pink salmon than the standard chum salmon baits. Ratios varied spatially, with western IPHC Regulatory Areas having lower values than eastern areas. Note that these ratios are based on modelling of data incorporating hook competition adjustments and do not necessarily reflect differences in raw catch rates of Pacific halibut between baits.

Table 1. Posterior estimates of the ratio of pink salmon to chum salmon catch rates for O32 and all sizes WPUE, and all sizes NPUE, by IPHC Regulatory Area (with 95% posterior credible intervals in parentheses).

IPHC Regulatory Area	O32 WPUE	All sizes WPUE	All sizes NPUE
2B	0.87 (0.68, 1.13)	0.80 (0.62, 1.02)	0.72 (0.57, 0.92)
2C	1.01 (0.81, 1.27)	0.89 (0.72, 1.11)	0.83 (0.66, 1.03)
3A	0.74 (0.59, 0.93)	0.71 (0.57, 0.87)	0.68 (0.55, 0.83)
3B	0.64 (0.49, 0.94)	0.62 (0.49, 0.78)	0.58 (0.46, 0.73)
4CDE	0.48 (0.29, 0.81)	0.32 (0.08, 1.22)	0.36 (0.10, 1.27)

Modelling showed that the inclusion of data from vessel captain stations had a large effect on estimates of indices of density for O32 WPUE and all sizes WPUE, with greater values when vessel captain station data were included (Table 2). Mean values of all sizes NPUE indices were similar with and without vessel captain station data, implying the vessels captains were able to target locations with larger Pacific halibut rather than locations with greater numbers of fish. The results imply that inclusion of data from vessel captain stations would lead to positive bias in estimated indices from the space-time model. Therefore, all model output used for stock assessment and management purposes is based on modelling that excludes data from such stations.

Table 2. Posterior means (with 95% credible intervals) for indices of density from modelling with and without vessel captain stations for O32 and all sizes WPUE, and all sizes NPUE, by IPHC Regulatory Area.

IPHC Reg. Area	O32 WPUE (lb/skate)		All sizes WPUE (lb/skate)		All sizes NPUE (halibut/skate)	
	With vessel captain stations	Without vessel captain stations	With vessel captain stations	Without vessel captain stations	With vessel captain stations	Without vessel captain stations
2B	70.5 (59.4, 82.6)	62.2 (51.5, 74.7)	97.7 (82.1, 116.0)	89.4 (74.7, 108.0)	6.8 (5.7, 8.2)	6.7 (5.4, 8.1)
2C	170.8 (147.1,195.7)	156.4 (134.0,181.5)	216.5 (188.3,248.2)	206.5 (176.7,238.4)	12.8 (11.0, 14.8)	12.9 (11.0, 15.3)

RECOMMENDATION

That the Commission **NOTE** paper IPHC-2025-AM101-10 that provides results of the space-time modelling of Pacific halibut survey data for 1993-2024.

REFERENCE

Ualesi, K., Rillera, R., Jack, T. and Coll, K. (2024) IPHC Fishery-independent setline survey (FISS) design and implementation in 2024. IPHC-2024-IM100-09.

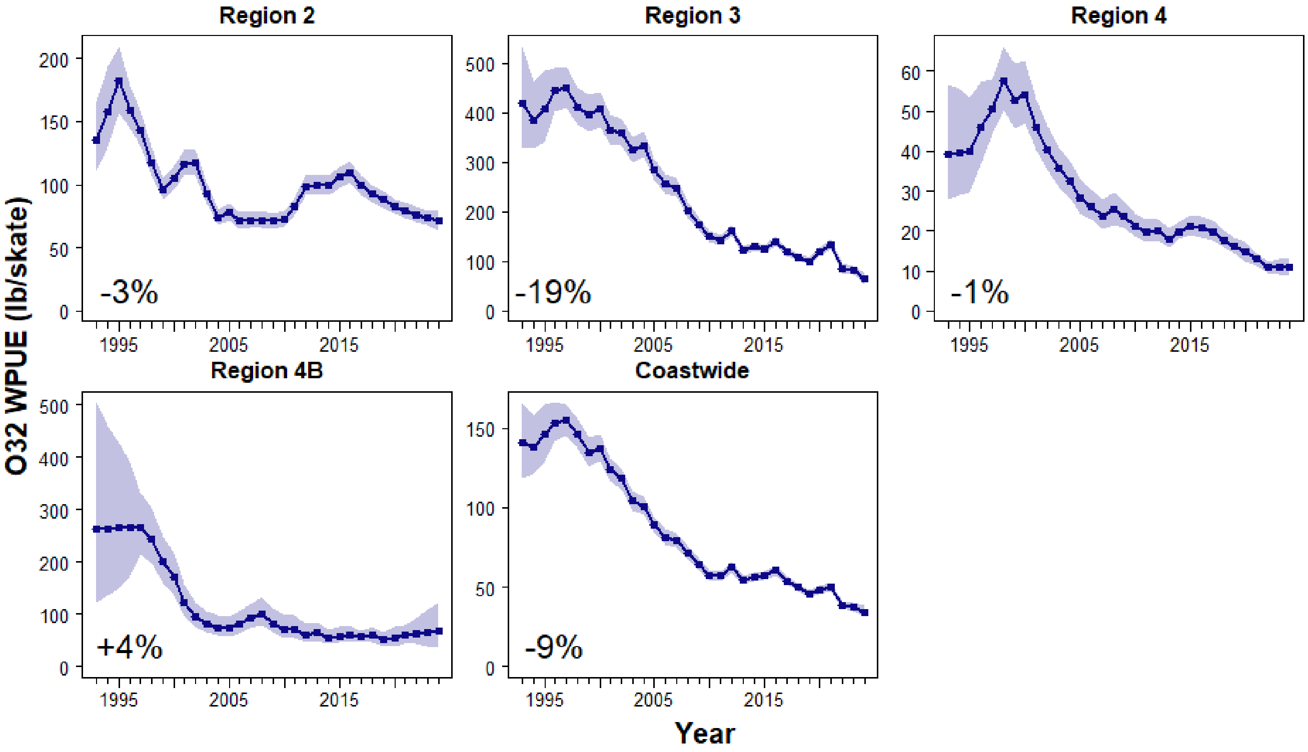

Figure 2. Space-time model output for O32 WPUE for 1993-2024 for Biological Regions. Filled circles denote the posterior means of O32 WPUE for each year. Shaded regions show posterior 95% credible intervals, which provide a measure of uncertainty: the wider the shaded interval, the greater the uncertainty in the estimate. Numeric values in the lower left-hand corners are estimates of the change in mean O32 WPUE from 2023 to 2024.

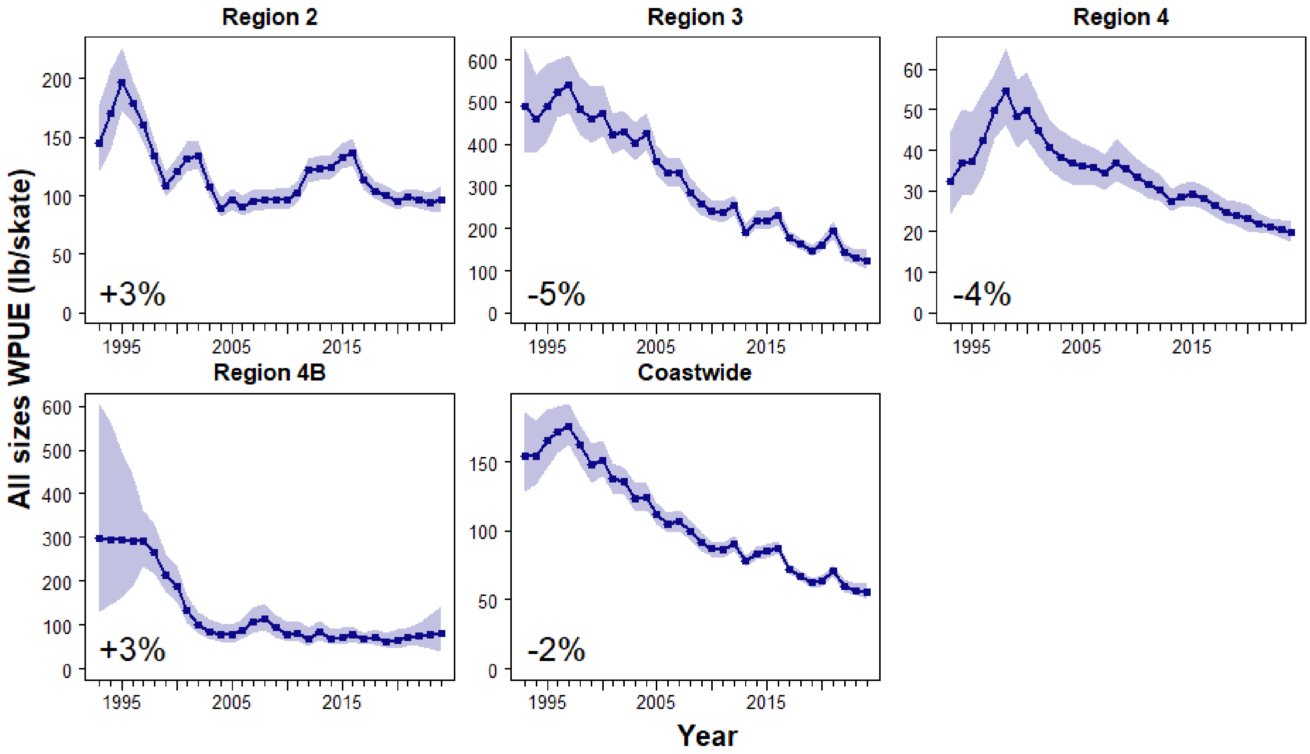

Figure 3. Space-time model output for all sizes WPUE for 1993-2024 for Biological Regions. Filled circles denote the posterior means of all sizes WPUE for each year. Shaded regions show posterior 95% credible intervals, which provide a measure of uncertainty: the wider the shaded interval, the greater the uncertainty in the estimate. Numeric values in the lower left-hand corners are estimates of the change in mean all sizes WPUE from 2023 to 2024.

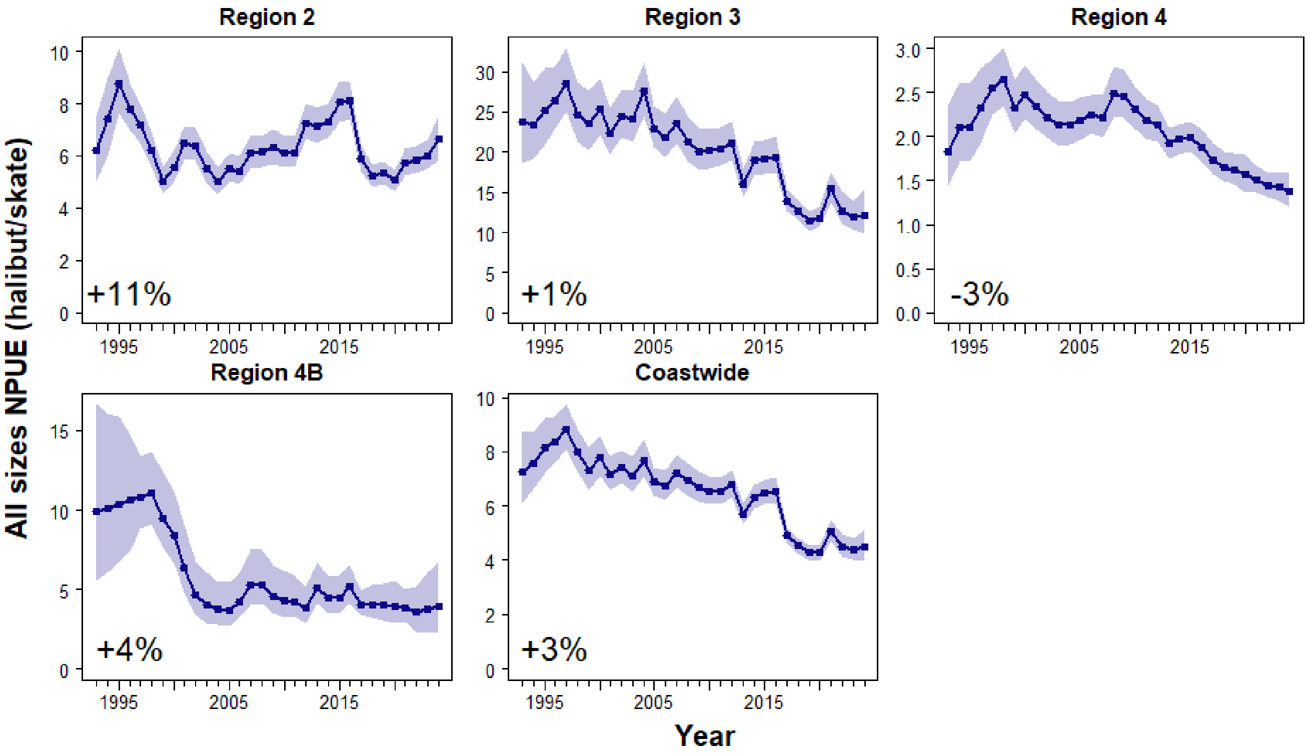

Figure 4. Space-time model output for all sizes NPUE for 1993-2024 for Biological Regions. Filled circles denote the posterior means of all sizes NPUE for each year. Shaded regions show posterior 95% credible intervals, which provide a measure of uncertainty: the wider the shaded interval, the greater the uncertainty in the estimate. Numeric values in the lower left-hand corners are estimates of the change in mean all sizes NPUE from 2023 to 2024.

APPENDIX A

Space-time modelling results by IPHC Regulatory Area

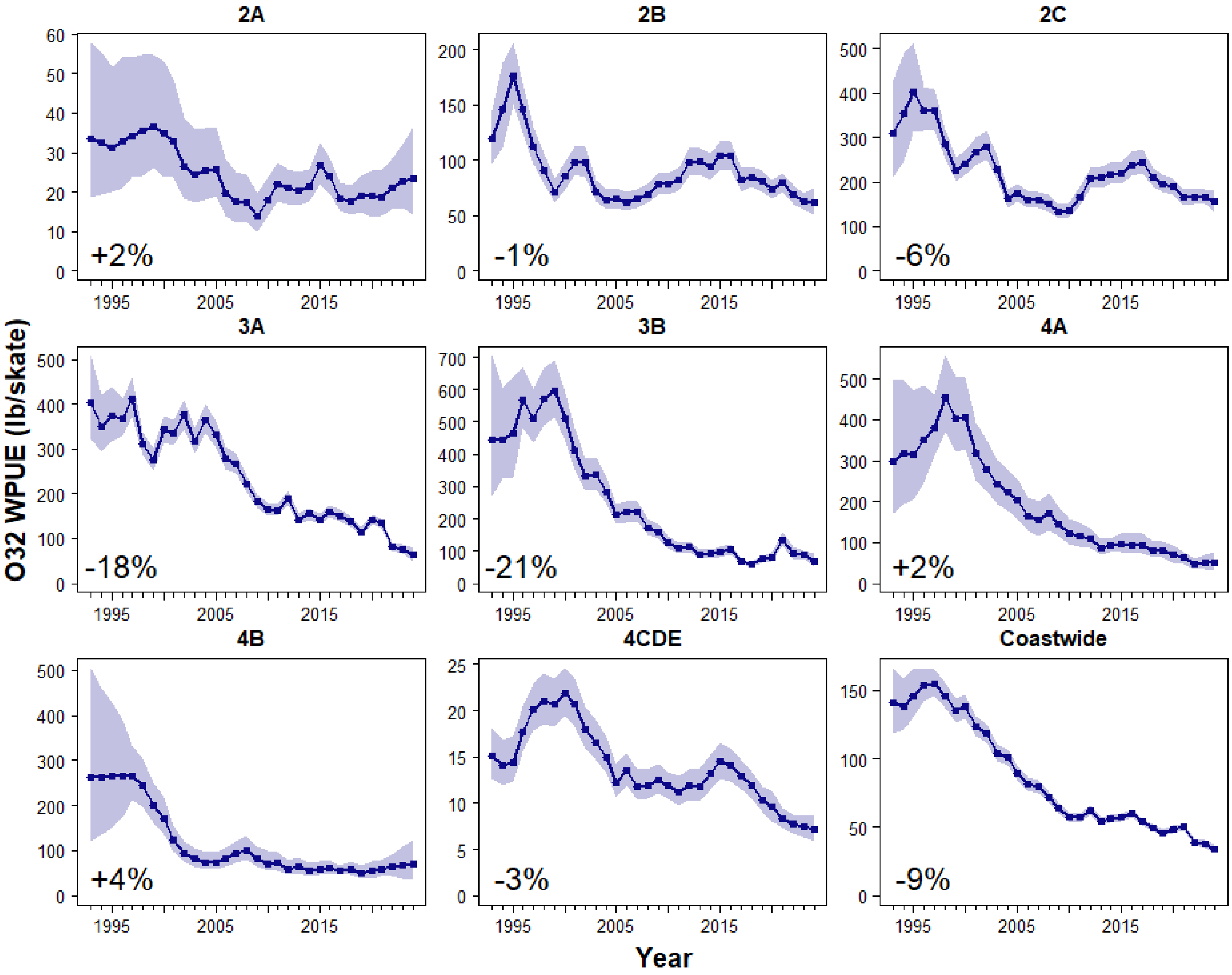

Figure A.1. Space-time model output for O32 WPUE for 1993-2024. Filled circles denote the posterior means of O32 WPUE for each year. Shaded regions show posterior 95% credible intervals, which provide a measure of uncertainty: the wider the shaded interval, the greater the uncertainty in the estimate. Numeric values in the lower left-hand corners are estimates of the change in mean O32 WPUE from 2023 to 2024.

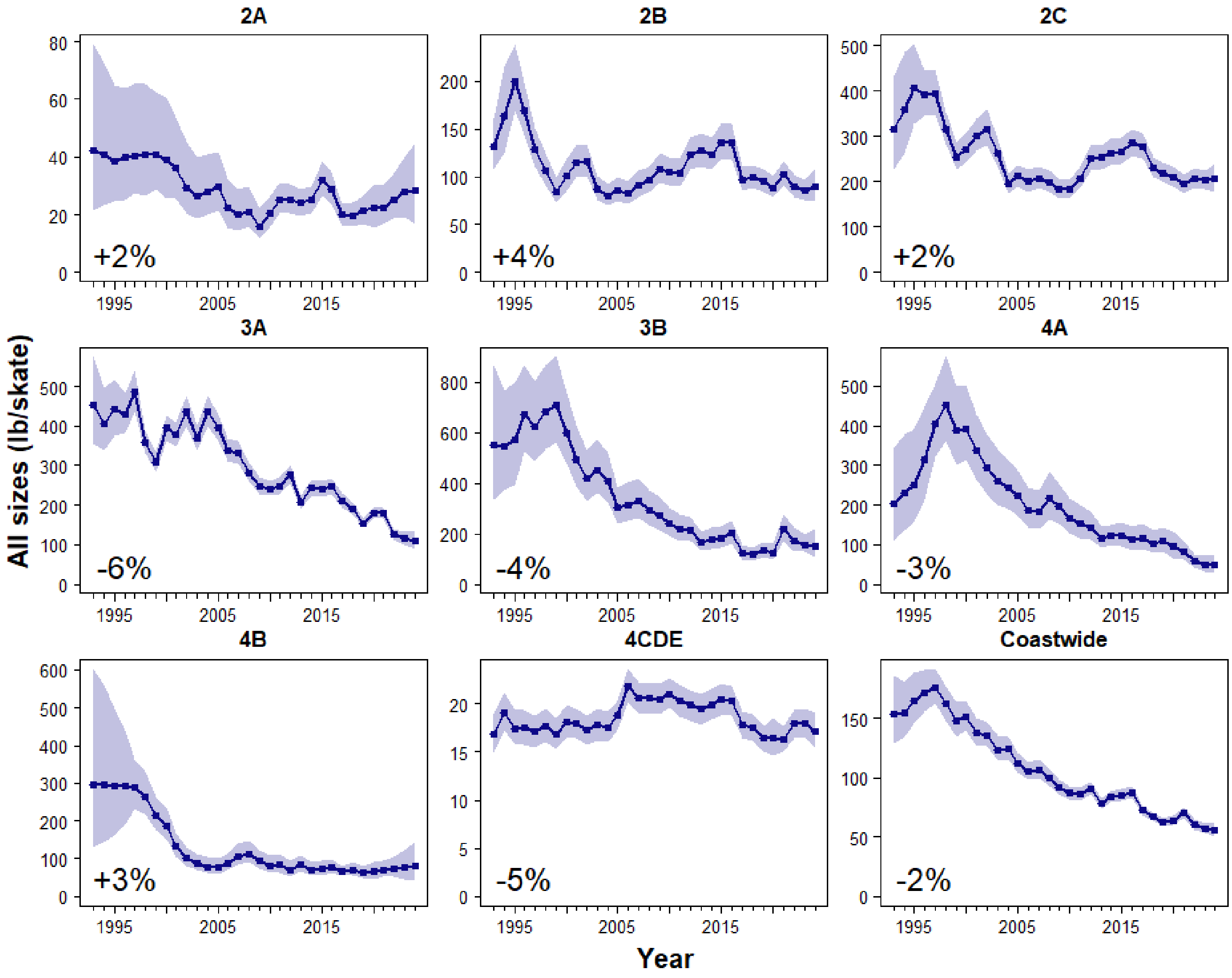

Figure A.2. Space-time model output for all sizes WPUE for 1993-2024. Filled circles denote the posterior means of all sizes WPUE for each year. Shaded regions show posterior 95% credible intervals, which provide a measure of uncertainty: the wider the shaded interval, the greater the uncertainty in the estimate. Numeric values in the lower left-hand corners are estimates of the change in mean all sizes WPUE from 2023 to 2024.

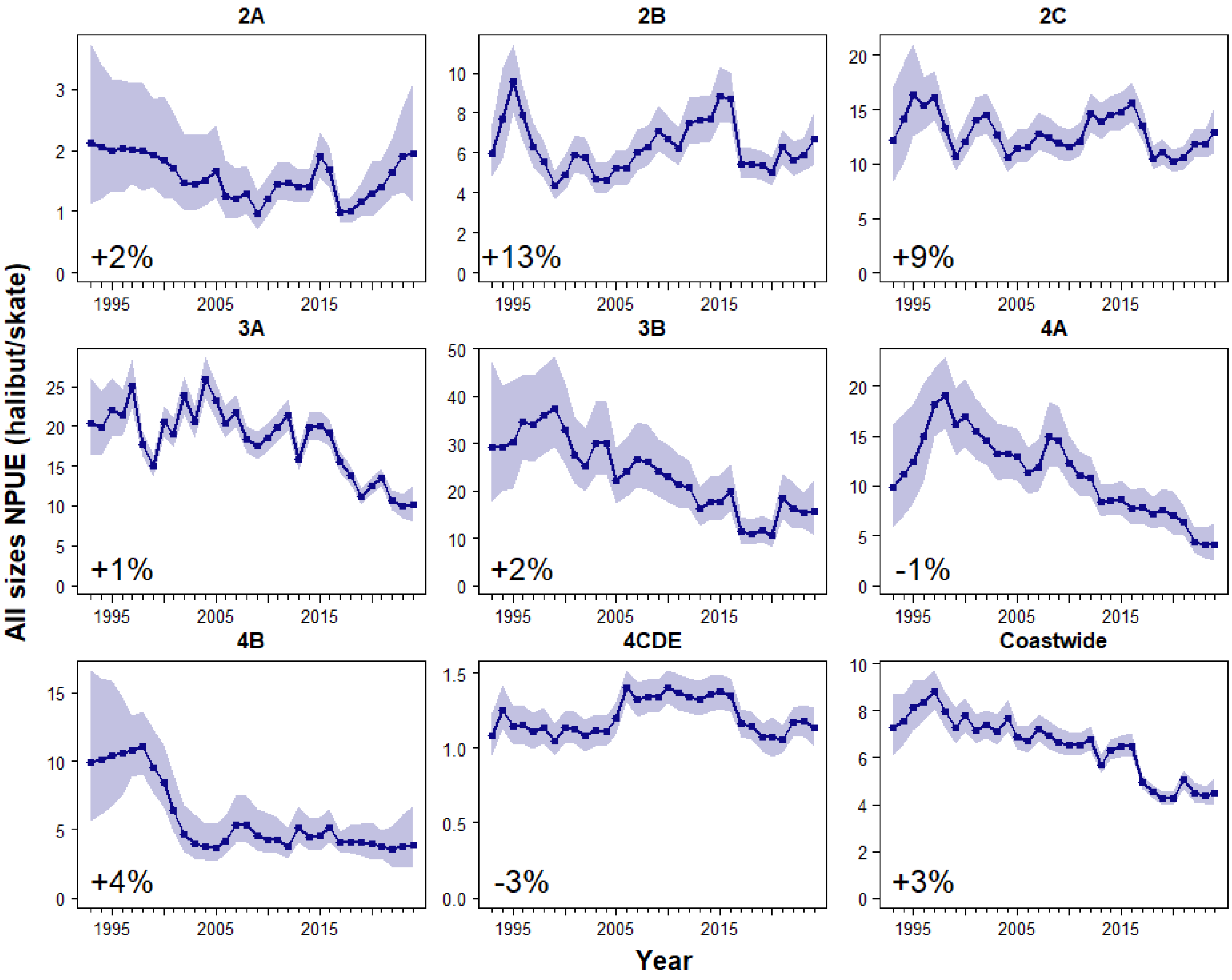

Figure A.3. Space-time model output for all sizes NPUE for 1993-2024. Filled circles denote the posterior means of all sizes NPUE for each year. Shaded regions show posterior 95% credible intervals, which provide a measure of uncertainty: the wider the shaded interval, the greater the uncertainty in the estimate. Numeric values in the lower left-hand corners are estimates of the change in mean all sizes NPUE from 2023 to 2024.

Data overview and stock assessment for Pacific halibut (*Hippoglossus stenolepis*) at the end of 2024

PREPARED BY: IPHC SECRETARIAT (I. STEWART, A. HICKS, R. WEBSTER, AND D. WILSON; 10 DECEMBER 2024)

PURPOSE

To provide the Commission with a summary of the data, stock assessment at the end of 2024. Note that this document reflects a revision to the projected landings and directed commercial fishery discards for 2024, including updated stock assessment results.

INTRODUCTION

In 2024 the International Pacific Halibut Commission (IPHC) undertook its annual coastwide stock assessment of Pacific halibut (*Hippoglossus stenolepis*). This stock assessment represents a second update, following the full assessment conducted in 2022. There are no structural changes to the assessment methods for 2023 or 2024. Supporting analyses were reviewed by the IPHC's Scientific Review Board (SRB) in June (SRB024; IPHC-2024-SRB024-08, IPHC-2024-SRB024-R) and September 2024 (SRB025; IPHC-2024-SRB025-06, IPHC-2024-SRB025-R).

This document provides an overview of the data sources available for the 2024 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 2024 for this analysis, which includes updates to data collected in previous years.

Overall, recent spawning biomass (SB) estimates are lower than those in last year's stock assessment; however, the recent estimated trend is nearly flat. Year-classes estimated for 2012 and 2016 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).

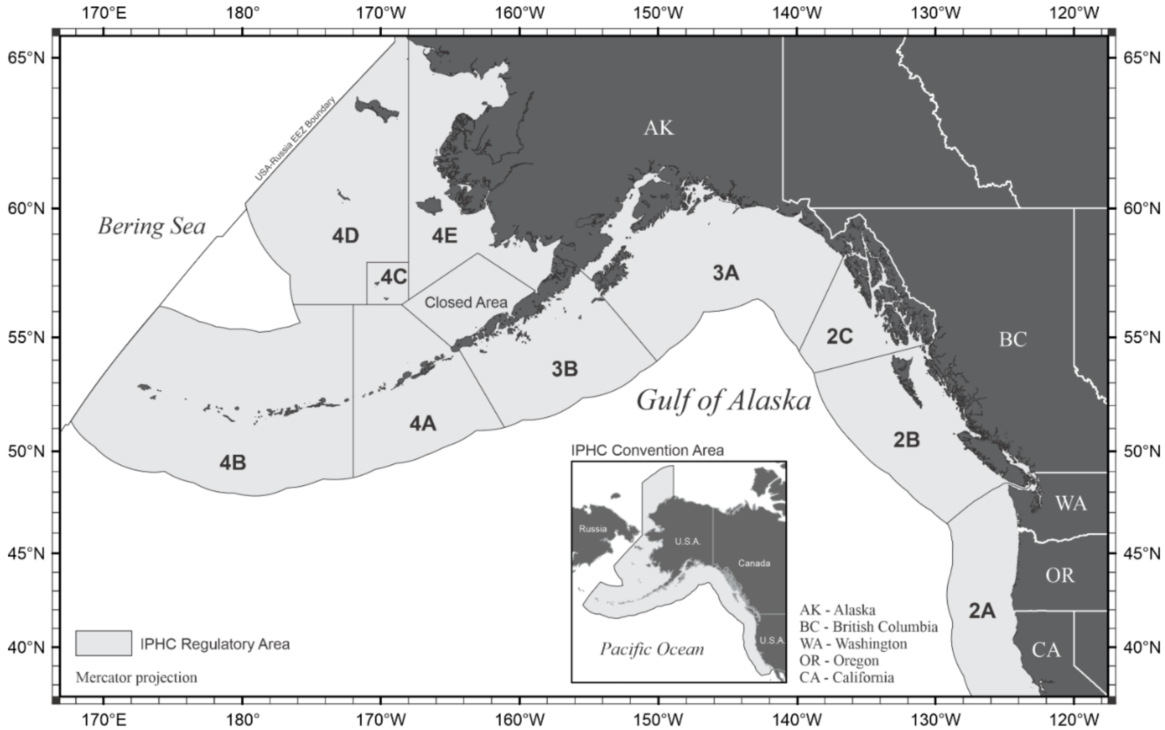

Figure 1. IPHC Convention Area (insert) and IPHC Regulatory Areas.

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 2025 are reported in a separate document (IPHC-2025-AM101-13).

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 1888-2024, mortality from all sources has totaled 7.4 billion pounds (~3.4 million metric tons, t). Since 1925, the fishery has ranged annually from 33 to 100 million pounds (15,000-45,000 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 35.7 million pounds (~16,200 t) from 2020-24.

2024 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-2025-AM101-08), modelled

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[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.

indices of abundance (IPHC-2024-IM100-10 Rev_1) based on the IPHC's FISS (in 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).

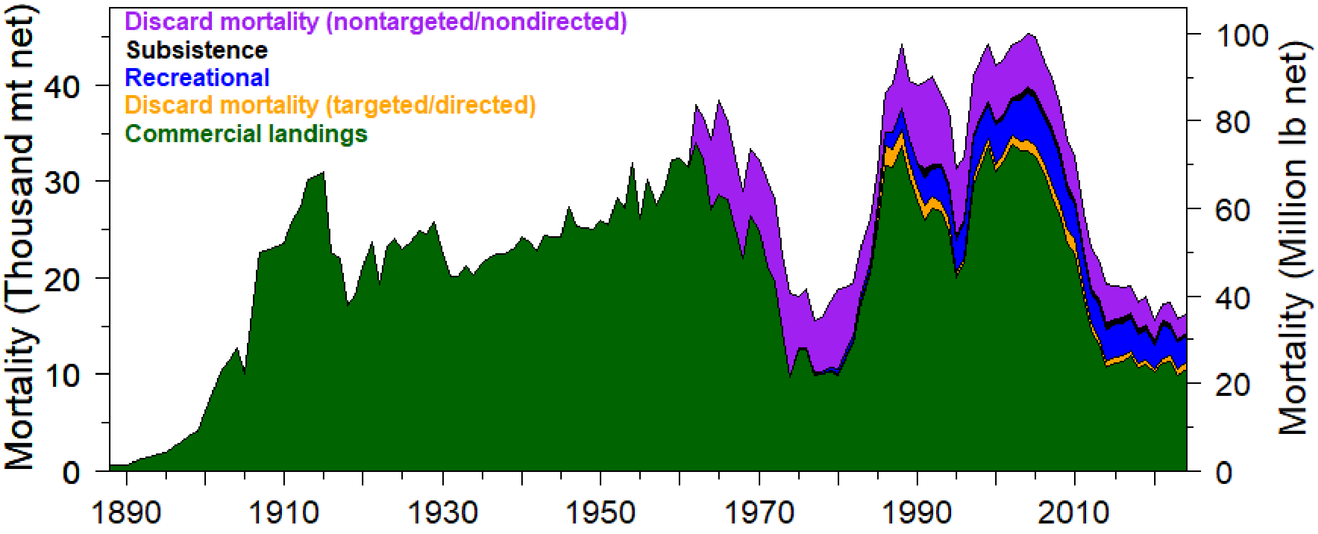

Figure 2. Summary of estimated historical mortality by source (colors), 1888-2024.

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 2024 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 2023 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 2024. Available information was finalized on 31 October 2024 in order to provide adequate time for analysis and modeling. However, directed commercial landings and discards were updated in late November to better reflect the fishery performance in 2024. 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 2024 were approximately 20.5 million pounds (~9,300 t), down 6% from 2023[2]. Discard mortality in non-directed fisheries was estimated to be 4.1 million pounds in 2024 (~1,900 t)[3], down 5% from 2023 and remaining below all recent estimates prior to 2021. The total recreational mortality (including estimates of discard mortality) was estimated to be 5.9 million pounds (~2,700 t) down 5% from 2023. Mortality from all sources decreased by 5% to an estimated 32.7 million pounds

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[2] The mortality estimates reported in this document and used in the assessment analysis were updated in late November 2024; 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 2025.

(~14,800 t) in 2024, the lowest value in 100 years, based on preliminary information available for this assessment.

The 2024 modelled FISS results detailed an estimated coastwide aggregate Numbers-Per-Unit-Effort (NPUE) which increased by 3% from 2023 to 2024, remaining at a level similar to those observed in 2018-2020 (Figure 3). Biological Region 3 increased by 1%, while Biological Region 2 increased by 11% and Biological Region 4 decreased by 3%. Biological Region 4B is estimated to have increased by 4%; however, this area has not been sampled since 2022 (and then only partially) and credible intervals reflect a wide plausible range of potential trends, both increasing and decreasing, from 2022 to 2024. The modelled coastwide Weight-Per-Unit-Effort (WPUE) of legal (O32) Pacific halibut, the most comparable metric to observed commercial fishery catch rates, decreased by 9% from 2023 to 2024. Individual IPHC Regulatory Areas varied from an estimated 4% increase (Regulatory Area 4B; noting high uncertainty and high likelihood of bias due to lack of recent sampling) to a 21% decrease (Regulatory Area 3B) in O32 WPUE (Figure 4).

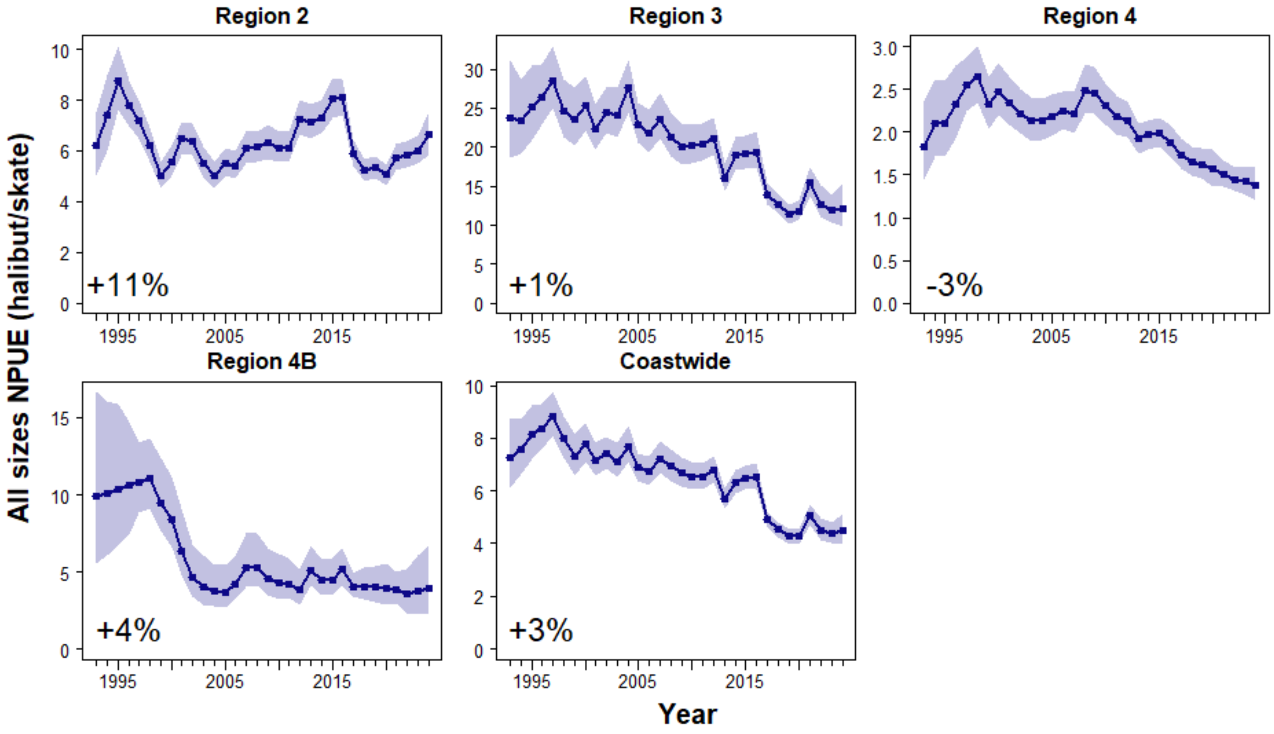

Figure 3. Trends in modelled FISS NPUE by Biological Region, 1993-2024. Percentages indicate the estimated change from 2023 to 2024. Shaded zones indicate 95% credible intervals.

Preliminary commercial fishery WPUE estimates from 2024 logbooks showed a 2% decrease from 2023 to 2024 at the coastwide level (Figure 5). However, based on recent updates to in-season preliminary estimates, after accounting for additional logbooks compiled after the fishing season this drop is expected to increase to 7%. Trends varied among IPHC Regulatory Areas, fisheries, and gears; however, all areas showed decreased CPUE in one or more index, with the largest decreases occurring in IPHC Regulatory Area 3B, corresponding to those observed in the FISS.

Biological information (ages and lengths) from the commercial fishery landings showed that in 2024 the 2012 year-class (now 12 years old) was again the largest coastwide contributor (in number) to the fish landed. This follows the same patterns observed in 2022-23, after the fishery transitioned from the previously most-abundant 2005 year-class. The FISS also observed the 2012 year-class as a large proportion of the total catch, but the largest proportion comprised the 2016 year-class (age-8 in 2024) also observed in the commercial fishery and recent recreational fisheries. Recent trawl surveys suggest the potential for one or more strong year-classes in 2016-2018; however, the most recent age-length key available is from 2022, so it is difficult to identify specifically which of these year-classes are present in appreciable numbers. Individual size-at-age trends appear mixed through 2024 with previously observed increases for younger ages (<14) reversing in some cases.

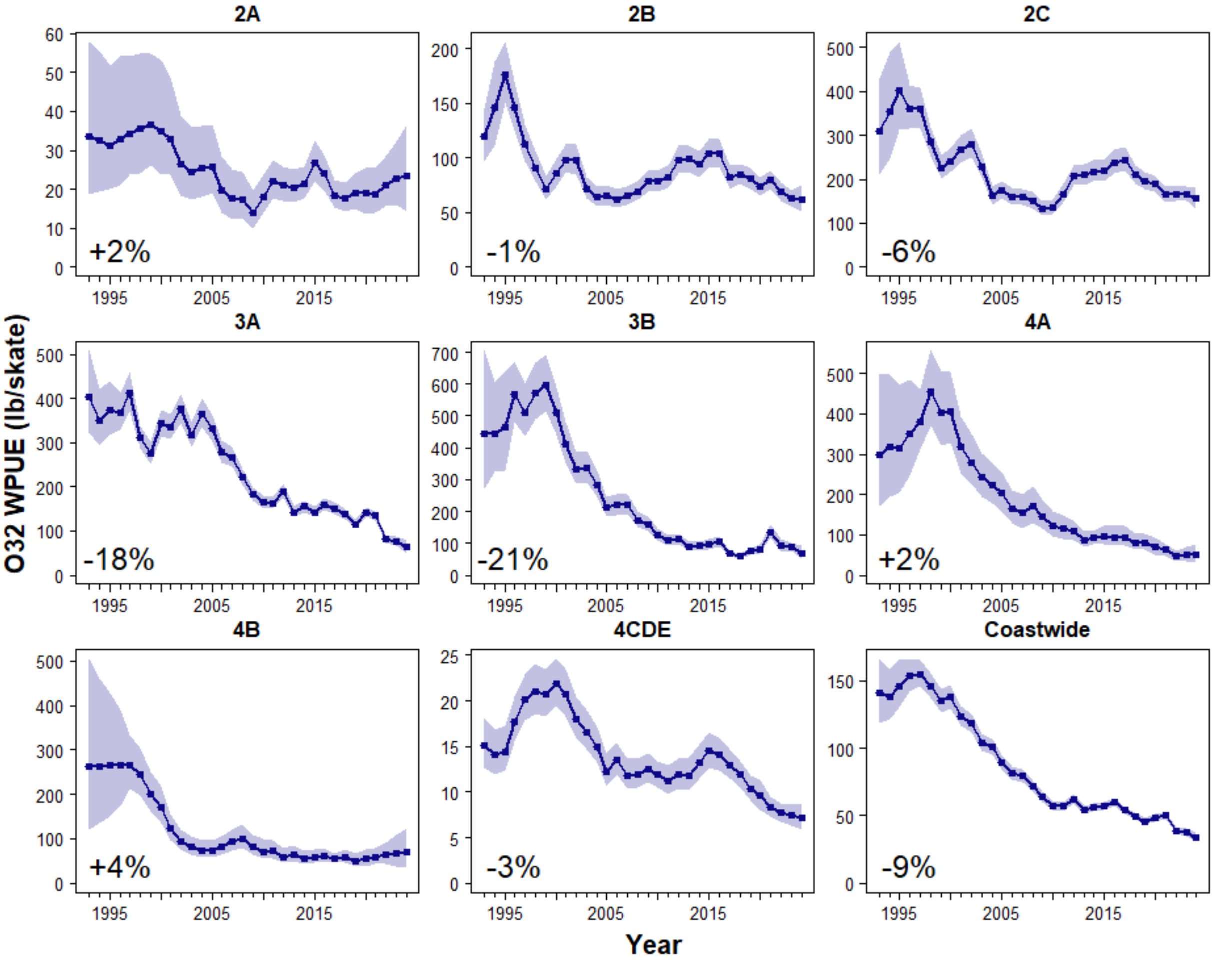

Figure 4. Trends in modelled FISS legal (O32) WPUE by IPHC Regulatory Area, 1993-2024. Percentages indicate the estimated change from 2023 to 2024. Shaded zones indicate 95% credible intervals.

Biological stock distribution

The population distribution (measured via the modelled FISS catch in weight of all Pacific halibut) showed a continuation of the 20-year 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. Due to the lack of FISS sampling in Biological Region 4B and generally reduced designs in 2023-24. the credible intervals for stock distribution are wide. For Biological Region 4B, the credible stock distribution in 2024 ranges from 4 to 12%. Survey data are insufficient to estimate stock distribution prior to 1993. It is therefore unknown how historical distributions may compare with recent observations.

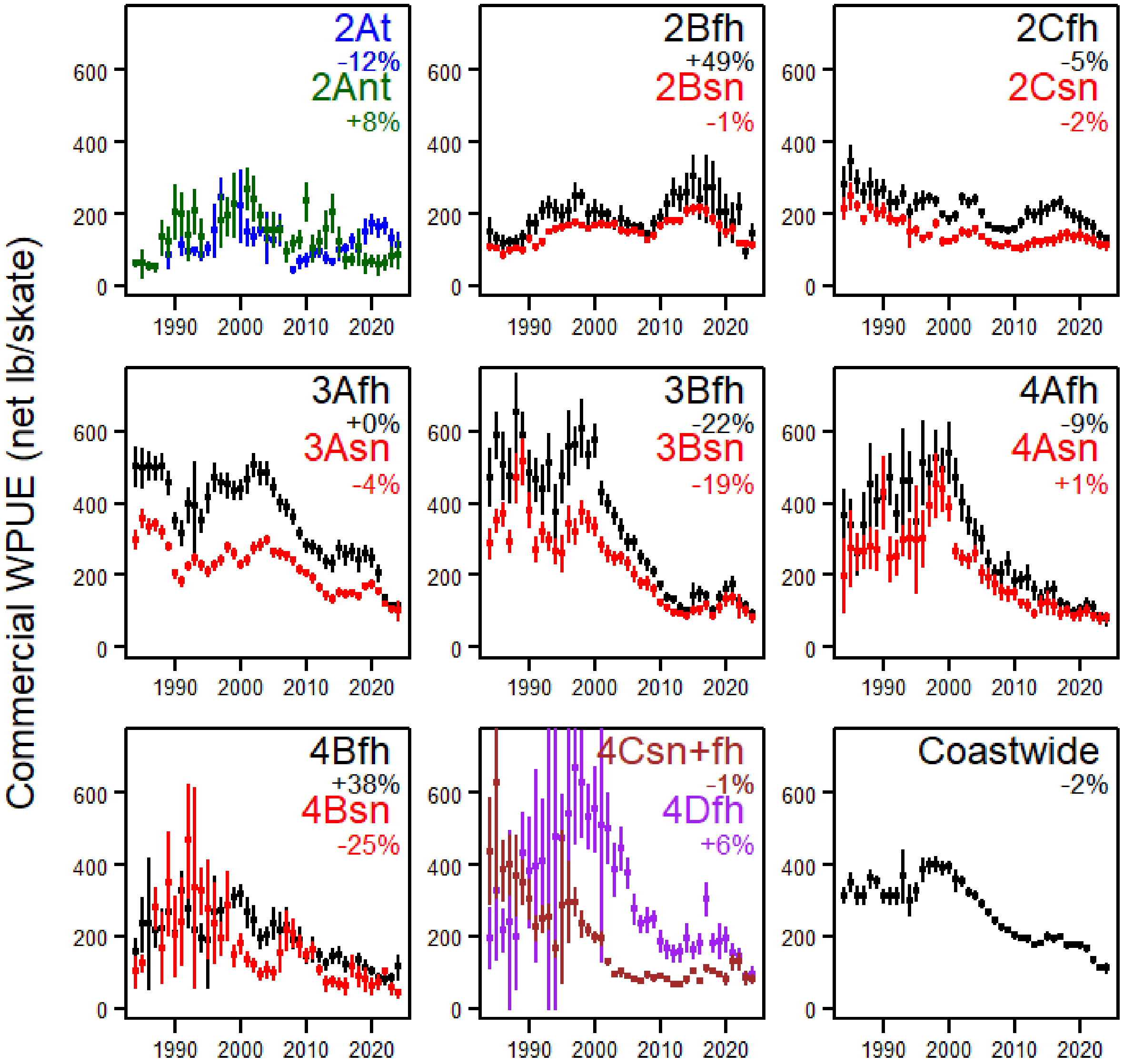

Figure 5. Trends in commercial fishery WPUE by IPHC Regulatory Area and fishery or gear, 1984-2024. The tribal fishery in 2A is denoted by “2At”, non-tribal by “2Ant”, fixed-hook catch rates by “fh” and snap-gear catch rates by “sn” for IPHC Regulatory Areas 2B-4D. Percentages indicate the change from 2023 to 2024 uncorrected for bias due to incomplete logbooks (see text above). Vertical lines indicate approximate 95% confidence intervals.

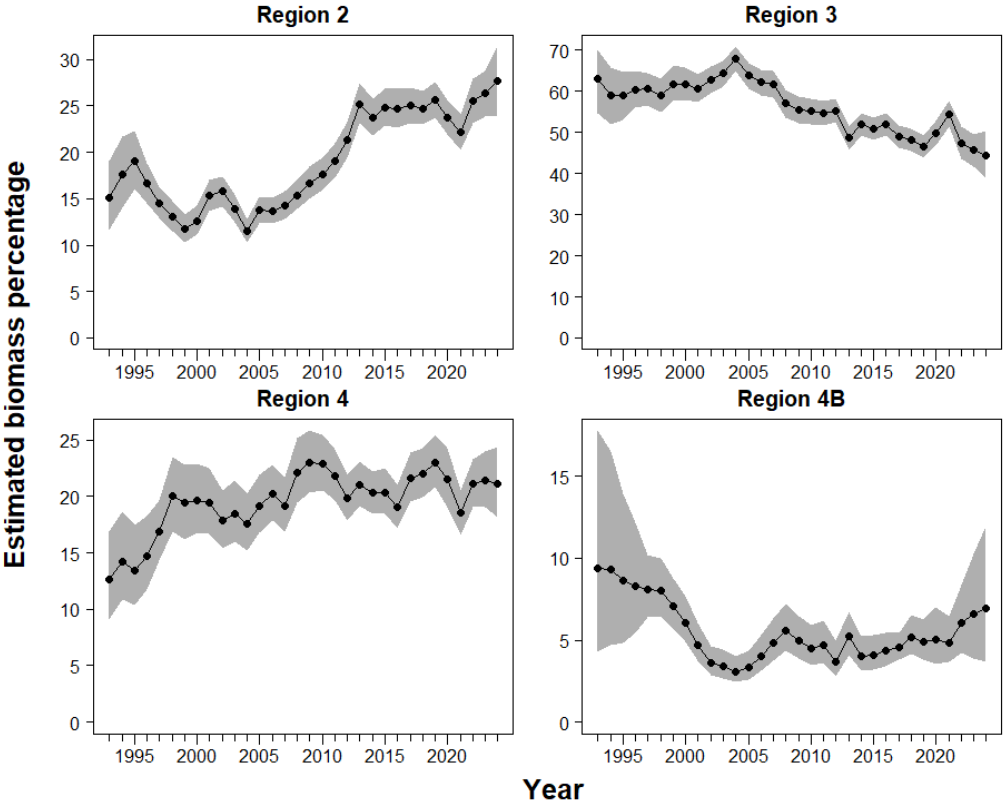

Figure 6. Estimated stock distribution (1993-2024) based on modelled survey catch weight per unit effort of all sizes of Pacific halibut. Shaded zones indicate 95% credible intervals.

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
2020	23.8%	49.7%	21.5%	5.0%
2021	22.2%	54.5%	18.5%	4.8%
2022	25.6%	47.2%	21.1%	6.1%
2023	26.3%	45.6%	21.5%	6.6%
2024	27.7%	44.3%	21.1%	7.0%

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), selectivity, 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 a second update, following the full assessment conducted in 2022 (IPHC-2023-SA01), and the update in 2023 (IPHC-2024-SA01). There are no structural changes to the assessment methods for 2024. Supporting analyses were reviewed by the IPHC's Scientific Review Board (SRB) in June (SRB024; IPHC-2024-SRB024-08, IPHC-2024-SRB024-R) and September 2024 (SRB025; IPHC-2024-SRB025-06, IPHC-2024-SRB025-R).

For the second year in a row, the most influential source of new information in this assessment was the directed commercial fishery logbook trend, including the updated (and lower) 2023 estimate as well as the estimate of the catch-rate in 2024. The addition of just this information resulted in an 17% decrease in the 2024 spawning biomass estimate, compared to that in the 2023 stock assessment. This is partly a result of the decline in the 2024 fishery WPUE and a lower 2023 fishery WPUE when adding additional logbooks to the analysis this year. Although differences in trend between the FISS and commercial fishery are not uncommon in the historical time-series, the sensitivity of this and last year's assessment to these data highlights the importance of both time-series in estimating the stock size and trend.

BIOMASS, RECRUITMENT, AND FISHING INTENSITY TRENDS

The results of the 2024 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 145 million pounds (~65,700 t) at the beginning of 2024. At the beginning of 2025 the spawning biomass is estimated to have increased slightly due to the continued maturation of the 2012 year-class and the onset of maturity of the 2016 year-class. The current spawning biomass estimate is 149 million pounds (67,500 t), with an approximate 95% credible interval ranging from 97 to 216 million pounds (~44,100-98,200 t; Figure 8). The recent spawning biomass estimates from the 2024 stock assessment are very consistent with previous assessments up 2019, and below subsequent estimates for 2020 to 2024 from more recent assessments (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 currently influencing the stock and therefore 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 at the beginning of 2025 was estimated to be 38% (credible interval: 18-55%) slightly higher than the estimate for 2024 (37%). The probability that the stock is below the $SB_{30\%}$ level is estimated to be 30% at the beginning of 2025, with a 11% 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 (41%), and the coastwide model above (143%). 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.

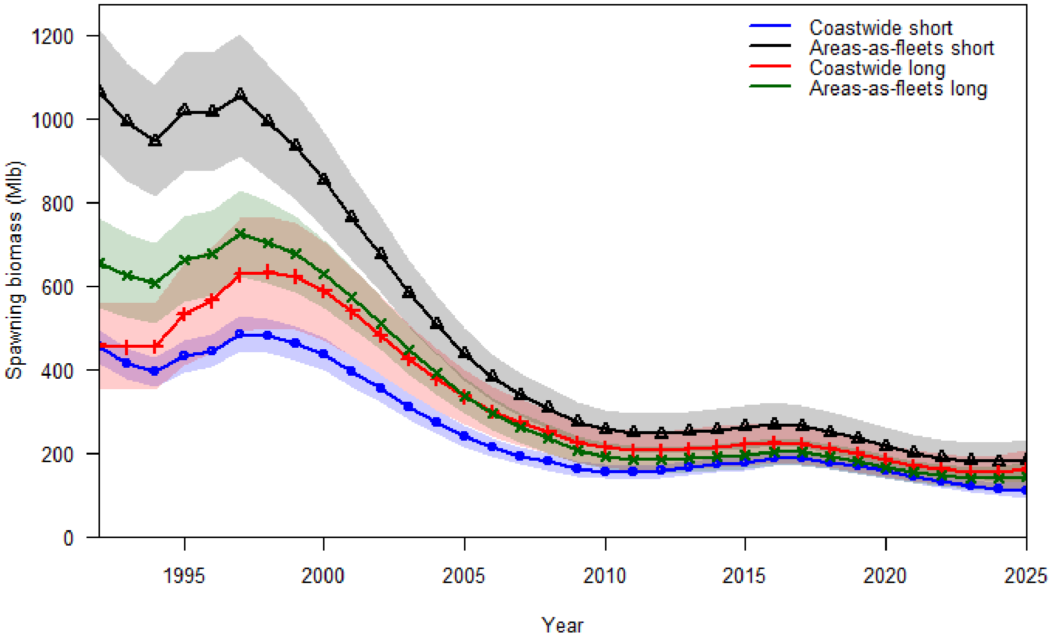

Figure 7. Estimated spawning biomass trends (1992-2025) based on the four individual models included in the 2024 stock assessment ensemble. Series indicate the maximum likelihood estimates; shaded intervals indicate approximate 95% credible intervals.

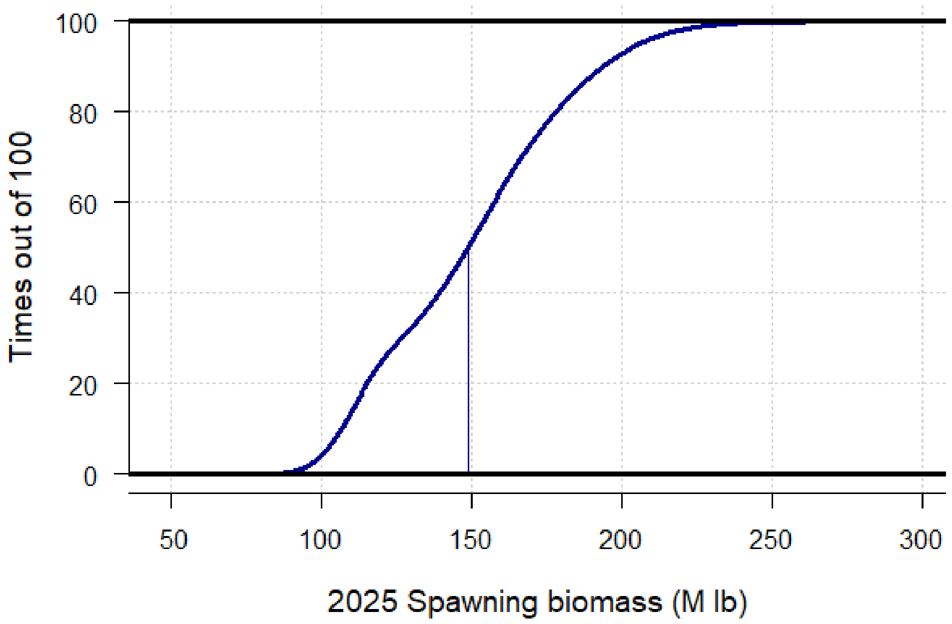

Figure 8. Cumulative distribution of the estimated spawning biomass at the beginning of 2025. Curve represents the estimated probability that the biomass is less than or equal to the value on the x-axis; vertical line represents the median (149 million pounds, ~64,500 t).

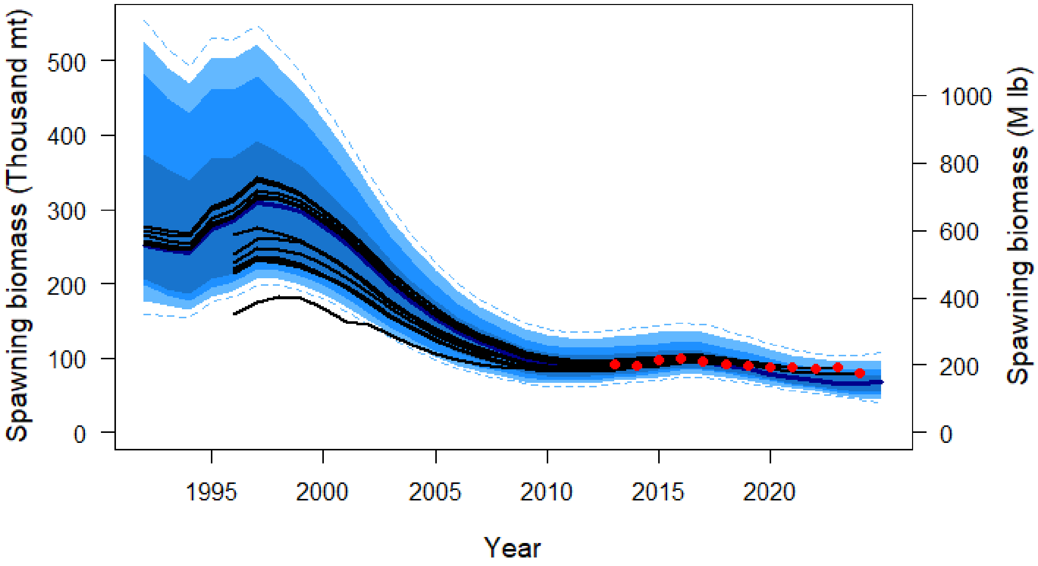

Figure 9. Retrospective comparison of female spawning biomass among recent IPHC stock assessments. Black lines indicate estimates from assessments conducted in 2012-2023 with the terminal estimate shown as a red point. The shaded distribution denotes the 2024 ensemble: the dark blue line indicates the 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 (59 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

2024). 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 largest recent cohorts to have been born 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 now comprise the majority of the spawning biomass. Based on age data through 2024, individual models in this assessment produced estimates of the 2012 year-classes that were similar to the average level observed over 1994-2005. Of the fish comprising the 2012 year-class, 56% are estimated to be mature as of 2024 and the continued maturation of this cohort has a strong effect on the short-term projections. The 2024 data indicate a reduction in the 2014 year-class compared to earlier data, placing it on a similar scale to 2006-2008. The 2016 year-class (age-8 in 2024) may be of a similar magnitude to the 2012 cohort but remains very uncertain. There is little information on recruitments after 2016 in the data currently available.

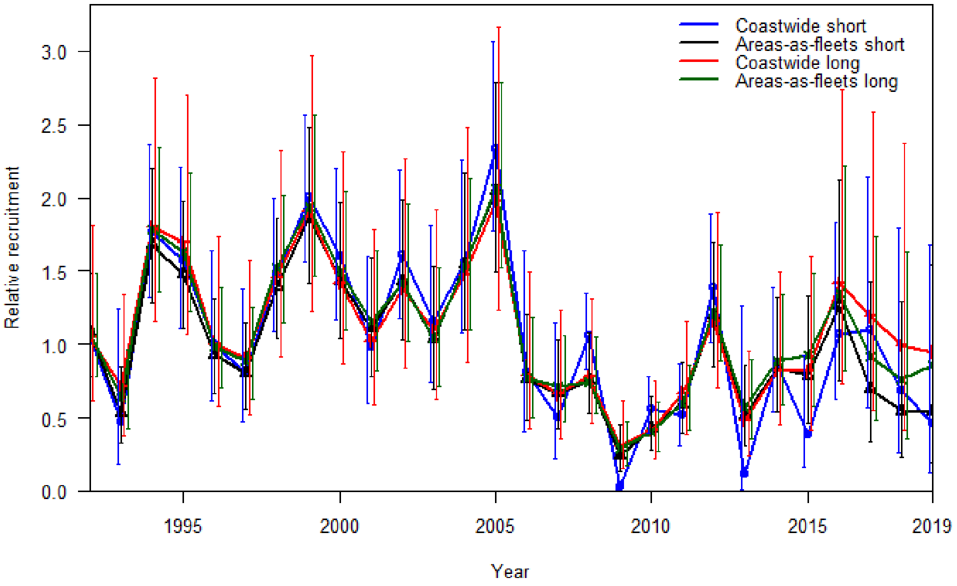

Figure 10. Estimated trends in age-0 relative recruitment (standardized to the mean for each model) from 1992-2019, based on the four individual models included in the 2024 stock assessment ensemble. Series indicate the maximum likelihood estimates; vertical lines indicate approximate 95% credible intervals.

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 historical time-series of fishing intensity is estimated to have peaked in the period from 2004-2011 (Figure 11). Since approximately 2014 previous and current estimates have fluctuated around reference levels. The 2024 fishing intensity is estimated to be $F_{49\%}$ (credible interval: 30-64%; Table 2), below both the current and previous ($F_{46\%}$) reference levels and the value estimated for 2023 (47%). 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 as fishing intensity was reduced (Figure 12).

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 seven years (2017-23) 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.

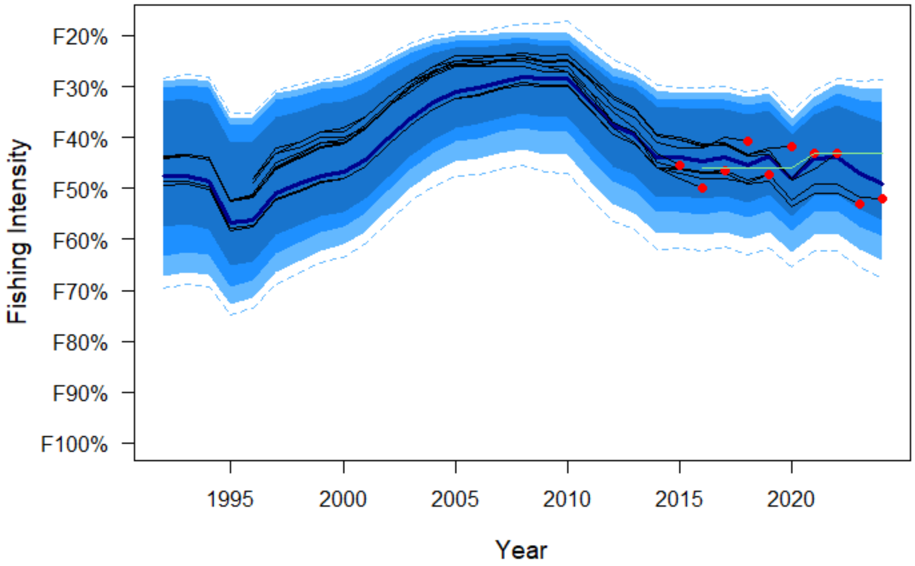

Figure 11. Retrospective comparison of fishing intensity (measured as $F_{xx\%}$, where xx% indicates the Spawning Potential Ratio (SPR) or the reduction in the lifetime reproductive output (due to fishing) among recent IPHC stock assessments. Black lines indicate estimates of fishing intensity from assessments conducted in 2014-2023 with the projection for the mortality limit adopted based on that assessment shown as a red point. The shaded distribution denotes the 2024 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).

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 along with fishing mortality.

The reduction in estimated commercial fishery catch rates from the time the data sets for the stock assessment are closed until the data are relatively complete (sometime the following year) has been previously identified. Concern over the potential for incomplete fishery CPUE to bias the assessment results led to the recommendation to ‘down-weight’ the terminal year via doubling the estimated variance in the index (IPHC-2017-SRB11-R). However, when the CPUE and other data provide differing information on the recent stock scale and/or trend this approach of inflating the variance may make subsequent analyses more sensitive to the change in CPUE rather than less. Historically this has not been an issue, however in both the 2023 and 2024 stock assessments it has. An alternative analysis was conducted this year using the estimated variance without any inflation and applying an additional 5% decrease from the observed (now updated) 2023 value to the preliminary 2024 estimate. This resulted in an additional 2% decrease in the estimated 2025 spawning biomass. An alternative projection is also provided based on this approach (IPHC-2025-AM101-13).

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.

Table 2. Status summary of the Pacific halibut stock and fishery in the IPHC Convention Area at beginning of 2025.

Indicators	Values	Trends	Status
Biological			
SPR$_{2024}$: P(SPR<43%): P(SPR<limit):	49% (30-64%)[2] 33% Limit not specified	Fishing intensity decreased from 2023 to 2024	**Fishing intensity below reference level**[3]
SB$_{2025}$ (Mlbs): SB$_{2025}$/SB$_{0}$: P(SB$_{2025}$<SB$_{30}$): P(SB$_{2025}$<SB$_{20}$):	149 (97–216) Mlbs 38% (18-55%) 30% 11%	SB increased 3% from 2024 to 2025	**Not overfished**[4]
Biological stock distribution:	See Tables and Figures	Region 3 decreased, Region 2 increased from 2023 to 2024	**Region 3 at the lowest observed proportion**
Fishery Context			
Total mortality 2024: Percent retained 2024: Average mortality 2020-24:	32.70 Mlbs, 14,832 t[1] 83% 35.66 Mlbs, 16,174 t	Mortality decreased from 2023 to 2024	**2024 mortality at 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 $SB_{20\%}$.

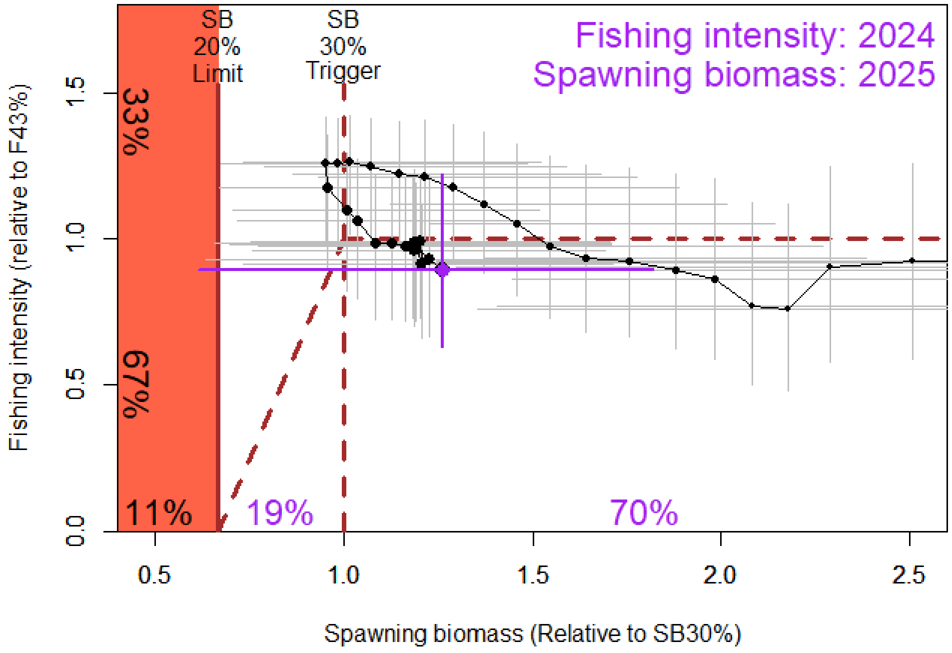

Figure 12. Phase plot showing the estimated time-series (1992-2025) of spawning biomass and fishing intensity relative to the reference points specified in the IPHC's interim management procedure. Dashed lines indicate the current $F_{43\%}$ (horizontal) reference fishing intensity, with

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 2024 and spawning biomass at the beginning of 2025 shown as the largest point (purple). Percentages along the y-axis indicate the probability of being above and below $F_{43\%}$ in 2024; 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 2025.

SUMMARY OF SCIENTIFIC ADVICE

Sources of mortality: In 2024, total Pacific mortality due to fishing decreased to 32.70 million pounds (14,832 t), below the 5-year average of 35.66 million pounds (16,174 t) and representing the lowest value in over 100 years, due to a TCEY reduction of 4.6% from 2023 to 2024. Of that total mortality, 83% was retained and utilized in one of the fishery sectors (Table 2); this was below to the percent utilized in 2023 (84%) and equal to that observed in 2022.

Fishing intensity: The 2024 fishing mortality corresponded to a point estimate of SPR = 49%; there is a 33% 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 2025) female spawning biomass is estimated to be 149 million pounds (67,500 t), which corresponds to a 30% chance of being below the IPHC trigger reference point of $SB_{30\%}$, and an 11% chance of being below the IPHC limit reference point of $SB_{20\%}$. The stock is estimated to have declined 32% from 2016 to 2024, then increased by 3% to the beginning of 2025. The relative spawning biomass (compared to the biomass projected to be present at the beginning of 2025 in the absence of any fishing) is currently estimated to be 38%, after reaching the lowest point in the recent time series (28%) 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 2022-24 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 2023-24 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 2023-24. This shift from older to younger (and smaller fish) has contributed to observed reduced catch rates. The current spawning stock is heavily reliant on the 2012 and now 2016 year-classes. 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-2025-AM101-06).

OUTLOOK

Short-term projections and the harvest decision table for 2025-2027 are reported in a separate document (IPHC-2025-AM101-13).

ADDITIONAL INFORMATION

A more detailed description of the stock assessment (IPHC-2025-SA-01) and the data sources (IPHC-2025-SA-02), will be published directly to the stock assessment page on the IPHC's website. That page also includes all 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-2025-AM101-11 that provides a summary of the data and the results of the 2024 stock assessment.

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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**: 86-99. doi:http://dx.doi.org/10.1016/j.fishres.2012.10.012.

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

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IPHC Management Strategy Evaluation and Harvest Strategy Policy

PREPARED BY: IPHC SECRETARIAT (A. HICKS, I. STEWART, & D. WILSON; 09 DECEMBER 2024)

PURPOSE

To provide the Commission with an update on Management Strategy Evaluation (MSE) progress in 2024 and work supporting the development of the Harvest Strategy Policy (HSP), and to provide a path forward to adopt a HSP in 2025.

EXECUTIVE SUMMARY AND DECISION POINTS

A 2024 MSE workplan was provided by the Commission through intersession decisions ID003 to ID007 (IPHC Circular 2024-015). This included investigating a new objective, evaluating management procedures (MPs), defining exceptional circumstances, drafting a harvest strategy policy, and investigating different FISS design scenarios.

Objectives

The IPHC Secretariat have been discussing two objectives with the Management Strategy Advisory Board (MSAB) and Scientific Review Board (SRB). These are the $B_{36\%}$ threshold objective and the optimise yield objective. Recent adopted TCEYs have been less than the TCEY determined from the reference interim SPR of 43%, and there are concerns of low spawning biomass and low catch-rates within the fishery. The continued departure from the current interim MP and reduction in coastwide TCEY suggests that there may be an additional objective. An objective to maintain the absolute spawning biomass above a threshold may be a useful objective, which could be added as a new objective in addition to the current $B_{36\%}$ threshold objective or replace it. The MSAB noted that a new objective to maintain the coastwide TCEY above a threshold may also be useful (IPHC-2024-MSAB020-R, para 16). A new objective related to fishery performance could be phrased as:

> Maintain the coastwide female absolute spawning biomass (or FISS WPUE) above the level estimated for 2023.

The SRB made a recommendation to quantify the objective “optimise yield” (see IPHC-2024-SRB024-R, para 22) so that it is meaningful and can have a performance metric that identifies the best performing MP. Optimising yield may include multiple specific objectives, such as maximising yield and minimising variability in yield, and evaluation may include examining trade-offs between multiple objectives. The MSAB recommended that ‘optimise’ be changed to ‘maximise’ and this objective be given equal consideration along with minimising interannual variability in yield (IPHC-2024-MSAB020-R, para 14). The general objective of the Commission to optimise yield would remain.

I. **Decision Point:** Consider adding an objective to maintain the female absolute spawning biomass above a threshold, such as the level estimated in 2023.

II. **Decision Point:** Noting that optimise yield remains a general objective of the Commission, consider the recommendation from MSAB020 to redefine the measurable objective “optimise yield” to “maximise yield”, and evaluate this measurable objective equally with the measurable objective to minimise interannual variability in yield.

Evaluation of management procedures

Three elements of an MP were evaluated using the MSE: assessment frequency fishing intensity, and constraints. These simulations showed that reducing the fishing intensity (i.e. higher SPR) would achieve a higher spawning biomass, slightly lower interannual variability in the TCEY, and improve a potential new objective to avoid low absolute spawning biomass. However, yield would be reduced, on average. Biennial and triennial assessments would likely improve yield and lower the interannual variability in the TCEY, while also allowing more time to improve assessment and MSE methods, but at the cost of not providing detailed annual information such as stock status and decision tables. The SRB accepted this at SRB025.

> **IPHC-2024-SRB025-R, para 29**: *The SRB* ***ACCEPTED*** *that*
>
> 1) *there are significant benefits of moving to a triennial assessment frequency in terms of freeing Secretariat resources to conduct other quantitative analyses (see para. 22); and*
> 2) *the MSE analysis showed no apparent cost of triennial assessment in terms of lost yield or increased interannual variability in TCEY*

There are trade-offs between the yield, the variability of yield, and the probability that the spawning biomass reaches levels below what has been observed in recent years. The largest effect on yield was due to changes in the fishing intensity, with a reduction of about 1.3 Mlbs in the TCEY, on average, for every 1% increase in the SPR. Interannual variability in the TCEY did not change much across fishing intensities lower than $F_{SPR=46\%}$, but increased more rapidly at $F_{SPR=43\%}$ and greater. The interannual variability in the TCEY was reduced when moving to less frequent assessments and determining the reference TCEY from the change in the O32 FISS WPUE. The chance that spawning biomass would be less than what was observed in recent years is also reduced with a reduction in fishing intensity. The MSAB made a recommendation to update the interim reference management procedure to a triennial stock assessment frequency using the change in the O32 FISS WPUE in non-assessment years and an SPR of 46% in assessment years to determine the reference TCEY:

> **IPHC-2024-MSAB020-R, para 41**: *The MSAB* ***RECOMMENDED*** *updating the reference MP for one three-year cycle on a trial basis using a triennial stock assessment frequency (synchronised with the full stock assessment scheduled in 2025 to inform 2026 mortality limits). The coastwide TCEY would be based on SPR=46% in assessment years and based on the proportional change in the FISS O32 WPUE index in non-assessment years. The triennial stock assessment frequency may increase the median coastwide TCEY and reduce the interannual variability in the coastwide TCEY. A lower fishing intensity would also reduce the probability that the spawning biomass is less than the 2023 spawning biomass in the short- and long-term, and result in lower interannual variability as noted in paragraph 26.*

III. **Decision Point:** Consider updating the current interim reference MP with a new SPR value (currently 43%), a longer period between stock assessments (currently annual), and possibly adding a constraint on the annual change in the TCEY.

IV. **Decision Point:** Recommend further MSE work to support modifications to the management procedure determining the reference coastwide TCEY.

Three different FISS designs were also evaluated using an annual assessment frequency, a fishing intensity with SPR=43%, and no constraint. Reducing the FISS to the core areas, and occasionally surveying non-core areas would reduce yield and increase uncertainty and interannual variability in the TCEY. Yield was reduced by approximately 450,000 pounds on average moving from a base block design to a core design, and another approximate 450,000 pounds on average moving to a reduced core design. At US$6.00/lb, a 450,000 lb drop in the TCEY would equate to a US$2.7 million reduction in economic value.

V. **Decision Point:** Recommend further MSE analyses to evaluate FISS designs and methods to present outcomes of these analyses.

Analyses to support further development of the Harvest Strategy Policy

This work supports the development of a harvest strategy policy (HSP). A draft HSP is provided as a separate document for the 101st Annual Meeting of the IPHC (IPHC-2025-AM101-17).

VI. **Decision Point:** Recommend any updates and edits to the draft Harvest Strategy Policy.

VII. **Decision Point:** Recommend further analyses to support the development of the harvest strategy policy.

1 INTRODUCTION

A 2024 MSE workplan was provided by the Commission through intersession decisions ID003 to ID007 (IPHC Circular 2024-015). This included investigating a new objective, evaluating management procedures (MPs), defining exceptional circumstances, drafting a harvest strategy policy, and investigating different FISS design scenarios. Many of these tasks were developed from past Management Strategy Advisory Board (MSAB) and Scientific Review Board (SRB) recommendations, including recommendations related to MSE work made at the 19th session of the MSAB (IPHC-2024-MSAB019-R), the 24th session of the SRB (IPHC-2024-SRB024-R), and the 25th Session of the SRB (IPHC-2024-SRB025-R).

This document reports progress on MSE topics and simulations, and how they support the development of a harvest strategy policy.

2 HARVEST STRATEGY POLICY

A Harvest Strategy Policy (HSP) provides a framework for applying a science-based approach to setting harvest levels. At the IPHC, this is specific to the TCEY for each IPHC Regulatory Area throughout the Convention Area where allocation among IPHC Regulatory Areas is part of the decision-making process. Currently, the IPHC has not formally adopted a harvest strategy policy but has set harvest levels under an SPR-based framework with elements adopted at multiple Annual Meetings of the IPHC since 2017. The MSE work and guidance from the MSAB and SRB have been a very important part of developing the HSP.

A management procedure (MP) determines the coastwide TCEY which is an input to the decision-making process (Figure 1). The management procedure is an agreed upon method to determine the coastwide TCEY that best meets all conservation and fishery objectives. The MP must be reproducible and include elements such as how to collect data, how often to conduct a stock assessment, and a harvest control rule that determines the fishing intensity (i.e. SPR). A harvest strategy extends the MP to encompass objectives and other procedures such as exceptional circumstances. The harvest strategy policy further includes decision-making, where Commissioners determine the distribution and the TCEY among IPHC Regulatory Areas and may deviate from the outputs of the MP to account for other objectives not considered in the harvest strategy. This may be, for example, to modify the coastwide TCEY to account for economic factors or other current conditions. The decision-making component mostly occurs at the Annual Meeting of the IPHC where stakeholder input is considered along with scientific information. Decision-making variability is one of many sources of uncertainty included in the MSE simulations to ensure that the HSP is robust to all sources of variability and uncertainty.

The interim HSP (IPHC-2024-IM100-17) is a complete document that may be endorsed by the Commission, understanding that it may be updated based on recent and continuing MSE work and recommendations from the SRB and MSAB. The MSE work presented here supports the continued development of the harvest strategy policy. More specifically, the following areas of the HSP may be updated given work completed in 2024.

- Update the Commission's priority objectives based on recommendations of the SRB and MSAB.
- Update the following elements of the coastwide management procedure based on recent MSE work. For example, the reference SPR and assessment frequency.
- Edits to the HSP text.

Outcomes of work related to objectives and results from evaluations of MPs are provided in this document.

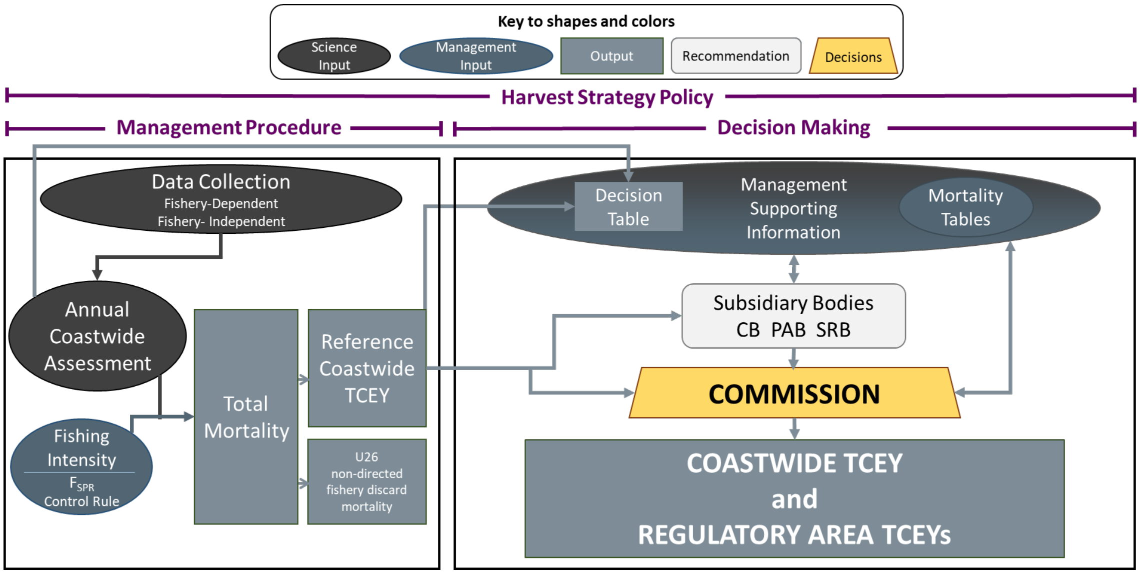

Figure 1. Illustration of the interim harvest strategy policy for the IPHC showing the determination of the coastwide TCEY (the management procedure at the coastwide scale) and the decision-making component that mainly occurs at the Annual Meeting.

2.1 Exceptional Circumstances

An exceptional circumstance is an event that is beyond the expected range of the MSE. Exceptional circumstances, which trigger specific actions to be taken if one is met, define a process for deviating from an adopted harvest strategy (de Moor, Butterworth, and Johnston 2022). It is important to ensure that the adopted harvest strategy is retained unless there are clear indications that the MSE may not be accurate. The IPHC interim harvest strategy policy (Figure 1) has a decision-making step after the MP, thus the Commission may deviate from an adopted MP as part of the harvest strategy policy, and this decision-making variability is included in the MSE simulations. However, if the MSE simulations are not representative of the realized outcomes, exceptional circumstances may be declared.

The Secretariat, with the assistance of the SRB and MSAB, has defined exceptional circumstances and the response that would be initiated, as well as 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). Triggers for an exceptional circumstance have been updated following further discussions with the SRB.

> **IPHC-2024-SRB024-R, para 25**. ***RECALLING*** *paper IPHC-2024-SRB024-03, Appendix A, SRB023-Rec.08 (para. 27), the SRB* ***RECOMMENDED****:*
>
> > *a) removing “exceptional circumstance” item c because the expected timeline of stock assessments and OM updates will automatically revise biological parameters and processes;*
> >
> > *b) removing “exceptional circumstance” item b because:*
> >
> > - *even though the operating model is an adequate representation of the coastwide dynamics and is useful for development of a coastwide MP, additional work on the regional stock dynamics needs to be done to improve correspondence with regional observations;*
> > - *improving estimation of regional stock dynamics is a longer-term project that the Secretariat will continue to work on with input from the SRB;*
> > - *as per paragraph 21, the SRB suggests that the annual TCEY distribution should not be included in a MP.*

Therefore, one trigger, using coastwide WPUE or NPUE, for an exceptional circumstance has been defined.

> 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.

The MSAB was also interested in developing exceptional circumstances using fishery-dependent data.

> **IPHC-2024-MSAB019-R, para. 53:** *The MSAB* ***NOTED*** *that the FISS is conducted to measure the population and that it may not be an accurate depiction of the fishery, and that fishery-dependent data may provide insights into fishery concerns that the FISS may not capture.*
>
> **IPHC-2024-MSAB019-R, para. 54:** *The MSAB* ***REQUESTED*** *that the SRB and Secretariat work together to consider different ways to incorporate fishery-dependent data into an exceptional circumstance.*

The MSE simulations predict many types of fishery-dependent data (e.g. WPUE, age-compositions) which may be used to develop additional exceptional circumstances. It will be important to delineate between changes in fishery-dependent data that should fall within the scope of the MSE predictions and those that may be caused by management actions not reflective of Pacific halibut stock dynamics (e.g. change in catch rates due to avoidance/targeting of other species). The response in these two cases may be different. Further consideration of exceptional circumstances incorporating fishery-dependent data will continue.

Potentially useful fishery-dependent metrics to base an exceptional circumstance on relate to the adopted TCEY or realized fishing mortality. These are important sources of uncertainty to simulate and using them to define an exceptional circumstance would ensure that the simulations are appropriately capturing future realizations. The SRB made the following recommendations related to this topic.

> **IPHC-2024-SRB025-R, para. 26**: *The SRB strongly **RECOMMENDED** against using MSE (a strategic tool) in the annual TCEY setting process. Exceptional circumstances checks (on WPUE and CATCH) are used to judge whether management procedures are generating appropriate recommendations in a given year.*
>
> **IPHC-2024-SRB025-R, para. 30**: *The SRB **RECOMMENDED** adopting realised coastwide catch as a fishery-dependent indicator for testing exceptional circumstances. Realised coastwide catch each year can be compared to the projected distribution of future TCEY for that year to determine whether biological or management processes (e.g. decision variability) are leading to unexpected TCEY.*

Therefore, a second exceptional circumstance could be:

> The realized coastwide fishing mortality is above the 97.5th percentile or below the 2.5th percentile of the simulated realized coastwide fishing mortality for two or more consecutive years.

This exceptional circumstance would capture both the decision-making process and the implementation variability of the fisheries (e.g. not realizing the exact adopted TCEY).

3 GOALS AND OBJECTIVES

The Commission defined four priority coastwide objectives and associated performance metrics for evaluating MSE simulations.

> **IPHC-2023-AM099-R, para. 76.** *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.*
>
> **IPHC-2023-AM099-R, para. 77**. *The Commission **AGREED** that the performance metrics associated with the objectives in Paragraph 76 are:*
>
> > *a) P(RSB): Probability that the long-term Relative Spawning Biomass (RSB) is less than the Relative Spawning Biomass Limit, failing if the value is greater than 0.05.*
> >
> > *b) P(RSB<36%): Probability that the long-term RSB is less than the Relative Spawning Biomass Reference Point, failing if the value is greater than 0.50.*
> >
> > *c) Median TCEY: the median of the short-term average TCEY over a ten-year period, where the short-term is 4-14 years in the future.*
> >
> > *d) Median AAV TCEY: the average annual variability of the short-term TCEY determined as the average difference in the TCEY over a ten-year period.*

These priority objectives and performance metrics come from a larger list of objectives which includes objectives specific to Biological Regions and IPHC Regulatory Areas (Appendix A).

The SRB recommended reconsidering two of these objectives.

> **IPHC-2024-SRB024-R, para 22**. *The SRB* ***RECOMMENDED*** *that the Commission develop a more specific and quantifiable catch objective to replace Objective c) (from AM099–Rec.02) "Optimize average coastwide TCEY".*
>
> **IPHC-2024-SRB024-R, para 23**. *The SRB* ***RECOMMENDED*** *that the Commission consider revising Objective b) (from AM099–Rec.02) "Maintain the long-term coastwide female spawning stock biomass at or above a biomass reference point (B36%) 50% or more of the time" to utilise a lower percentile than the 50th (median) to reflect concerns associated with the implications of low CPUE for the fishery at the 36% target for relative spawning biomass. A lower percentile better captures the role of uncertainty in this performance measure.*

3.1 Considering the $RSB_{36\%}$ objective

The MSAB made a similar recommendation at MSAB019 to discuss a new objective, which was discussed at the 20th Session of the MSAB (MSAB020).

> **IPHC-2024-MSAB019-R, para 51.** ***NOTING*** *paragraph 48, the MSAB* ***RECOMMENDED*** *developing an objective and identifying a management procedure that addresses the current circumstances and differences in perception of the stock status.*

Pacific halibut have seen large changes in average weight-at-age and high variability in recruitment, which have changed the stock dynamics considerably. Figure 2 shows the dynamic unfished spawning biomass, the current spawning biomass, and the relative spawning biomass (RSB) since 1993, as estimated in the 2023 stock assessment for Pacific halibut (IPHC-2024-SA-01). Estimated dynamic unfished spawning biomass is currently lower than in the late 1990's because weight-at-age has decreased considerably, and because of a recent period of low recruitment. The current estimated spawning biomass trajectory (with fishing) has been stable in recent years, resulting in an increasing RSB and an estimated 2024 stock status of 42%. Therefore, the Pacific halibut stock is likely to be above the RSB_{lim} (20%), RSB_{trigger} (30%), and RSB_{thresh} (36%) reference points.

However, the coastwide FISS O32 WPUE and coastwide commercial WPUE has been declining in recent years (Figure 3), causing concern about the absolute stock size and fishery catch-rates. The coastwide FISS index of O32 WPUE was at its lowest value observed in the time-series, declining by 3% from 2022 to 2023 and coastwide commercial WPUE was also at its lowest value in the recent time-series, declining by 10% from the 2022 to 2023 (and likely more as additional logbook information has been obtained). The stock assessment for 2023 also estimated a high probability of further decline in spawning biomass at the reference fishing intensity (SPR=43%).

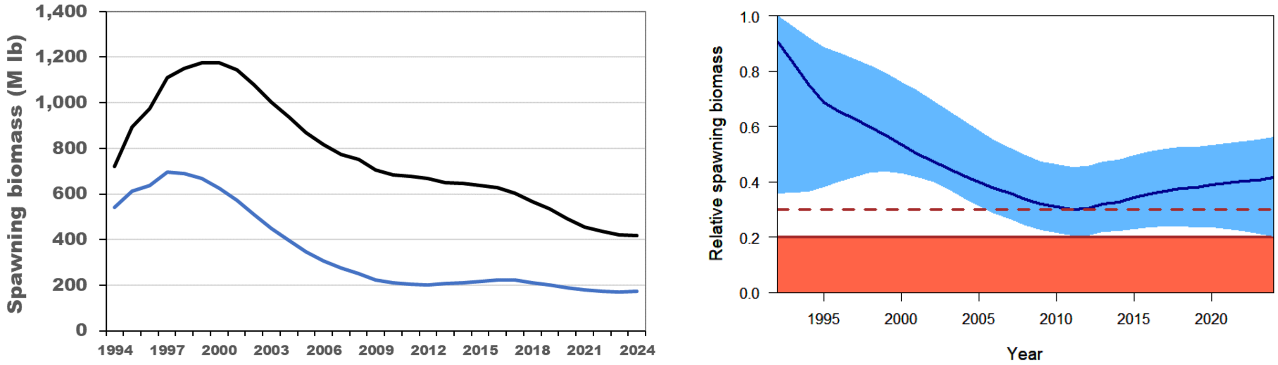

Figure 2. Dynamic unfished spawning biomass (black line) and current spawning biomass (blue line) from the 2023 stock assessment (left) and dynamic relative spawning biomass (right) with an approximate 95% credible interval in light blue and the control rule limit ($B_{20\%}$) and trigger ($B_{30\%}$) in red. Figures from IPHC-2024-SA-01. Management decisions in 2024 were based on these results.

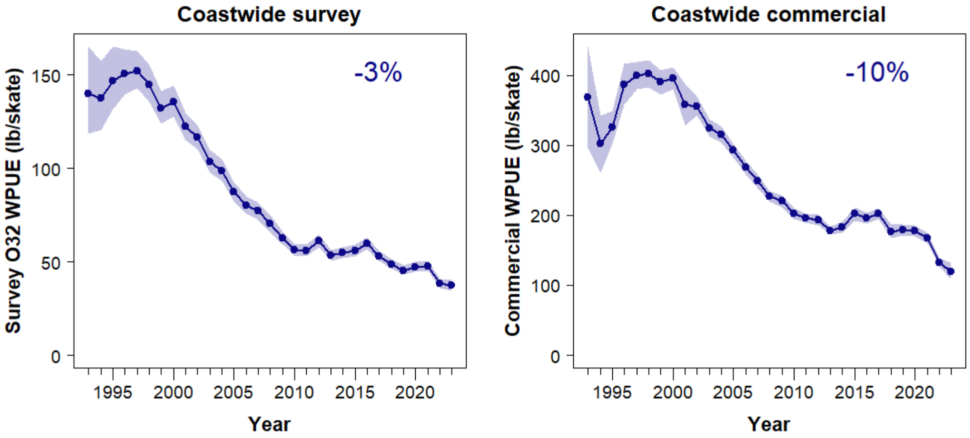

Figure 3. The coastwide FISS O32 WPUE index (left) and coastwide commercial WPUE (right) through 2023 showing the percent change in the last year (from IPHC-2024-SA-02). Based on past calculations, additional logbooks collected in 2024 will likely further reduce the decline in commercial WPUE.

Recent Commission decisions (2023 and 2024) have set coastwide TCEYs less than the reference TCEY estimated by the stock assessment and current interim management strategy. Main concerns noted by the Commission include 1) low absolute spawning biomass, 2) low catch-rates in the commercial fishery, 3) high probability of decline in absolute spawning biomass at a fishing mortality above 39 Mlbs, and 4) a large amount of uncertainty in the projections.

The continued departure from the current interim MP and reduction in coastwide TCEY suggests that there may be an additional objective. Related to these concerns, the SRB initially made a recommendation to re-evaluate what they called the target objective (IPHC-2023-SRB023-R, para. 25), followed by the recommendation at SRB024 to further modify this objective (IPHC-2024-SRB024-R, para 23). Most recently, the SRB made the following recommendation.

> **IPHC-2024-SRB025-R, para. 31.** The SRB **RECOMMENDED** adding a measurable objective related to absolute spawning biomass under the general objective 2.1 "maintain spawning biomass at or above a level that optimises fishing activities" to be included in the priority Commission objectives after, or in place of, the current relative biomass threshold objective

An objective to maintain the absolute spawning biomass above a threshold may be a useful objective for several reasons. First, the level of spawning biomass likely correlates with catch-rates in the fishery, and a higher spawning biomass would likely result in a more efficient and economically viable fishery. Second, current priority conservation objectives use dynamic relative spawning biomass which may result in a low absolute spawning biomass with a satisfactory stock status. Third, a minimum absolute coastwide spawning biomass may be necessary to ensure successful reproduction (such a level is currently unknown for Pacific halibut). Lastly, an observed reference stock level may have concrete meaning to stakeholders. For example, the recent estimated spawning biomass may be near or below the lowest spawning biomass estimated since the mid-1970's and observed fishery catch rates were historically low in 2022 and 2023.

One way to implement this new objective is to continue the use of a conservation limit reference point for relative spawning biomass ($RSB_{20\%}$) and add a fishery biomass threshold reference point for which dropping below would result in serious hardships to the fishery. The fishery biomass threshold reference point could be defined using an absolute metric in units of spawning biomass or simply a TCEY value. A fishery threshold differs importantly from a conservation limit reference point, where a fishery threshold is used to maintain catch-rates and a conservation limit is used to indicate an overfished stock. A fishery absolute spawning biomass threshold may also add extra protection for the stock by further reducing the probability of breaching existing limit and threshold reference points ($RSB_{20\%}$ and $RSB_{36\%}$, respectively). A new objective related to fishery performance could be phrased as:

> Maintain the coastwide female spawning stock biomass (or FISS WPUE) above a threshold.

The metric, the threshold value, and the tolerance for being below that threshold are not obvious choices. Clark and Hare (2006) used the estimated spawning biomass in 1974, which subsequently produced recruitment resulting in an increase in the stock biomass. However, there is a high uncertainty in the estimates of historical absolute spawning biomass before the 1990's. Recent estimates of spawning biomass may be reasonable as they are relevant to concerns of low catch-rates, but it is unknown how and if the stock will quickly recover from this current state.

3.2 Considering the optimise yield objective

The SRB made a recommendation to quantify the objective to "optimise yield" (see IPHC-2024-SRB024-R, para 22 above) so that it is meaningful and can have a performance metric that identifies the best performing MP. Optimising yield may include multiple objectives, such as maximising yield and minimising variability in yield, and evaluation may include examining trade-offs between multiple objectives.

The MSAB recommended that 'optimise' be changed to 'maximise' and this objective be given equal consideration along with minimising interannual variability in yield

> **IPHC-2024-MSAB020-R, para 14**. *The MSAB* ***RECOMMENDED*** *that the Commission priority objective "optimise average coastwide TCEY" (c in paragraph 12) be changed to "maximise average coastwide TCEY" and that this objective along with the variability in yield objective (d in paragraph 12) be given equal consideration to allow for the evaluation of trade-offs between these two objectives.*

Changing this objective from 'optimise' to 'maximise' would not change the overall goal of the Commission to optimise yield. In fact, the two objectives "maximise yield" and "minimizer interannual variability in yield" are both a part of optimising yield. Giving equal consideration to both objectives would better meet the general goal of the Commission to optimise yield.

4 MANAGEMENT PROCEDURES EVALUATED

The MSAB made two requests at MSAB019, which coincide with SRB and Commission recommendations, providing guidance on management procedures (MPs) to evaluate. The investigation of these MPs will support the development of the harvest strategy policy.

> **IPHC-2024-MSAB019-R, para. 39**. The MSAB **REQUESTED** that the evaluation of annual, biennial, and triennial assessments include, but is not limited to, the following concepts.
>
> - Annual changes in the coastwide TCEY is driven by an empirical rule in non-assessment years of a multi-year MP;
> - A constraint on the coastwide TCEY to reduce inter-annual variability and the potential for large changes in every year or only assessment years. This may be a 10%, 15%, or 20% constraint, a slow-up fast-down approach, or similar approach;
> - SPR values ranging from 35% to 52%.

Elements of MPs that were evaluated included assessment frequency, fishing intensity, and constraints on the interannual change in the TCEY. Additionally, different FISS designs were simulated to evaluate the impacts of reduced sampling including eliminating non-core areas. Distribution of the TCEY to IPHC Regulatory Areas is not under evaluation and is implemented as a source of variability.

4.1 Assessment frequency and an empirical management procedure

The frequency of conducting the stock assessment is a priority element of the MP to be investigated. This includes conducting assessments annually (every year), biennially (every second year), or triennially (every third year) to determine the status of the Pacific halibut stock and the coastwide TCEY for that year. In years with no assessment, the coastwide TCEY would be determined using a simpler approach and the estimated status of the stock would not be updated.

The mortality limits in a year with a stock assessment can be determined using an SPR-based approach, and in years without a stock assessment, the mortality limits would use an empirical rule. The only empirical rule evaluated in 2024 was to update the coastwide TCEY proportionally to the recent change in the coastwide FISS O32 WPUE. Notating *y* as year, the TCEY in a non-assessment year would be determined as follows.

$$TCEY_y = TCEY_{y-1} \times \frac{WPUE_{y-1}}{WPUE_{y-2}}$$

Another option, currently not being considered, is to use a simple statistical model, tuned to meet the objectives, that would determine the coastwide TCEY. Stock assessments would be completed periodically to update the status of the stock and verify that the management procedure is working appropriately.

4.2 Fishing intensity

The fishing intensity is determined by finding the fishing rate (*F*) that would result in a defined equilibrium spawning potential ratio (F_{SPR}). Because the fishing rate changes depending on the stock demographics and distribution of yield across fisheries, SPR is a better indicator of fishing intensity and its effect on the stock than a single *F*. A range of SPR values between 35% and 52% (the interim reference SPR is currently 43%) were investigated.

4.3 Constraints

One of the priority objectives (Appendix A) is to limit annual changes in the coastwide TCEY. Due to variability in many different processes (e.g. population, estimation, and decision making) the interannual variability of the TCEY from MSE simulations is typically higher than 15%. Over the past ten years (2015–2024), the interannual variability (average annual variability or AAV) in the adopted coastwide TCEY was 5.4% and the AAV of the reference coastwide TCEY was 14.5%. Across those years, the percent change in the adopted coastwide TCEY ranged from -10% to 8% and the coastwide reference TCEY ranged from -21% to 29% (Table 1). This was a period of relatively stable spawning biomass and higher variability is expected when the stock is increasing or decreasing.

Decision-making since 2015 has reduced the interannual variability in the coastwide TCEY, compared to the reference. The adopted TCEYs have a smaller range than the reference TCEYs and tend to cluster around 39 million pounds. The adopted TCEYs also tend to be closer to the status quo (i.e. the TCEY from the previous year) than the reference TCEYs when the reference TCEY difference from status quo was not near zero (Table 1). This is akin to saying the change from one year to the next is less for the adopted TCEYs than the reference TCEYs. The spawning biomass has been relatively stable during the last ten years, and it is not known how the recent decision-making process would react to a rapidly increasing or decreasing spawning biomass. Therefore, decision-making variability was modelled as a normal random process in the OM with a fixed standard deviation of 7Mlbs. This is more variability than recently observed but ensures that the evaluations are robust to potential variability in the future.

This interannual variability in the coastwide reference TCEY can be reduced by adding a constraint in the MP, mimicking recent decision patterns. The MSAB has suggested many different constraints including a 15% constraint on the change in the coastwide TCEY from one year to the next, and a slow-up/fast-down approach (TCEY increases by one-third of the increase suggested by the unconstrained MP or decreases by one-half of the decrease suggested by the unconstrained MP). The MSAB has requested further investigating constraints on the coastwide TCEY.

Table 1. Percent change in the adopted TCEY from the previous year (2015–2024) for each IPHC Regulatory Area and coastwide, and for the coastwide reference TCEY determined from the interim management procedure in place for that year.

Year	2A	2B	2C	3A	3B	4A	4B	4CDE	Coastwide Adopted	Coastwide Reference
2015	-4.5%	3.5%	13.3%	7.9%	-0.3%	25.6%	2.7%	19.3%	8.1%	6.0%
2016	18.9%	4.2%	5.5%	-1.9%	-8.3%	-0.5%	-10.5%	-4.7%	-0.1%	2.3%
2017	16.7%	1.0%	7.6%	1.6%	16.7%	-7.7%	-2.2%	-5.7%	2.9%	7.7%
2018	-10.2%	-14.7%	-9.9%	-3.2%	-17.8%	-3.3%	-4.5%	-5.7%	-8.7%	-20.7%
2019	25.0%	-3.8%	0.0%	7.7%	-11.3%	11.5%	13.3%	10.5%	3.8%	29.0%
2020	0.0%	0.0%	-7.7%	-9.6%	7.6%	-9.8%	-9.7%	-2.5%	-5.2%	-20.3%
2021	0.0%	2.5%	-0.9%	14.8%	0.0%	17.1%	6.9%	2.1%	6.6%	22.3%
2022	0.0%	8.0%	1.9%	3.9%	25.0%	2.4%	3.6%	3.0%	5.7%	5.7%
2023	0.0%	-10.3%	-1.0%	-17.0%	-5.9%	-17.6%	-6.2%	-6.1%	-10.3%	26.0%
2024	0.0%	-4.6%	-1.0%	-6.0%	-6.0%	-6.9%	-8.1%	-3.9%	-4.6%	-5.9%

Constraints simulated in this round of MSE analyses included the following:

- A maximum 15% change in the coastwide TCEY in either direction from one year to the next (15% up/down).
- A maximum 15% change in the coastwide TCEY only when the TCEY is increasing from one year to the next (15% up).

4.4 FISS designs

An element of the management procedure that can be evaluated is the collection of data from the FISS. The recently implemented FISS design was reduced from the proposed scientific designs in 2022, 2023, and 2024 to maintain revenue neutrality and future reductions may be necessary. The SRB made two recommendations to evaluate FISS designs using the MSE framework:

> **IPHC-2024-SRB024-R, para** 35. *The SRB* ***REQUESTED*** *that the Secretariat present preliminary (at SRB025) and final (at SRB026) results of MSE runs with different FISS designs to better understand the actual net cost of the survey after accounting for potential reductions in TCEY associated with the increased uncertainty from reduced FISS designs.*
>
> **IPHC-2024-SRB024-R, para** 43. *The SRB* ***REQUESTED*** *that the Secretariat integrate FISS design considerations into the annual MSE workplan and 5-Year Program of Integrated Research and Monitoring to better quantify the value provided by the FISS.*

There are three sources of variability and uncertainty in the simulations, all of which may be affected by the FISS design.

- **FISS uncertainty** affects the estimates of FISS WPUE and NPUE directly. This is used in the empirical rule and affects the stock assessment estimates. It may have some feedback into decision-making variability.
- **Estimation error** is from the stock assessment and is influenced by FISS uncertainty. Estimation error is also influenced by the variability in the population and fishery-dependent data.
- **Decision-making variability** is the variability resulting from decisions made by the Commission to depart from the MP. This could be affected by bias in the FISS and assessment estimates because the Commission may respond similarly based on the trends they perceive (e.g. autocorrelation in the deviations from the MP). It is possible to correlate decision-making with the FISS estimate, but this may mimic a control rule (i.e. element of the MP) and would conflate the estimation error with the decision-making variability, possibly making performance metrics, such as the probability that the spawning biomass is less than the 2023 spawning biomass, less meaningful. Decision-making variability is currently modelled independently of FISS uncertainty.

The MSE framework is capable of examining FISS designs, given the necessary inputs. Projections of estimated uncertainty of FISS O32 WPUE (see document IPHC-2024-SRB024-06) and simulations investigating the outcomes of the stock assessment given different FISS design assumptions (see IPHC-2024-SRB025-06) informed the inputs to the MSE simulations. Unlike the stock assessment simulations, where specific trends in the population are investigated, the MSE simulations have emergent trends influencing uncertainty and bias. The MSE is also able to determine the long-term effects on yield and population status.

Three FISS designs were simulated, representing increasing observation and assessment error (Table 2). The Base Block FISS design includes sampling in all Biological Regions and IPHC Regulatory Areas each year. It relies on a rotating selection of entire charter regions where individual charter regions are sampled every 1-5 years. The Core FISS design samples charter regions in IPHC Regulatory Areas 2B, 2C, 3A, and 3B every year and other areas are not surveyed. The Reduced Core FISS design samples a subset of higher catch-rate charter regions in areas 2B, 2C, 3A, and 3B. Bias is expected in the Core and Reduced Core FISS designs because some areas are not surveyed. It would not be expected that either of these core designs would be implemented in perpetuity without occasionally surveying other areas.

The Core FISS and Reduced Core FISS designs have additional details in how bias is modelled. Bias is assumed to be additive depending on the trend in spawning biomass, and is halved when a survey is done in non-core areas. When the spawning biomass is large, the survey is more likely to be revenue neutral increasing the ability to survey non-core areas. Further details are provided in IPHC-2024-SRB025-07.

The MSE analysis of FISS designs will not capture the stakeholder perception and possible lack of confidence in the FISS as a tool for management. FISS observations have been important for the stock assessment, distribution of the TCEY, general understanding of the trends in each IPHC Regulatory Area, and in negotiations of the coastwide and area-specific TCEYs.

Table 2. Assumptions of observation and estimation error for four FISS designs.

FISS Design	Frequency	Coastwide WPUE CV	Coastwide WPUE Bias	Assessment Uncertainty	Assessment Bias
Base Block	Every year	4%	None	18%	None
Core	2-4 years	6%	Increases annually up to 3%	19%	Increases annually up to 2%
Reduced Core	2-4 years	8%	Increases annually up to 4%	20%	Increases annually up to 2.5%

5 RESULTS

5.1 Assessment frequency, fishing intensity, and constraints

Assessment frequency, different fishing intensities (SPR), and a constraint were simulated assuming a Base Block FISS design with estimation error and decision-making variability. Performance metrics associated with the four priority objectives are shown in Table 3. The probability of being below a relative spawning biomass (RSB) of 36% was similar for each assessment frequency at the same fishing intensity, and an SPR of 40% resulted in an RSB near 36%. The short-term median TCEY increased and the AAV decreased as the assessment frequency increased; this is opposite of the expected pattern that a greater TCEY results in a higher AAV. The AAV was lowest with the triennial assessment frequency but was greater than 15% (a past benchmark defined by the MSAB) for all fishing intensities and assessment frequencies. For the annual and biennial assessment frequencies, the AAV was lowest (but above 22%) for a fishing intensity of 46% and increased with lower and higher fishing intensities. This may be a consequence of how decision-making variability was modelled (i.e. constant standard deviation).

Short- and long-term performance metrics for the probability that the spawning biomass is less than the spawning biomass in 2023 provide insight into the chance of being at spawning biomass levels seen in recent years (Table 4). There is a greater than 25% (1 in 4) chance that the spawning biomass is less than the spawning biomass in 2023 when fishing at an SPR=40% and a near 20% (1 in 5) chance when fishing at an SPR=49% in the long-term. These probabilities increase to 51% and 34% in the short-term (projections of 4–13 years) for those same SPR values.

Including a constraint of 15% when the TCEY goes up or down in the MP reduced the AAV, although the AAV remained above 15% with decision-making variability, and also reduced the yield (Table 5). This resulted in a smaller probability of the RSB being less than 36%. The 15% constraint resulted in a lower potential range of TCEYs with the 5th percentile of the TCEY as low as 14.7 M lbs. The constraint of 15% only when the TCEY is increasing (15% up) showed similar results, but with a slightly higher yield. The yield was less with a constraint because increases from small TCEYs were smaller given a maximum percent change resulting in small absolute changes.

Table 3. Performance metrics associated with priority objectives for various fishing intensities (SPR) and an annual, biennial, or triennial assessment with an empirical rule proportional to FISS O32 WPUE used to determine the TCEY in non-assessment years. All simulations assumed the Base Block FISS design, estimation error, and decision-making variability. No constraints are applied to the interannual change in the TCEY. Relative spawning biomass (RSB) performance metrics are long-term and yield based performance metrics (TCEY and AAV) are short-term metrics.

Assessment Frequency	**Annual**				
SPR	**40**	**43**	**46**	**49**	**52**
P(RSB<20%)	<0.001	<0.001	<0.001	<0.001	<0.001
P(RSB<36%)	0.453	0.247	0.090	0.014	0.001
Median TCEY	64.26	60.11	56.08	52.03	47.87
AAV	25.3%	24.2%	23.5%	23.5%	23.7%
Assessment Frequency	**Biennial**				
SPR	**40**	**43**	**46**	**49**	**52**
P(RSB<20%)	<0.001	<0.001	<0.001	<0.001	<0.001
P(RSB<36%)	0.464	0.291	0.129	0.040	0.007
Median TCEY	64.96	60.38	56.28	52.27	48.17
AAV	23.3%	22.6%	22.5%	22.8%	23.5%
Assessment Frequency	**Triennial**				
SPR	**40**	**43**	**46**	**49**	**52**
P(RSB<20%)	<0.001	<0.001	<0.001	<0.001	<0.001
P(RSB<36%)	0.473	0.288	0.134	0.052	0.009
Median TCEY	65.50	61.04	56.96	53.57	49.11
AAV	20.7%	20.1%	20.0%	20.5%	21.0%

Table 4. The probability that the spawning biomass is less than the spawning biomass in 2023 for various fishing intensities (SPR) and an annual, biennial, or triennial assessment with an empirical rule proportional to FISS O32 WPUE used to determine the TCEY in non-assessment years. All simulations assumed the Base Block FISS design, estimation error, and decision-making variability. No constraints are applied to the interannual change in the TCEY. Short-term performance metrics are 4-13 years into the projection period.

Assessment Frequency	**Annual**				
SPR	**40**	**43**	**46**	**49**	**52**
Long-term $P(SB < SB_{2023})$	0.308	0.272	0.230	0.196	0.164
Short-term $P(SB < SB_{2023})$	0.490	0.428	0.362	0.316	0.282
Assessment Frequency	**Biennial**				
SPR	**40**	**43**	**46**	**49**	**52**
Long-term $P(SB < SB_{2023})$	0.322	0.278	0.248	0.212	0.168
Short-term $P(SB < SB_{2023})$	0.488	0.442	0.372	0.322	0.288
Assessment Frequency	**Triennial**				
SPR	**40**	**43**	**46**	**49**	**52**
Long-term $P(SB < SB_{2023})$	0.316	0.282	0.232	0.202	0.172
Short-term $P(SB < SB_{2023})$	0.510	0.484	0.394	0.340	0.292

Table 5. Performance metrics associated with priority objectives for an SPR of 43% and an annual assessment with and without a 15% constraint on the change in the TCEY (up/down or only up). All simulations assumed the Base Block FISS design. Relative spawning biomass (RSB) performance metrics are long-term and yield based performance metrics (TCEY and AAV) are short-term metrics.

Constraint	None	15% up/down	15% up
P(RSB<20%)	<0.001	<0.001	<0.001
P(RSB<36%)	0.2466	0.0506	0.0528
Median TCEY	60.11	49.51	51.55
AAV	24.2%	16.6%	16.7%

Overall, the range of SPR values investigated and the three assessment frequencies met the conservation objective and the objective to remain above an RSB of 36% at least 50% of the time. The TCEY increased with higher fishing intensity and was slightly higher with a longer interval between assessments. The interannual variability in the TCEY was greater than 15% but lowest with a triennial assessment frequency. The triennial assessment frequency showed potential increases in the TCEY but larger potential change in an assessment year. AAV was lowest with an SPR between 43% and 46%, and unexpectedly increased at lower fishing intensities, which is likely due to decision-making variability.

5.2 FISS Designs

The three FISS designs were compared across multiple fishing intensities, but with the annual assessment frequency only. Decision-making variability was present in all simulations.

The conservation objective of remaining above an RSB of 20% was met for all fishing intensities and FISS designs (Table 6). The probability that the RSB was less than 36% decreased with the reduced FISS designs, indicating that the population size was slightly larger when the non-core areas were not sampled. This occurred because the median TCEY was less when using the Core FISS design compared to the Base Block FISS design, and was less again when using the Reduced Core FISS design compared to the Core FISS design. The AAV increased with the Core and Reduced Core FISS designs (Figure 4).

With an SPR of 43%, the median TCEY declined by 450,000 lbs when moving to the Core FISS design from the Base Block FISS design, and another 450,000 lbs when moving to the Reduced Core FISS design. At US$6.00/lb, a 450,000 lb drop in the TCEY would equate to a US$2.7 million reduction in economic value. A similar drop occurred for an SPR of 52%. This metric includes the long-term, multi-year result where a reduction in the TCEY may provide fish for future years to spawn or be caught at a larger size. This may be why this value is less than the value determined from the stock assessment simulation results reported in document IPHC-2024-SRB025-06. As also discussed in document IPHC-2024-SRB025-06, there is a non-economic value to the FISS in that it is used for decision-making, comparisons, and to have a better understanding of the population trends.

Table 6. Performance metrics associated with priority objectives for various fishing intensities (SPR) and different FISS designs. All simulations assumed an annual assessment and decision-making variability. No constraints were applied to the interannual change in the TCEY. Relative spawning biomass (RSB) performance metrics are long-term and yield based performance metrics (TCEY and AAV) are short-term metrics.

FISS design	**Base Block**			
SPR	**43%**	**46%**	**49%**	**52%**
P(RSB<20%)	<0.002	<0.002	<0.002	<0.002
P(RSB<36%)	0.2466	0.0896	0.0144	0.0012
Median TCEY	60.11	56.08	52.03	47.87
AAV	24.2%	23.5%	23.5%	23.7%
FISS design	**Core**			
SPR	**43%**	**46%**	**49%**	**52%**
P(RSB<20%)	<0.002	<0.002	<0.002	<0.002
P(RSB<36%)	0.2308	0.0856	0.0164	0.0010
Median TCEY	59.66	55.30	51.23	47.32
AAV	24.9%	24.0%	24.0%	24.4%
FISS design	**Reduced Core**			
SPR	**43%**	**46%**	**49%**	**52%**
P(RSB<20%)	<0.002	<0.002	<0.002	<0.002
P(RSB<36%)	0.2256	0.0860	0.0180	0.0012
Median TCEY	59.21	55.10	50.88	47.07
AAV	26.4%	25.5%	25.0%	25.3%

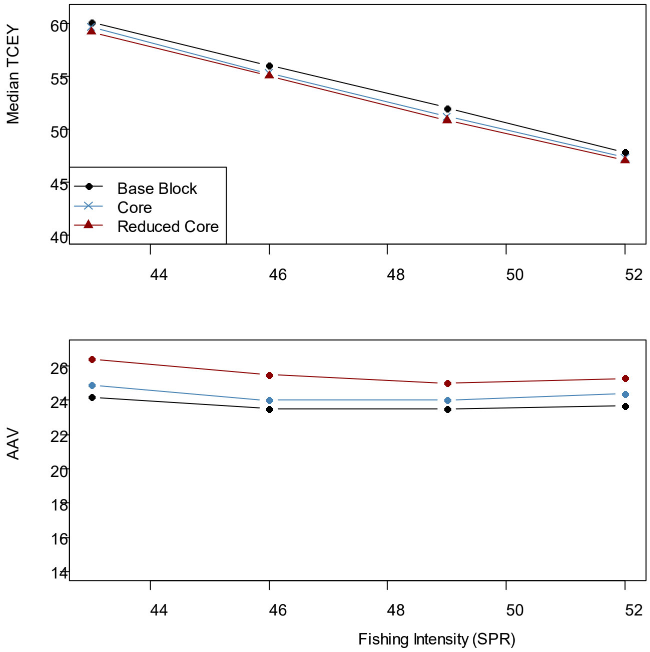

Figure 4. Median TCEY (top) and AAV (bottom) for different fishing intensities (SPR) and FISS designs.

6 CONCLUSIONS

Three elements of an MP were evaluated using the MSE: assessment frequency fishing intensity, and constraints. These simulations showed that reducing the fishing intensity (i.e. higher SPR) would achieve a higher spawning biomass, slightly lower interannual variability in the TCEY, and move towards a potential new objective of avoiding low absolute spawning biomass. However, yield would be reduced, on average. Biennial and triennial assessments may improve yield and lower the interannual variability in the TCEY, also allowing more time to improve assessment and MSE methods, but at the cost of not providing detailed annual information such as stock status. The SRB noted this at SRB025.

> **IPHC-2024-SRB025-R, para 29**: *The SRB **ACCEPTED** that*
>
> 1) *there are significant benefits of moving to a triennial assessment frequency in terms of freeing Secretariat resources to conduct other quantitative analyses (see para. 22); and*
> 2) *the MSE analysis showed no apparent cost of triennial assessment in terms of lost yield or increased interannual variability in TCEY*

Furthermore, three different FISS designs were evaluated with an annual assessment frequency, a fishing intensity with SPR=43%, and no constraint. Reducing the FISS to the core areas, and occasionally surveying non-core areas would reduce yield and increase uncertainty and interannual variability in the TCEY.

There are trade-offs between the yield, the variability of yield, and the probability that the spawning biomass reaches levels below what has been observed in recent years. The largest effect on yield was the fishing intensity with a reduction of about 1.3 Mlbs in the TCEY, on average, for every 1% increase in the SPR. Variability did not change much across fishing intensities, but was greatly affected by the assessment frequency and the FISS design. The chance that spawning biomass would be less than what was observed in recent years is reduced with a reduction in fishing intensity. The usefulness of the MSE is to highlight these trade-offs for decision-makers.

Based on these results, the MSAB made a recommendation to modify the current interim management procedure.

> **IPHC-2024-MSAB020-R, para 41**. *The MSAB **RECOMMENDED** updating the reference MP for one three-year cycle on a trial basis using a triennial stock assessment frequency (synchronised with the full stock assessment scheduled in 2025 to inform 2026 mortality limits). The coastwide TCEY would be based on SPR=46% in assessment years and based on the proportional change in the FISS O32 WPUE index in non-assessment years. The triennial stock assessment frequency may increase the median coastwide TCEY and reduce the interannual variability in the coastwide TCEY. A lower fishing intensity would also reduce the probability that the spawning biomass is less than the 2023 spawning biomass in the short- and longterm, and result in lower interannual variability as noted in paragraph 26.*

This work supports the development of the harvest strategy policy (IPHC-2025-AM101-17). A draft Harvest Strategy Policy is available for consideration at the 101st Annual Meeting of the IPHC.

RECOMMENDATION/S

That the Commission:

1) **NOTE** paper IPHC-2025-AM101-12 presenting recent MSE work including exceptional circumstances; goals and objectives; evaluating assessment frequency, a constraint and fishing intensity; and investigating the effects of reduced FISS designs.
2) **RECOMMEND** adding a measurable objective related to absolute female spawning biomass under the general objective 2.1 "maintain spawning biomass at or above a level that optimizes fishing activities" to be included in the priority Commission objectives after, or in place of, the current biomass threshold objective.
3) **NOTING** that optimising yield remains a general objective of the Commission, **RECOMMEND** to redefine the measurable objective "optimise yield" to "maximise yield", and evaluate this measurable objective equally with the measurable objective to minimise interannual variability in yield.
4) **RECOMMEND** updating the current interim reference MP with a new SPR value (currently 43%), a longer period between stock assessments (currently annual), and possibly a constraint on the annual change in the TCEY.
5) **RECOMMEND** further MSE work to support modifications to the management procedure determining the reference coastwide TCEY.
6) **RECOMMEND** further MSE analyses to evaluate FISS designs and methods to present outcomes of these analyses.
7) **RECOMMEND** any updates and edits to the draft Harvest Strategy Policy.
8) **RECOMMEND** further analyses to support the development of the harvest strategy policy.

REFERENCES

de Moor, C. L., D. Butterworth, and S. Johnston. 2022. "Learning from three decades of Management Strategy Evaluation in South Africa." *ICES Journal of Marine Science* 79: 1843-1852.

APPENDICES

Appendix A: Primary objectives used by the Commission for the MSE

APPENDIX A
PRIMARY OBJECTIVES USED BY THE COMMISSION FOR THE MSE EVALUATIONS

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 relative spawning biomass above a biomass limit reference point ($RSB_{20\%}$) at least 95% of the time	$RSB <$ Spawning Biomass Limit (RSB_{Lim}) RSB_{Lim}=20% unfished spawning biomass	Long-term	0.05	$P(RSB < RSB_{Lim})$ 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	$P\left(p_{SB,R} < p_{SB,R,min}\right)$
2.1 MAINTAIN SPAWNING BIOMASS AT OR ABOVE A LEVEL THAT OPTIMIZES FISHING ACTIVITIES	Maintain the long-term coastwide female relative spawning biomass at or above a biomass reference point ($RSB_{36\%}$) 50% or more of the time	$RSB<$Spawning Biomass Reference (RSB_{Thresh}) $RSB_{Thresh}=RSB_{36\%}$ unfished spawning biomass	Long-term	0.50	$P(RSB < RSB_{Thresh})$ 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

$$AAV_t = \frac{\sum_{t+1}^{t+9} \left| TCEY_t - TCEY_{t-1} \right|}{\sum_{t}^{t+9} TCEY_t}$$

$$AC_t = \frac{\left| TCEY_t - TCEY_{t-1} \right|}{TCEY_{t-1}}$$

Stock projections and the harvest decision table for 2025-2027

PREPARED BY: IPHC SECRETARIAT (I. STEWART AND A. HICKS; 10 DECEMBER 2024)

PURPOSE

To provide the Commission with short-term (3 year) stock projections and the harvest decision table for 2025-2027.

METHODS

Short-term tactical stock projections under varying levels of mortality are conducted using the results from the 2024 stock assessment (IPHC-2025-AM101-11). 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 2024 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 (2024), per the decision made 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 2025 (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 2024 (the *status quo*)
- Bracketing alternatives 5 and 10% above and below the *status quo*

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[1] The North Pacific Fishery Management Council adopted 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. This new approach resulted in a 20% reduction to the A80 sector's PSC limit in 2024 and an additional 5% reduction for 2025. However, the actual halibut mortality has been far below the aggregate PSC limit for all sectors in the Bering Sea and Aleutian Islands (52% in 2024). 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 (29% in 2024).

- Alternatives of 15% and 25% below the *status quo* requested by the Commission at IM100 (IPHC-2024-IM100-R)
- The mortality at which there is less than or equal to a 50% chance that the spawning biomass will be smaller in 2028 than in 2025 ("*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 2025 (median value with the 95% credible interval below) are reported.

RESULTS

Spawning biomass estimates in 2024 from the 2024 stock assessment are lower (17%) than those in last year's stock assessment, but the recent estimated trend is nearly flat (+3% from 2024 to 2025). Updated estimates of the 2012 and 2016 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 are similar over the three-year projection period as both year-classes continue to mature.

Projections indicate that the spawning biomass would increase 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 (35.28 million pounds; Table 2, Figure 2), risks of stock decrease over one and three years are 43/100 and 45/100. For all harvest levels that exceed the three-year surplus (37.4 million pounds) risks of stock decline are larger than 50/100, and reaching 88/100 for the coastwide TCEY that is projected to correspond to the $F_{35\%}$ *MSY* proxy harvest level in 2025. Alternative harvest levels around the *status quo* (+/- 5 and 10%) are projected to result in levels of fishing intensity ranging from $F_{50\%}$ to $F_{44\%}$, similar to those estimated in recent years. For larger reductions to the status quo (-15% and -25%) risk of one year stock decrease drops to 26/100 and 16/100 respectively. The alternatives around the status quo span a range of stock trajectories from increasing (all alternatives up to the *status quo*) to decreasing (*status quo* +10%). At the reference level of fishing mortality ($F_{43\%}$) the 2025 coastwide TCEY is projected to be 39.8 million pounds (41.7 million pounds of total mortality including U26 non-directed discard mortality). Stock decline over the next three years is projected to be likely (57/100 to 58/100) 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 49/100.

All projections result in a probability of the relative spawning biomass dropping below the $SB_{30\%}$ threshold over the next three years of 17-28/100. The probability of dropping below the $SB_{20\%}$ limit is estimated to be <1-21%.

Table 1. Harvest decision table for 2025-2027 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.

		2025 Alternative			*Status quo -25%*	*Status quo -15%*	*Status quo -10%*	*Status quo -5%*	*Status quo*	$F_{46\%}$	3-Year Surplus	*Status quo +10%*	*Reference* $F_{43\%}$	*MEY proxy*	*MSY proxy*	
		Total mortality (M lb)	0.0	21.8	28.3	31.8	33.6	35.4	37.1	37.8	39.0	40.7	41.7	46.1	55.1	
		TCEY (M lb)	0.0	20.0	26.5	30.0	31.8	33.5	35.3	35.9	37.2	38.8	39.8	44.3	53.2	
		2025 fishing intensity	$F_{100\%}$	$F_{63\%}$	$F_{55\%}$	$F_{51\%}$	$F_{50\%}$	$F_{48\%}$	$F_{47\%}$	$F_{46\%}$	$F_{45\%}$	$F_{44\%}$	$F_{43\%}$	$F_{40\%}$	$F_{35\%}$	
		Fishing intensity interval	--	41-75%	33-69%	30-66%	28-65%	27-63%	26-62%	25-62%	25-61%	24-60%	23-59%	21-56%	17-51%	
Stock Trend **(spawning biomass)**	in 2026	is less than 2025	<1	5	16	26	31	37	43	45	49	54	57	70	88	a
		is 5% less than 2025	<1	<1	2	4	6	8	11	12	14	17	19	29	50	b
	in 2027	is less than 2025	<1	7	21	30	35	40	45	47	50	55	58	69	86	c
		is 5% less than 2025	<1	2	8	14	18	22	26	27	30	34	37	48	70	d
	in 2028	is less than 2025	<1	8	20	30	35	40	45	47	50	55	58	70	87	e
		is 5% less than 2025	<1	3	11	18	22	26	30	32	36	40	43	55	77	f
Stock Status **(Spawning biomass)**	in 2026	is less than 30%	26	26	27	27	27	27	27	27	28	28	28	28	29	g
		is less than 20%	1	5	7	8	9	10	10	11	11	12	12	14	18	h
	in 2027	is less than 30%	25	25	26	26	26	26	26	26	26	26	26	27	28	i
		is less than 20%	<1	2	4	6	7	8	9	9	10	11	12	15	20	j
	in 2028	is less than 30%	17	25	25	25	25	26	26	26	26	26	26	27	28	k
		is less than 20%	<1	1	3	5	6	7	8	9	10	11	12	16	21	l
Fishery Trend **(TCEY)**	in 2026	is less than 2025	0	7	24	28	31	34	38	39	42	46	49	60	80	m
		is 10% less than 2025	0	4	22	26	27	29	32	33	35	38	39	48	67	n
	in 2027	is less than 2025	0	6	23	27	30	33	37	38	41	46	48	60	81	o
		is 10% less than 2025	0	4	20	25	27	29	31	32	34	37	39	49	69	p
	in 2028	is less than 2025	0	5	21	26	29	33	37	38	41	46	49	61	82	q
		is 10% less than 2025	0	3	18	23	26	28	31	32	34	37	40	50	71	r
Fishery Status **(Fishing intensity)**	in 2025	is above $F_{43\%}$	0	7	25	29	32	35	39	41	44	47	50	59	78	s

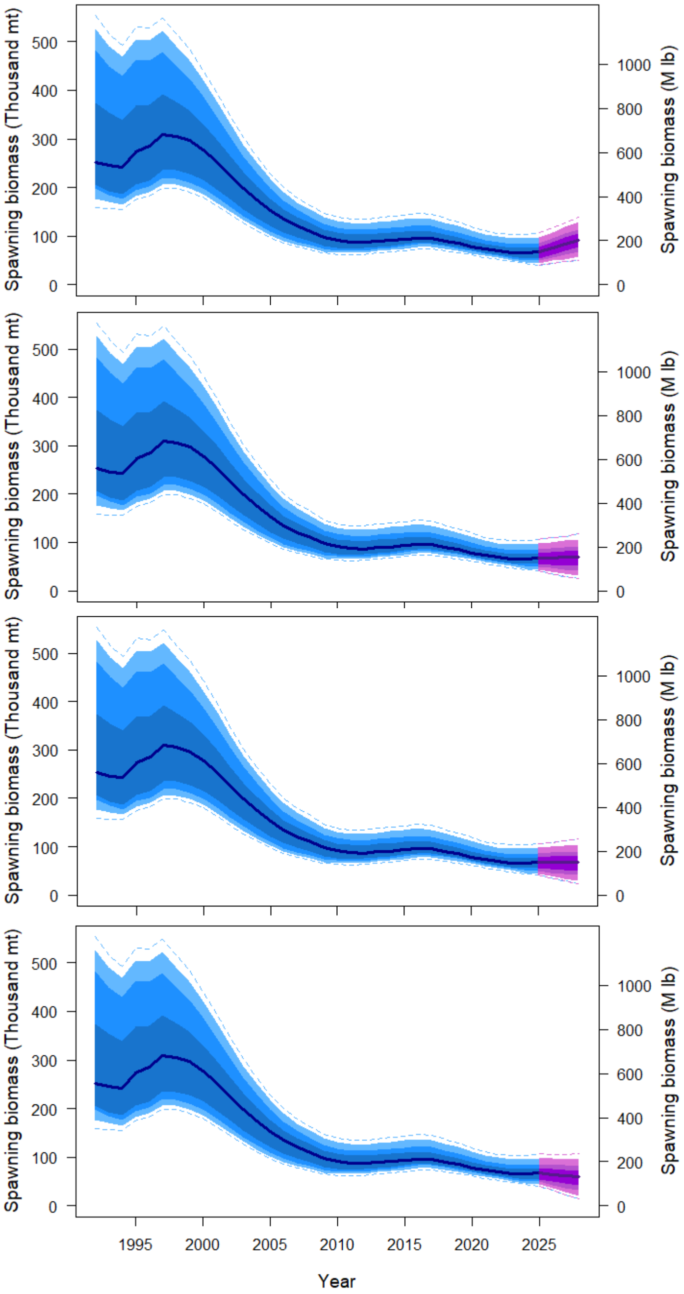

Figure 1. Three-year projections of stock trend under alternative levels of mortality corresponding to various reference points: no fishing mortality (upper panel), the 3-year surplus (37.2 million pounds; second panel), and the TCEY projected for the $F_{43\%}$ reference level of fishing intensity (39.8 million pounds, third panel) and the TCEY projected for the $F_{35\%}$ MSY proxy level of fishing intensity (53.2 million pounds, bottom panel).

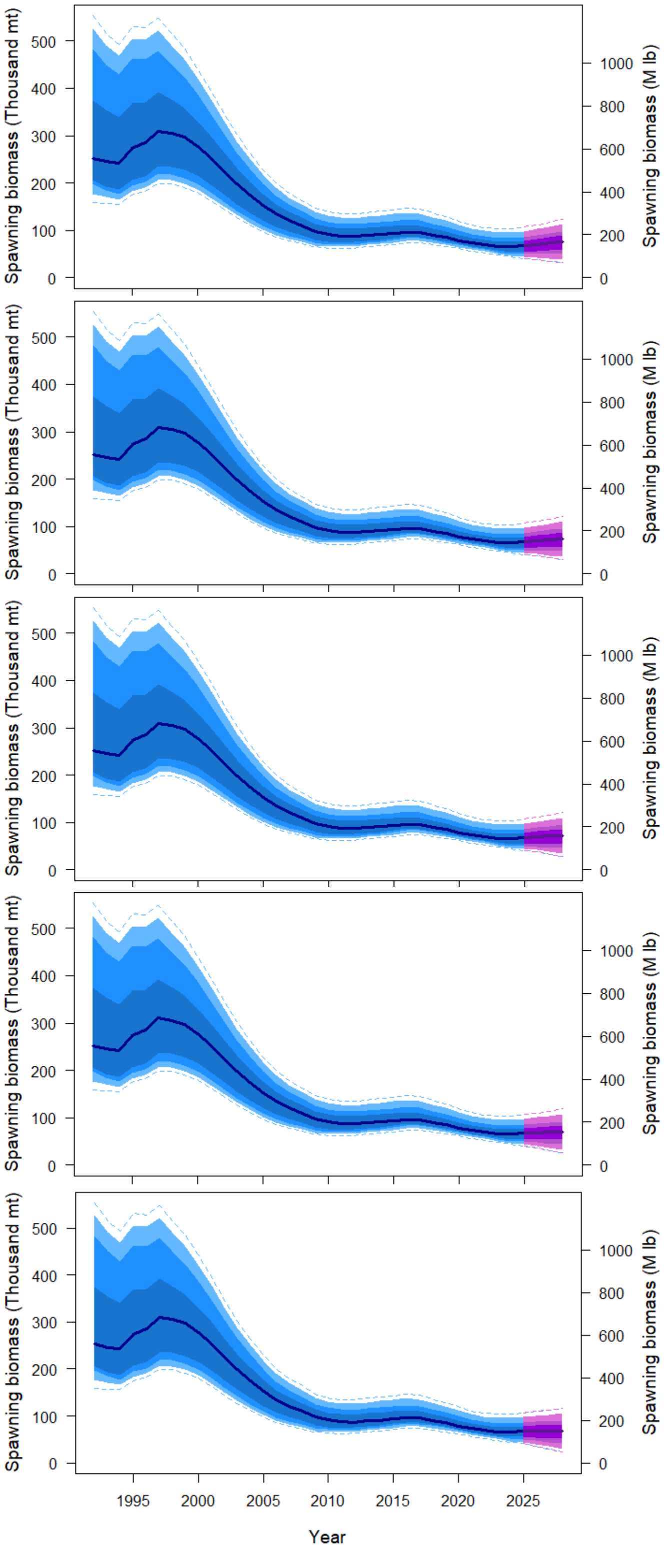

Figure 2. Three-year projections of stock trend under alternative levels of mortality corresponding to alternative harvest levels around the *status quo* coastwide TCEY from 2024: the *status quo* coastwide TCEY -25% (26.5 million pounds; upper panel), the *status quo* coastwide TCEY -15% (30.0 million pounds; second panel), the *status quo* coastwide TCEY -10% (31.8 million pounds; third panel), the *status quo* coastwide TCEY set in 2024 (35.28 million pounds; fourth panel) and the *status quo* coastwide TCEY +10% (38.8 million pounds; bottom panel).

Table 2. Recent adopted TCEYs by IPHC Regulatory Area and coastwide (million pounds 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
2024	1.65	6.47	5.79	11.36	3.45	1.61	1.25	3.70	35.28

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 2022-2024 estimated to be lower than at any time in the last 34 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 2024 extends the 20-year trend in the stock distribution shifting from Biological Region 3 toward Biological Region 2. 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. Recent poor recruitment (2006+) seems to suggest that the stock is in a state of low productivity with no indication of when this prevailing condition may change. Finally, the extremely important role of the directed commercial fishery data in informing reductions in the estimated scale of recent biomass in the stock assessment is a new phenomenon observed only in the last two stock assessments. To the degree that the FISS designs have been limited in those years there is an ongoing uncertainty about why these two time-series are providing different or lagged signals.

An alternative projection was conducted, using 2024 commercial fishery catch rates corrected for the magnitude of changes observed in the 2023 data after additional logs had been collected through 2024. This projection used the status quo mortality for 2025 and resulted in an estimated SPR of 46%, compared to the value of 47% using preliminary commercial fishery data available through October 2024. Based on this result, if commercial data updates in 2025 are similar to those in recent years, it seems likely that the 2025 stock assessment may estimate a higher fishing intensity for a given management alternative than is reflected in the current decision table.

ADDITIONAL INFORMATION

Estimate of non-directed discard mortality based on end-of-year information for 2024 will be available in early Janaury 2025. At that time, detailed mortality projection tables (reporting allocations to specific fishing sectors within individual IPHC Regulatory Areas) will be available on request and the mortality projection tool will be updated for 2025.

Detailed stock assessment (IPHC-2025-SA-01) and data overview (IPHC-2025-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-2025-AM101-13, which provides a summary of projections and the harvest decision table for 2025-2027.
b) **REQUEST** any additional harvest decision table alternatives.
c) **REQUEST** any additional detailed mortality projections for 2025 (by IPHC Regulatory Area and fishery sector).

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.

IPHC. 2024. Report of the 100th session of the IPHC Interim Meeting (IM100). Electronic meeting, 25-26 November 2024. IPHC-2024-IM100-R. 28 p.

2025 and 2026-29 FISS designs

PREPARED BY: IPHC SECRETARIAT (R. WEBSTER, I. STEWART, K. UALESI, T. JACK, D. WILSON; 12 DECEMBER 2024)

PURPOSE

To present an optimal long-term FISS design, the approved 2025 FISS design, and discuss the potential for biases that may result from non-optimal FISS designs.

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 81.3 cm 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).

In recent years, financial constraints due to reduced catch rates, lower sales prices and higher costs have led to the implementation of FISS designs with reduced spatial footprints (IPHC-2024-SRB024-06). Effort has been concentrated in IPHC Regulatory Areas 2B, 2C, 3A and 3B, with limited sampling in other areas in 2023-24. In 2024, only a relatively small proportion of stations were fished in IPHC Regulatory Areas 3A and 3B.

The Base Block Design (described below) was presented to the Commission at the September 2024 Work Meeting and the 14th Special Session of the IPHC (SS014, IPHC-2024-SS014-03) as a more efficient approach to annual sampling in the core of the stock compared to recent designs based on random selection of FISS stations. For 2025, high projected financial costs for this design meant that it was not viable to undertake without substantial supplementary funding. Therefore, IPHC Secretariat staff developed a "fiscally viable" design for 2025 that would have reduced spatial coverage for the third year in a row but at a projected loss that could be covered by revenue, supplementary funding and (if necessary) IPHC reserve funds. Following SS014, the final 2025 FISS design was approved via inter-sessional agreement (IPHC-2024-CR-030, IPHC-2024-CR-031). This design included sampling of FISS charter regions in IPHC Regulatory Areas 3A and 3B that were unsampled in either 2023, 2024 or both, and were not part of the initial fiscally viable design. Both the Base Block Design and the Commission-approved 2025 FISS design are presented in this document.

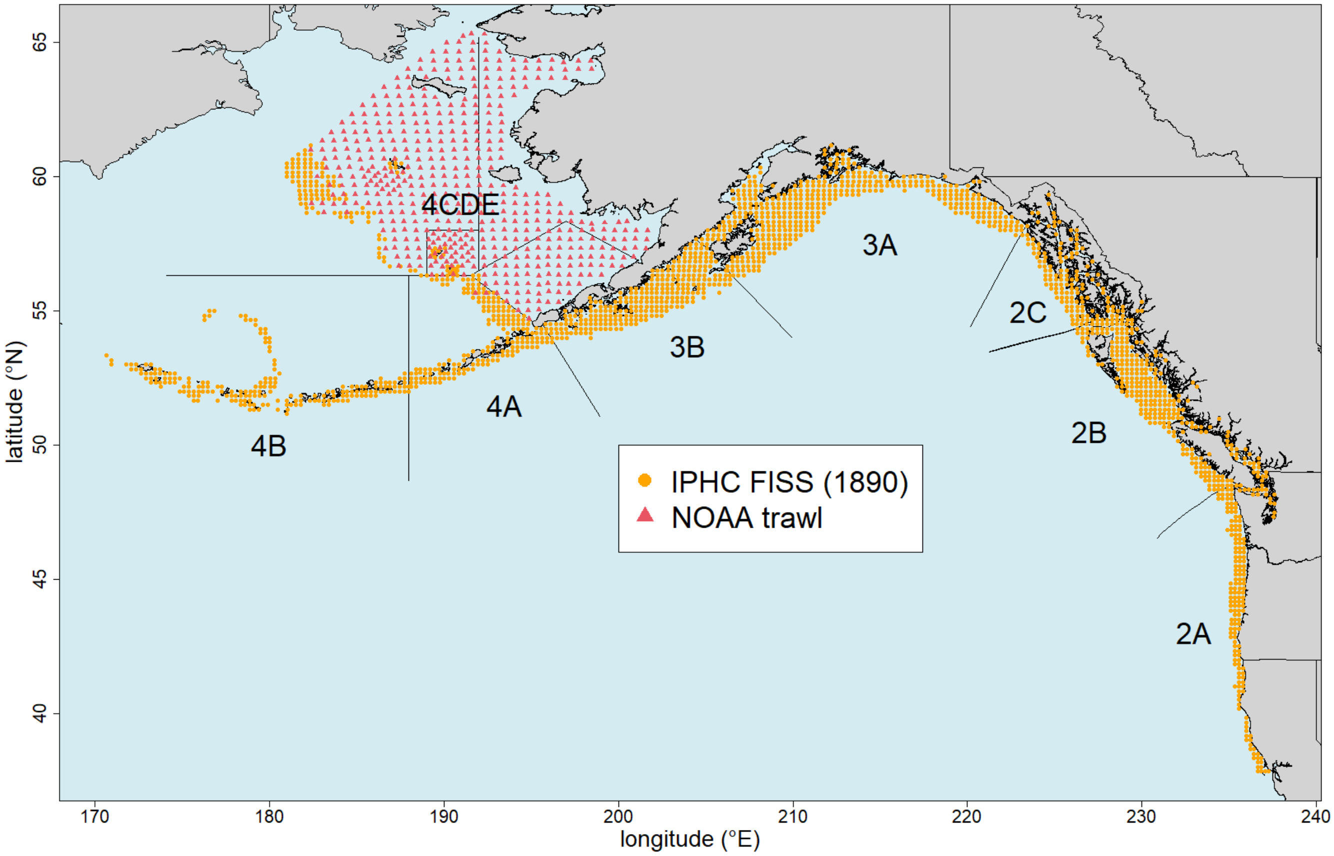

Figure 1. Map of the full 1890 station FISS design, with orange circles representing stations available for inclusion in annual sampling designs. Red triangles represent the locations of NOAA trawl stations used to provide complementary data for Bering Sea modelling (not all are sampled each year).

FISS DESIGN OBJECTIVES (Table 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 to inform spatial management decisions. The priority of the current rationalised 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 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

OPTIMAL FIVE-YEAR ROTATIONAL FISS DESIGN (BASE BLOCK DESIGN)

The **Base Block design** when undertaken on an annual basis ensures that all charter regions in the core areas are sampled over a three-year period, while prioritizing coverage in other areas based on minimising the potential for bias and maintaining CVs below 25% for each IPHC Regulatory Area. The **Base Block design** also includes some sampling in all IPHC Biological Regions in each year, ensuring that both trend and biological data from across the spatial range of Pacific halibut in Convention waters are available to the stock assessment and for stock distribution estimation. From the perspective of meeting the Primary Objective of the FISS (Table 1), the **Base Block design** can be considered the optimal rotational design.

Using samples generated from the fitted 2023 space-time models as simulated data for 2024-27, we projected the coefficient of variation (CV, a relative measure of precision) for mean O32 WPUE for each year of the design by IPHC Regulatory Area and Biological Region. As CVs are generally greater in the terminal year of the time series and that year is the most relevant for informing management, the CV values in Table 2 are for the final year of the modelled time series. For example, the values for 2026 were found by fitting the model to the data for 1993-2026 (with simulated data used for 2024-26).

With uncertainty in future designs, it is expected that by 2027 implemented designs will vary significantly from those in the Base Block design and the other designs (Core Block and Reduced Core) presented at WM2024. Nevertheless, to compare potential levels of uncertainty five years from now under designs with similar sampling coverage, we also projected CVs for IPHC Regulatory Areas 2A, 3B and 4B for 2029. The Base Block design would lead to CVs of 21%, 14% and 14% for 2A, 3B and 4B respectively in 2029.

Table 2. Projected coefficients of variation (CVs, %) for mean O32 WPUE for the FISS **Base Block design**, terminal year of time series, and IPHC Regulatory Area or Biological Region.

Regulatory Area	**Base Block**		
	2025	2026	2027
2A	17	22	23
2B	8	10	7
2C	6	6	6
3A	9	7	7
3B	13	12	15
4A	19	13	20
4B	15	20	18
4CDE	8	8	8
Biological Region			
Region 2	5	6	5
Region 3	7	7	8
Region 4	8	7	9
Region 4B	15	20	18
Coastwide	4	4	4

Projected terminal year CVs for the Base Block design for 2025-27 are all 25% or less for all IPHC Regulatory Areas. In the core areas (2B, 2C, 3A and 3B), CVs are at 15% or less (Table 2). All Biological Region CVs except Region 4B are below 10% while the coastwide CV is projected to be 4% in all years. The Base Block design is therefore projected to maintain precise estimates of indices of Pacific halibut density and abundance across the range of the stock, and to provide a strong basis for estimating trends, demographics, and the distribution of the stock. At the same time, the rotating nature of the sampled blocks means that almost all FISS stations are sampled within a 5-year period (2-3 years within the core areas) resulting in low risk of missing important stock trends and therefore a low risk of large bias in estimates of trend and stock distribution. The consistent nature of the sampling design means that CVs will be maintained at comparable values beyond 2027.

For context, average research survey CVs[1] have been estimated to be approximately ~20%; however, this value includes both 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 Core Block and Reduced Core designs.

The **Base Block design** shown in Figures 2 to 6 for 2025-29 were presented to the Commission at IM099 as potential designs for 2024-28, although the **Base Block design** was not considered for adoption for 2024 due to high projected costs and low catch rates. These block designs ensure that all charter regions in the core areas are sampled over a three-year period, while prioritizing coverage in other areas based on minimising the potential for bias and maintaining CVs below 25% for each IPHC Regulatory Area. The **Base Block design** also include some sampling in all IPHC Biological Regions in each year, ensuring that data from across the spatial

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[1] Based on a meta-analysis of 18 trawl survey and species combinations.

range of Pacific halibut are available to the stock assessment and for stock distribution estimation. We note that paragraph 72 of the AM100 report (IPHC-2024-AM100-R) states:

> *The Commission NOTED that the use of the base block design (Figures 7 to 11 of paper IPHC-2024-AM100-13) will be the focus of future planning and annual FISS proposals from the Secretariat.*

The Base Block design for the 2025 FISS (Figure 2) was projected to result in a net loss of around US$2 million and was therefore not considered fiscally viable (IPHC-2024-SS014-03).

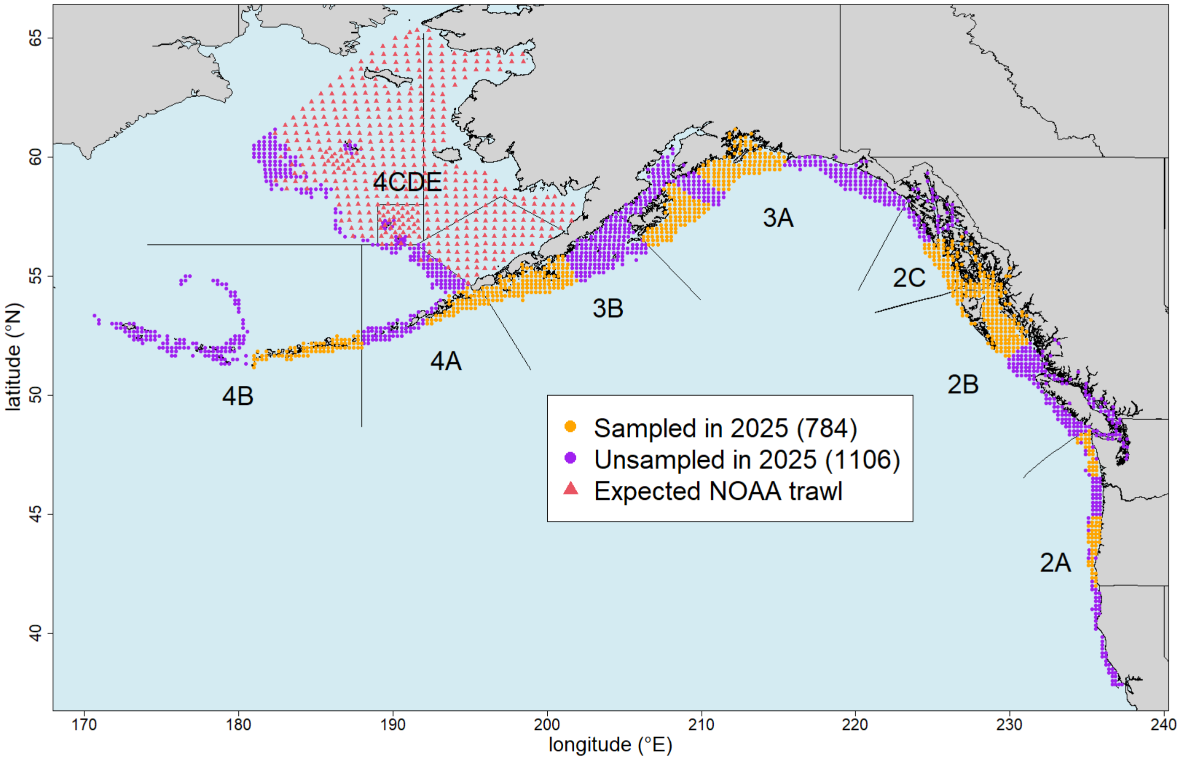

Figure 2. Base Block design for 2025 (orange circles). Design is based on fishing 2-4 complete blocks of stations (charter regions) in the core areas (2B, 2C, 3A and 3B) and previously implemented subareas elsewhere.

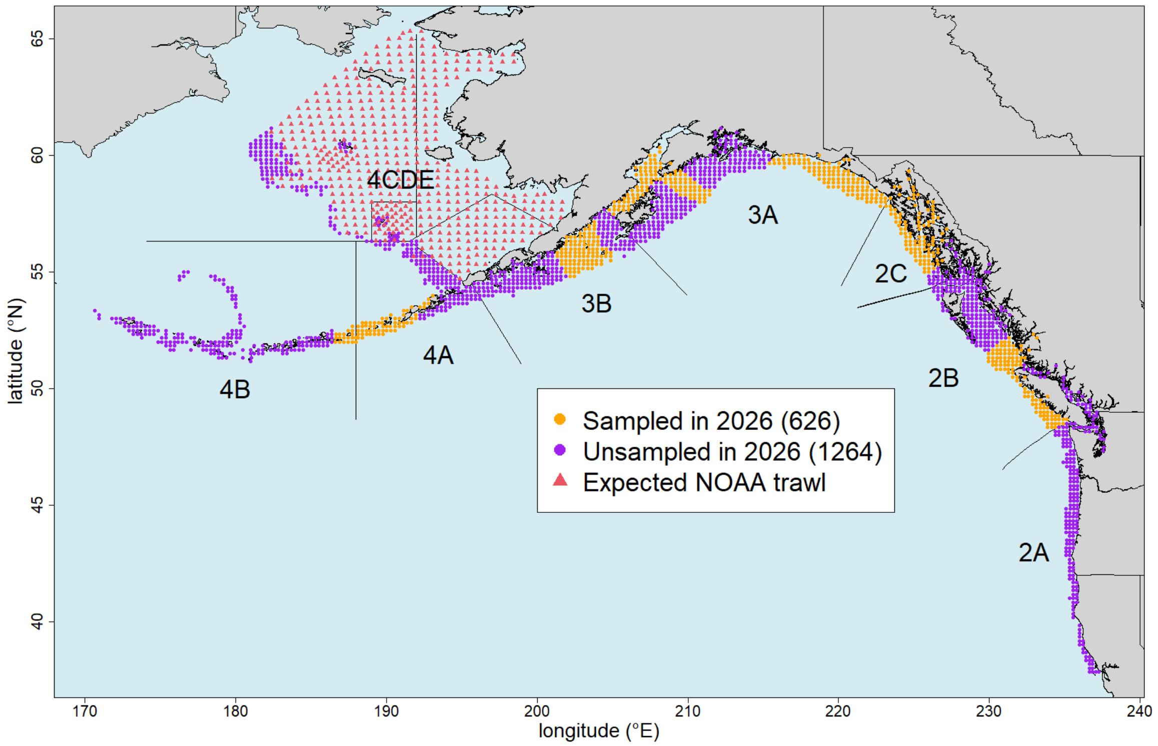

Figure 3. Base Block design for 2026 (orange circles) – indicative only. Design is based on fishing 2-4 complete blocks of stations (charter regions) in the core areas (2B, 2C, 3A and 3B) and previously implemented subareas elsewhere.

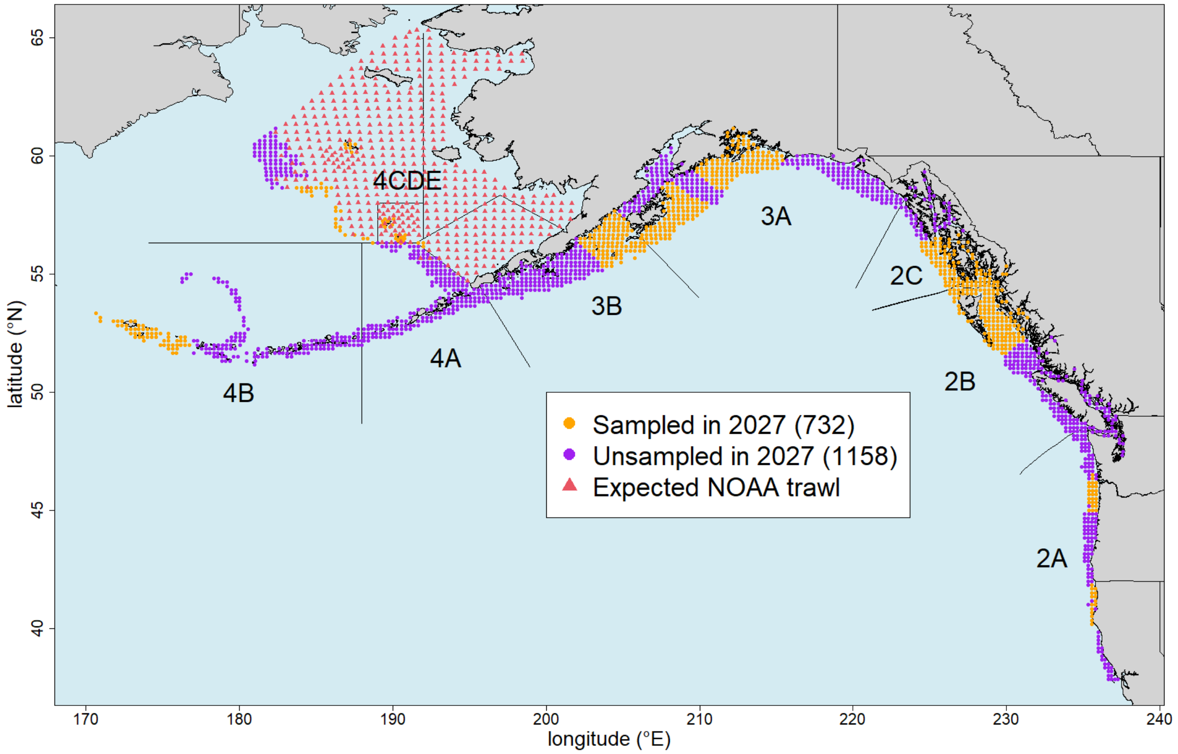

Figure 4. Base Block design for 2027 (orange circles) – indicative only. Design is based on fishing 2-4 complete blocks of stations (charter regions) in the core areas (2B, 2C, 3A and 3B) and previously implemented subareas elsewhere.

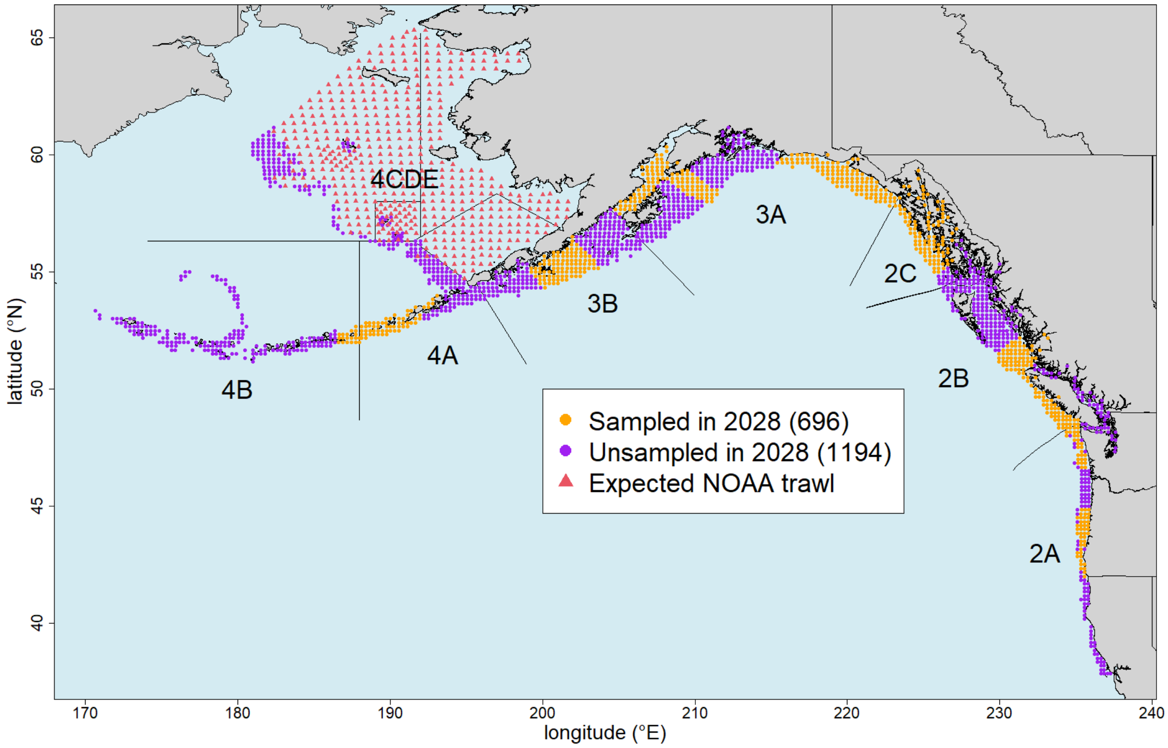

Figure 5. Base Block design for 2028 (orange circles) – indicative only. Design is based on fishing 2-4 complete blocks of stations (charter regions) in the core areas (2B, 2C, 3A and 3B) and previously implemented subareas elsewhere.

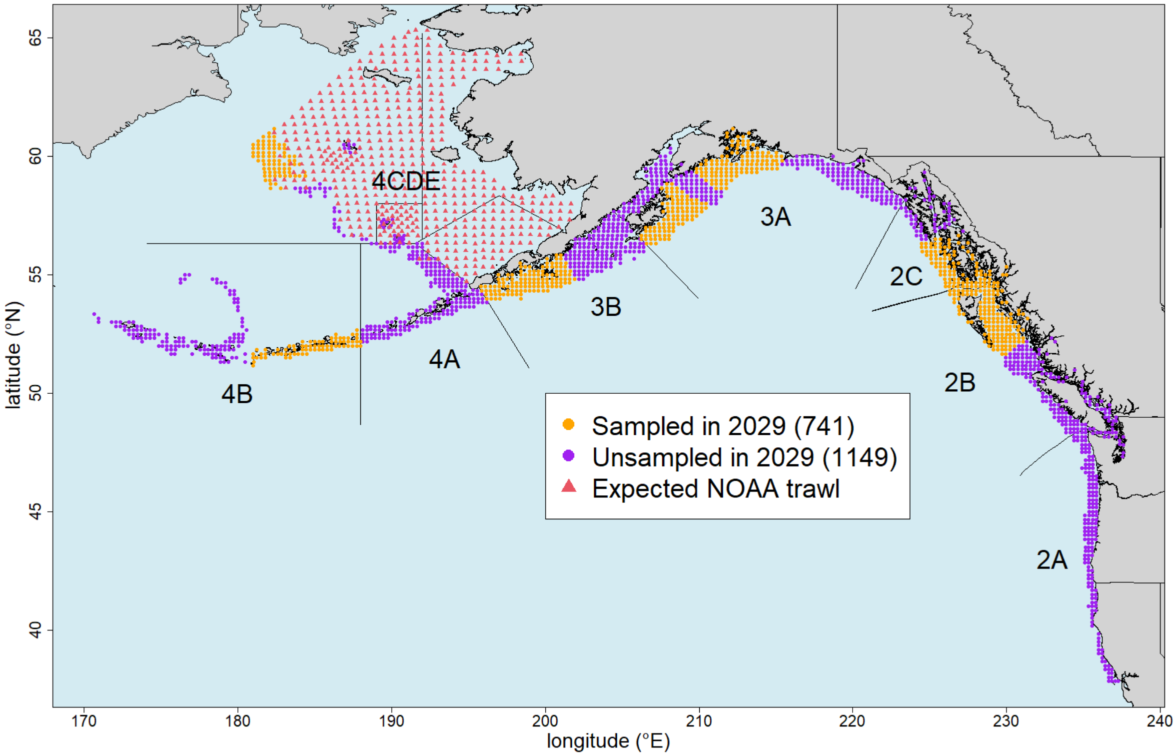

Figure 6. Base Block design for 2029 (orange circles) – indicative only. Design is based on fishing 2-4 complete blocks of stations (charter regions) in the core areas (2B, 2C, 3A and 3B) and previously implemented subareas elsewhere.

THE APPROVED 2025 FISS DESIGN

At SS014 (IPHC-2024-SS014-03), the Commission tentatively decided on a 2025 FISS design (Figure 7) that included the following:

- One charter region in each of 2B and 2C
- 60 stations in each of 2A and 4A/4B, covered by supplementary funding
- Two charter regions in each of 3A and 3B, each last sampled in 2022-23, and selected to reduce the bias risk over the short term

Implementation of this design is projected to result in a net loss to the FISS, with the projected deficit to be covered by a transfer from the IPHC Reserve Fund of $1,000,000. This design was approved via inter-sessional agreement (IPHC-2024-CR-030, IPHC-2024-CR-031).

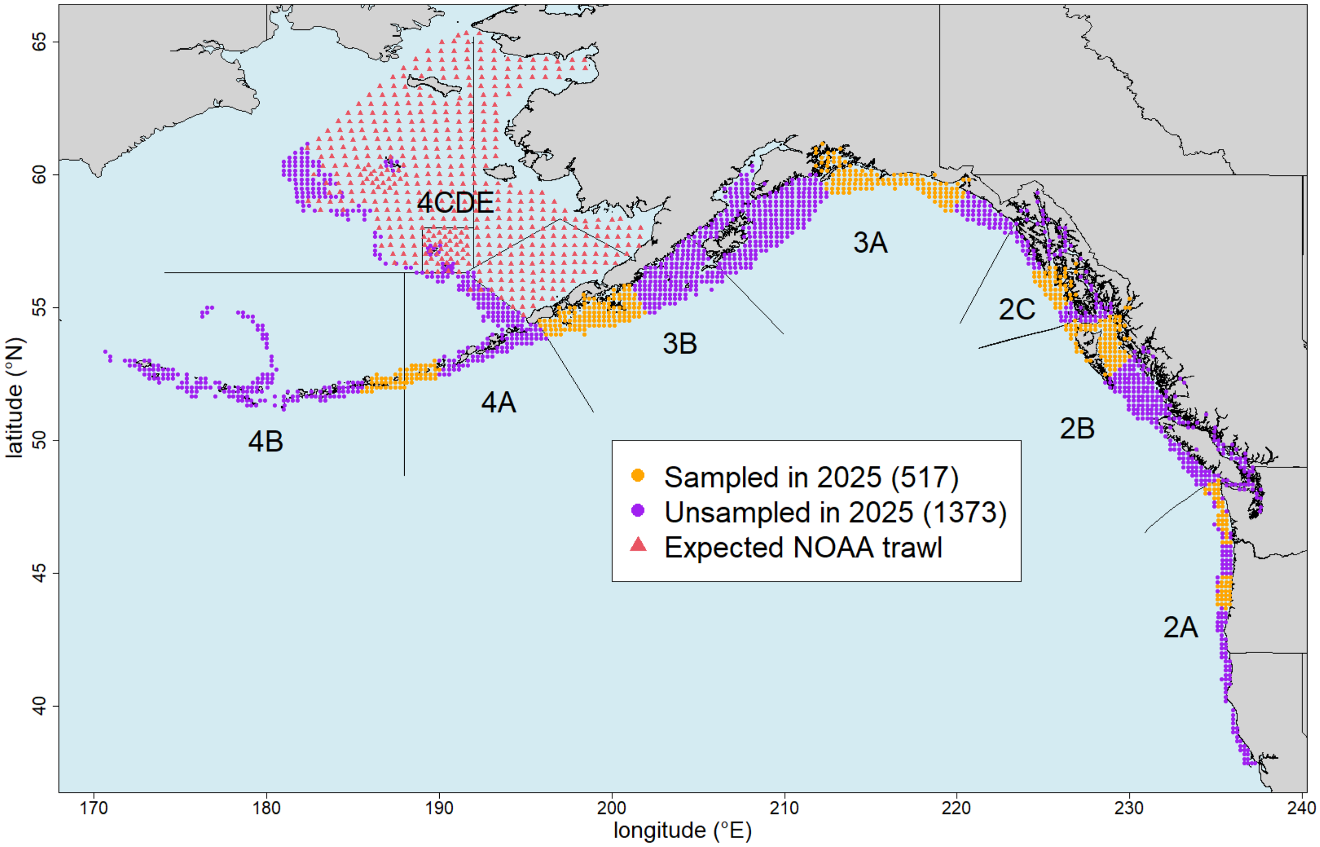

Figure 7. The approved 2025 FISS design (orange circles).

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THE POTENTIAL FOR BIAS RESULTING FROM REDUCED FISS DESIGNS

Indices of Pacific halibut density can change by large amounts over short periods, with annual changes of 15% or more regularly observed at the level of Biological Region (Figure 8) and Regulatory Area (Figure 9). Over a three-year period, large changes in indices of density are the norm (Figures 10 and 11), including at the coastwide level. Lack of sampling or low spatial coverage in an area or region means such changes are fully or largely unobserved, leading to biased estimates of indices, stock trends, and stock distribution. The greater the unobserved change, the greater the bias. Designs such as that implemented in 2024 and the approved 2025 FISS design (Figure 7) therefore have high potential for bias in area, regional and coastwide estimates, particularly as 2025 would be the second or third year with reduced coverage for much of the stock.

The risk of bias is lowest in Biological Region 2, which has had good spatial coverage over the last three years (2022-24; Figure 12). The planned 2025 sampling in the highest density habitat in IPHC Regulatory 2A means that bias risk in 2025 will be low throughout this region. While some sampling in Biological Regions 3, 4 and 4B mitigates the bias potential, persistent large coverage gaps means that 73% of habitat covered by the full FISS design will be unsampled next year and the risk of not observing the large changes that often occur in much of the stock remains high.

Including the habitat covered by the NOAA trawl survey in the Bering Sea, implementation of approved 2025 FISS design means that either FISS or trawl sampling covers 51% and 63% of habitat in each of 2024 and 2025 respectively. Based on this level of sampling coverage and observed levels of change shown in Figures 8 to 11, we would expect coastwide indices of abundance to have bias of up to +/-13% following the 2025 FISS. However, bias could be much higher in Biological Regions 3 and 4B, which would have had lower levels of sampling than the coast as a whole for two or more years following completion of the 2025 FISS.

Recently completed simulation analyses explored the effect on stock assessment results of a cumulative bias in the FISS index of 15% over the upcoming period from 2025-2027 (IPHC-2024-SRB025-06). If the true FISS trend were going down by 15%, but due to a reduced design the FISS index was estimated to be flat over this same period, the estimates of spawning biomass, fishing intensity (SPR) and probability of stock decline in 2028 at the same harvest level would be biased. The simulation results indicated that this bias correspond to a 2-3% overestimate of spawning biomass, a 1% overestimate of SPR (underestimate of fishing intensity) and a 9% underestimate of the probability of stock decline in 2028. Based on recent harvest decision tables, to account for a 9% underestimate of the probability of stock decline the coastwide TCEY would need to be reduced by approximately 4 million pounds, equating to approximately US$24 million in landed catch. Thus, under significantly reduced FISS designs accounting for potential bias in management decisions could have a significant impact on short-term fishery yields and revenue. While the true degree of bias would be unknown (at least until the next comprehensive FISS design was completed), this level of bias (15%) is possible in the reduced designs evaluated here.

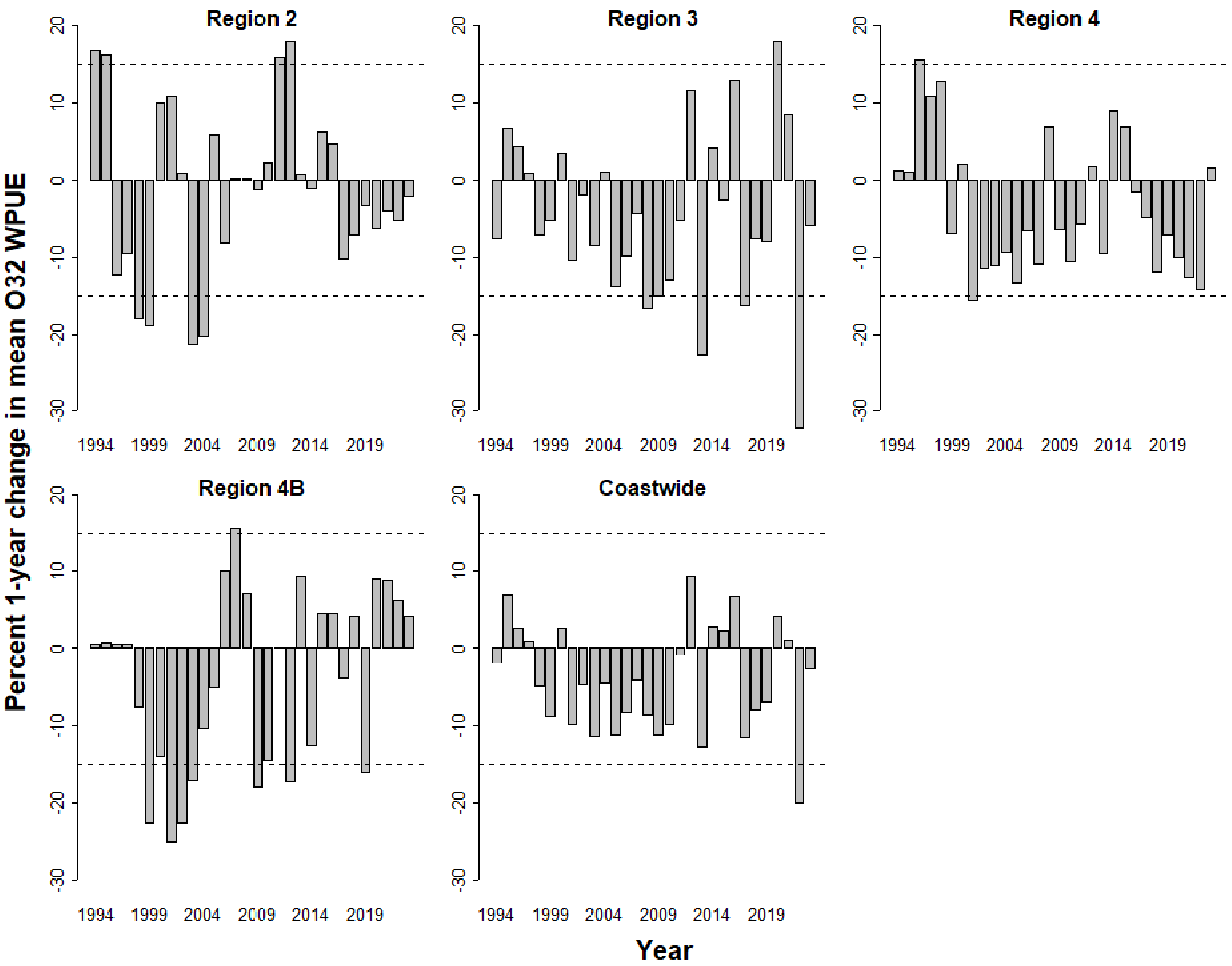

Figure 8. Estimated 1-year changes in mean O32 WPUE by IPHC Biological Region. Dashed lines mark changes of +/-15%.

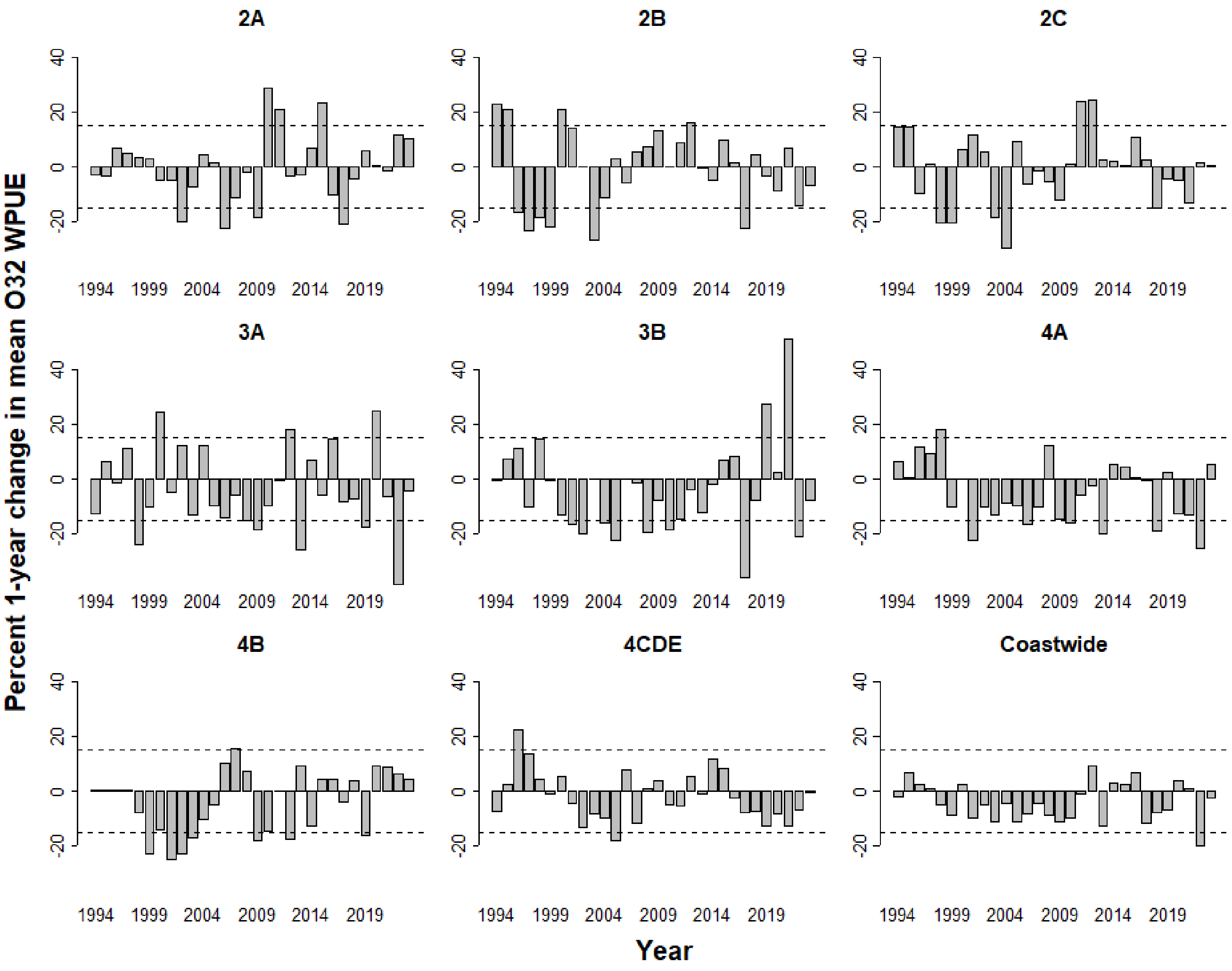

Figure 9. Estimated 1-year changes in mean O32 WPUE by IPHC Regulatory Area. Dashed lines mark changes of +/-15%.

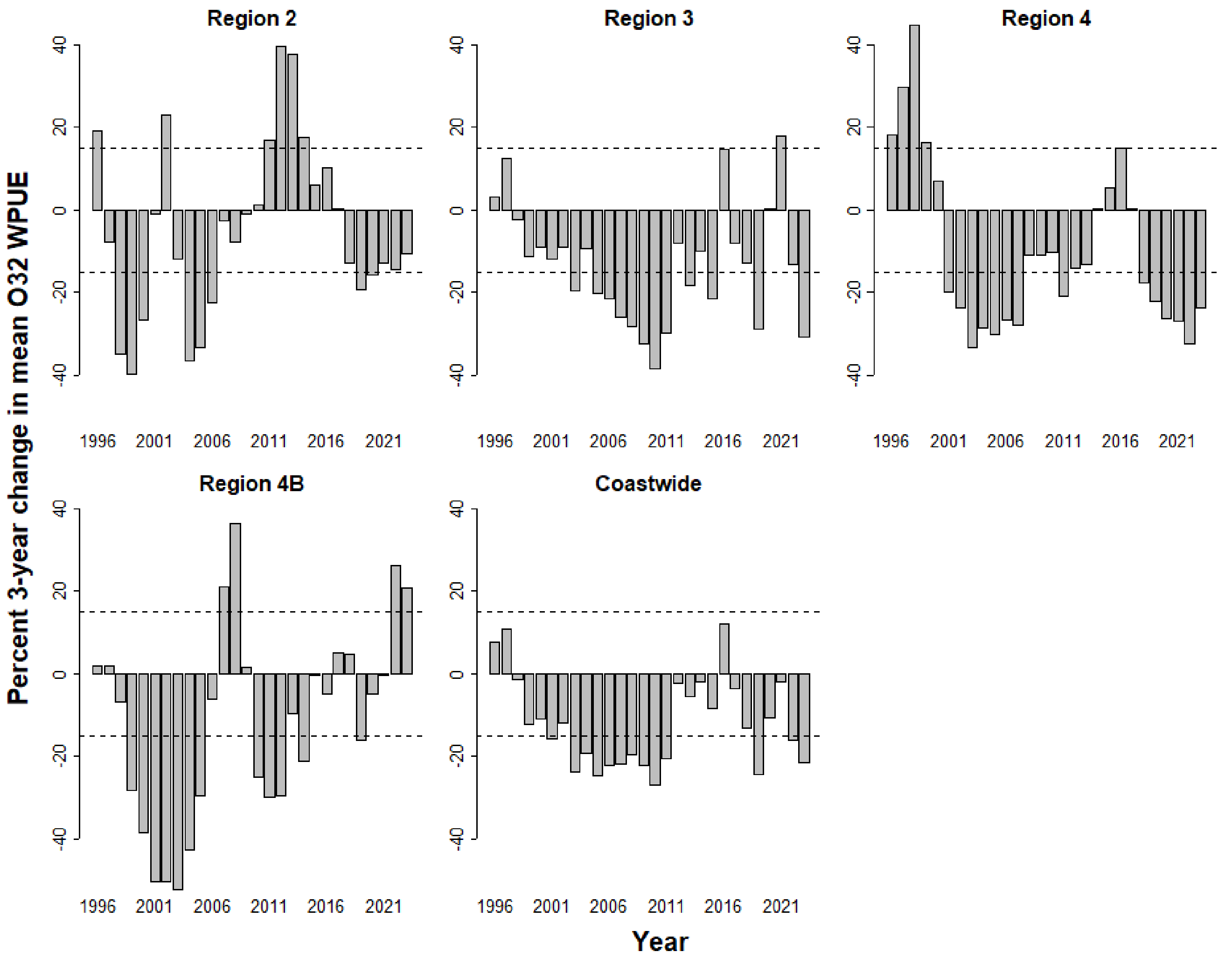

Figure 10. Estimated 3-year changes in mean O32 WPUE by IPHC Biological Region. Dashed lines mark changes of +/-15%.

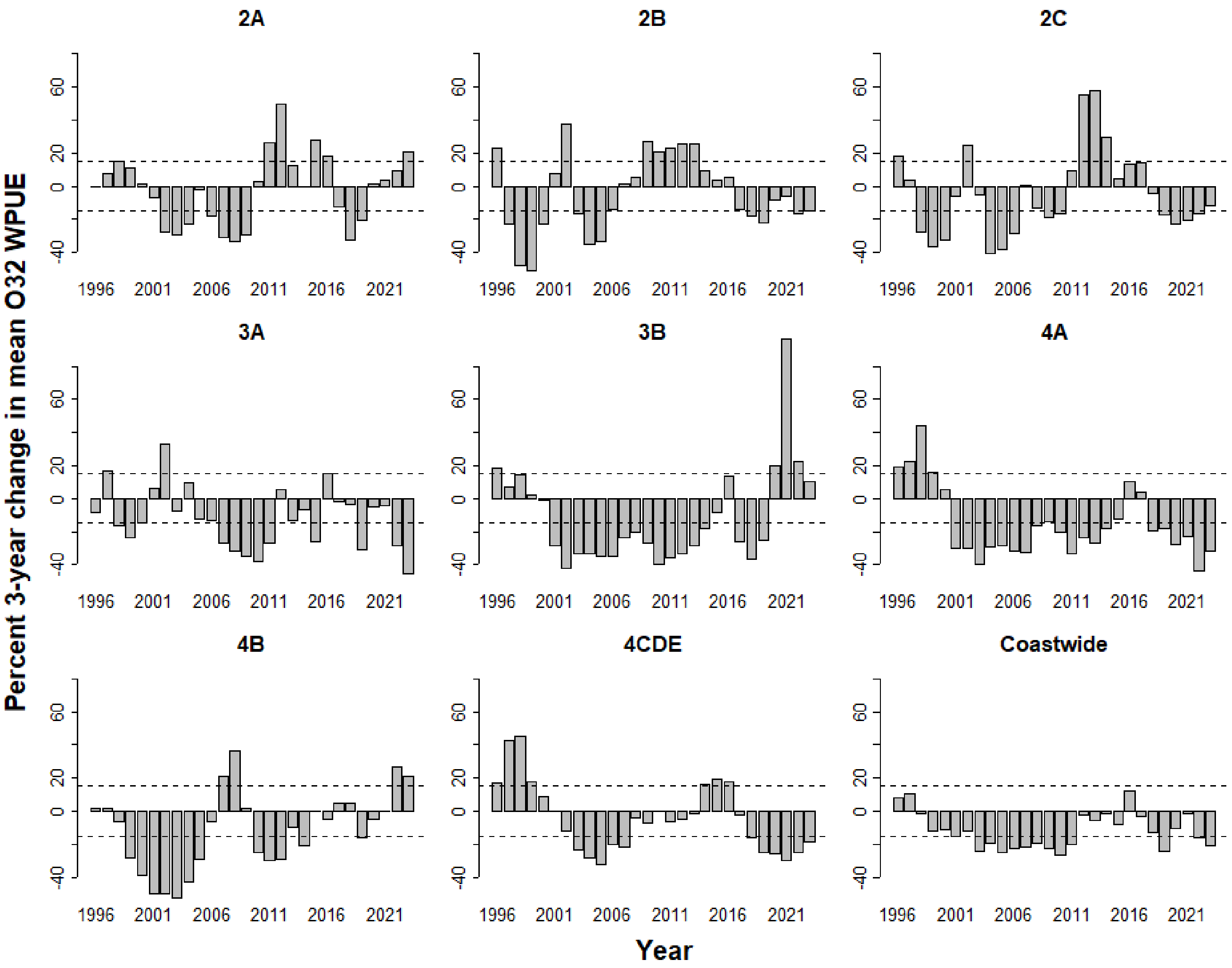

Figure 11. Estimated 3-year changes in mean O32 WPUE by IPHC Regulatory Area. Dashed lines mark changes of +/-15%.

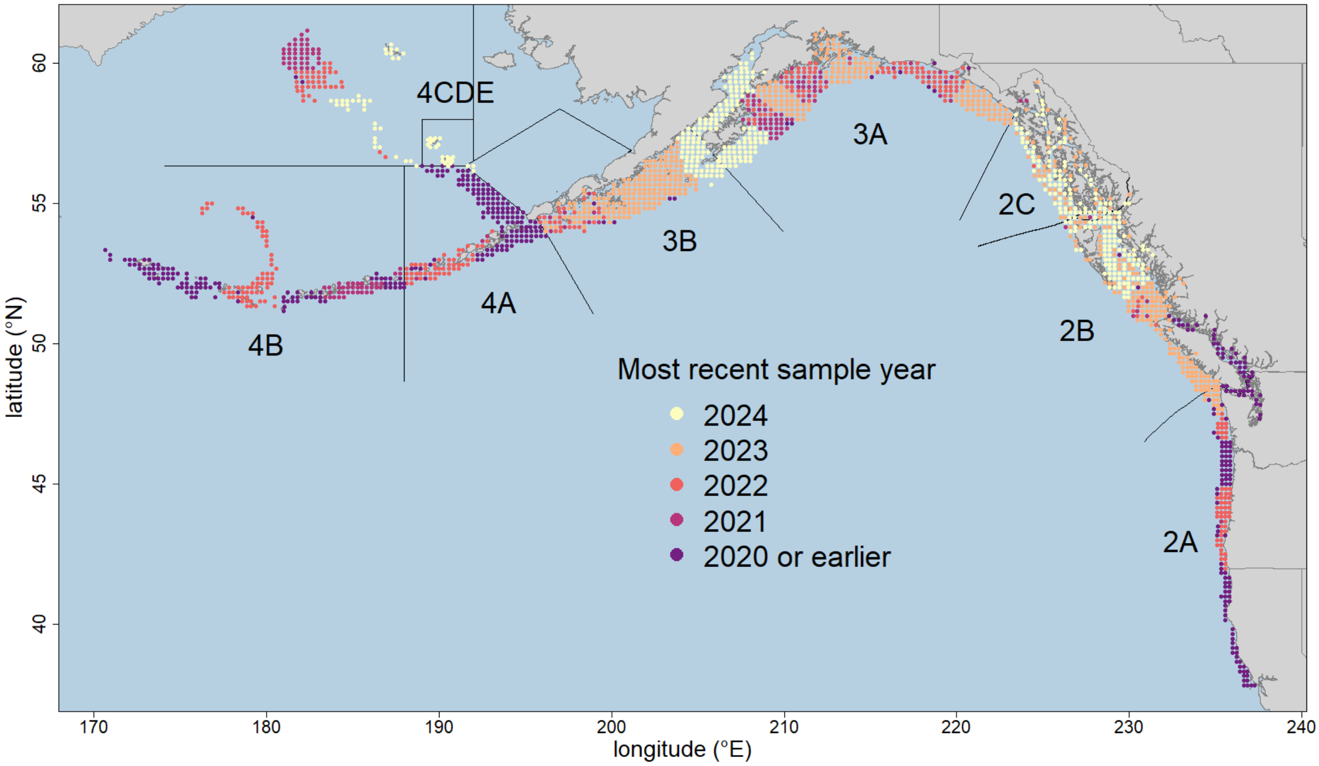

Figure 12. Map of FISS grid stations with coloured circles showing the most recent year each station was fished effectively.

RECOMMENDATION

That the Commission **NOTE** paper IPHC-2025-AM101-14 that reviews an optimal long-term FISS design, the approved 2025 FISS design, and discusses the potential for biases that may result from non-optimal designs.

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IPHC Fishery Regulations: Proposals for the 2024-25 process

PREPARED BY: IPHC SECRETARIAT (B. HUTNICZAK; 13 & 28 DECEMBER 2024)

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 for consideration by the Commission at the 101st Session of the IPHC Annual Meeting (AM101).

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 2024-25 process.

The Commission had an opportunity for a preliminary review of the majority of the proposals during the 100th Session of the IPHC Interim Meeting (IM100). The deadline for submission of regulatory proposals for consideration by the Commission at the 101st Session of the IPHC Annual Meeting (AM101) is 28 December 2024.

DISCUSSION

A list of titles, subjects, and sponsors for IPHC Fishery Regulations proposals submitted as part of the 2024-25 process is provided in **Appendix I**.

RECOMMENDATION

That the Commission:

1) **NOTE** paper IPHC-2025-AM101-16 Rev_1 that provides the Commission with an overview of the IPHC Fishery Regulations proposals that the IPHC Secretariat, Contracting Parties, and other stakeholders have submitted for consideration by the Commission at the 101st Session of the IPHC Annual Meeting (AM101).

APPENDICES

Appendix I: Titles, subjects, and sponsors for IPHC Fishery Regulations proposals submitted for consideration in the 2024-25 process.

APPENDIX I

Titles, subjects, and sponsors for IPHC Fishery Regulations proposals submitted for consideration in the 2024-25 process.

Ref. No.	Title	Brief description
IPHC Secretariat		
IPHC-2025-AM101-PropA1	IPHC Fishery Regulations: 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-2025-AM101-PropA2	IPHC Fishery Regulations: 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-2025-AM101-PropA3	IPHC Fishery Regulations: Minor amendments	To improve consistency in the IPHC Fishery Regulations.
Contracting Parties		
IPHC-2025-AM101-PropB1	IPHC Fishery Regulations: Recreational (Sport) Fishing for Pacific Halibut - IPHC Regulatory Areas 2C, 3A, 3B, 4A, 4B, 4C, 4D, 4E (Sect. 28): 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		
IPHC-2025-AM101-PropC1	IPHC Fishery Regulations: Commercial Fishing Periods (Sect. 9) – year-round commercial Pacific halibut fishery in IPHC Regulatory Area 2B	**Proponent:** Robert Hauknes (commercial fisher) Originally published: 26 September 2024 To propose year-round commercial Pacific halibut fishery in IPHC Regulatory Area 2B.
IPHC-2025-AM101-PropC2	IPHC Fishery Regulations: Application of Commercial Fishery Limits (Sect. 12) – addressing concerns regarding localized depletion around St. Matthew Island	**Proponent:** Shawn McManus (commercial fisher) To propose closing the one-way door for halibut IFQ/CDQ holders from halibut Area 4C into Area 4D North of 60 degrees North latitude and East of 174 degrees West longitude.
IPHC-2025-AM101-PropC3	IPHC Fishery Regulations: Mortality and Fishery Limits (Sect. 5) - TCEY in Regulatory Area 2A	**Proponent:** Timothy Greene (Makah Tribe) To propose a TCEY for IPHC Regulatory Area 2A of 1.65Mlb for 2025.
IPHC-2025-AM101-PropC4	***Other proposal (Non-IPHC Fishery Regulations):*** Rebuilding Plan for Pacific halibut	**Proponent:** Buck Laukitis (commercial fisher) To propose a Rebuilding Plan for Pacific halibut.
IPHC-2025-AM101-PropC5	Mortality and Fishery Limits (Sect. 5) – definition of reaction to overfishing	**Proponent:** Malcolm Milne (North Pacific Fisheries Association) To propose a reaction to the Pacific halibut stock overfishing.

Interim: IPHC Harvest Strategy Policy

PREPARED BY: IPHC SECRETARIAT (A. HICKS, I. STEWART, & D. WILSON; 09 DECEMBER 2024)

PURPOSE

To provide the Commission with a draft of the interim Harvest Strategy Policy (HSP) for further consideration, and adoption in 2025.

INTRODUCTION

A draft Harvest Strategy Policy (HSP) has been developed for consideration by the Commission. The HSP provides a framework for applying a consistent and transparent science-based approach to setting mortality limits for Pacific halibut (*Hippoglossus stenolepis*) fisheries throughout the Convention Area while ensuring sustainability of the Pacific halibut population. This draft contains principles developed during the Management Strategy Evaluation (MSE) process at IPHC. This document may be updated based on decisions at the 101st Session of the IPHC Annual Meeting (AM101).

POTENTIAL UPDATES TO THE DRAFT INTERIM HSP

In its current state, the HSP is a complete document describing the management framework for Pacific halibut. However, ongoing discussions with the Scientific Review Board (SRB) and the Management Strategy Advisory Board (MSAB), and recent MSE work, may provide useful information for updating the HSP following the AM101. The following areas may be updated given work completed in 2024 (see IPHC-2025-AM101-12), should the Commission direct the Secretariat to do so:

- Update the Commission's priority objectives based on recommendations of the SRB and MSAB (see IPHC-2025-AM101-12).
- Update the following elements of the coastwide management procedure based on recent MSE work: reference SPR, assessment frequency, and a constraint on the interannual change in the TCEY (see IPHC-2025-AM101-12).
- A more complete definition of overfishing.
- Any edits to the HSP.

The HSP may be updated in the future, with the Commission's endorsement, when research or recommendations from subsidiary bodies suggest that improvements are warranted.

RECOMMENDATION/S

That the Commission:

1) **NOTE** paper IPHC-2025-AM101-17 that provides an updated draft interim Harvest Strategy Policy.
2) **RECOMMEND** any further updates and edits to the draft interim Harvest Strategy Policy for incorporation prior to endorsement in 2025.

APPENDICES

Appendix A: International Pacific Halibut Commission Interim: Harvest Strategy Policy (2024)

APPENDIX A

INTERNATIONAL PACIFIC HALIBUT COMMISSION

INTERIM: HARVEST STRATEGY POLICY

(2024)

Commissioners

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Paul Ryall	Jon Kurland
Neil Davis	Robert Alverson
Peter DeGreef	Richard Yamada

Executive Director

David T. Wilson, Ph.D.

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BIBLIOGRAPHIC ENTRY

IPHC 2024. Interim: IPHC Harvest Strategy Policy
IPHC–2024–HSP, 19 pp.

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NOTE: The following is an interim document based on an amalgamation of current IPHC practices and best practices in harvest strategy policy. Current research is ongoing and it is expected that this policy document will then be updated accordingly.

ACRONYMS

CB	Conference Board
HCR	Harvest Control Rule
HSP	Harvest Strategy Policy
IPHC	International Pacific Halibut Commission
LIM	Limit
MEY	Maximum Economic Yield
MP	Management Procedure
MSAB	Management Strategy Advisory Board
MSE	Management Strategy Evaluation
NER	Net Economic Returns
OM	Operating Model
PAB	Processor Advisory Board
RAB	Research Advisory Board
RSB	Relative Spawning Biomass
SB	Spawning Biomass (female)
SPR	Spawning Potential Ratio
SRB	Scientific Review Board
TCEY	Total Constant Exploitable Yield
THRESH	Threshold
U.S.A.	United States of America

DEFINITIONS

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

TABLE OF CONTENTS

EXECUTIVE SUMMARY

The *IPHC Harvest Strategy Policy* (HSP) provides a framework for applying a consistent and transparent science-based approach to setting mortality limits for Pacific halibut (*Hippoglossus stenolepis*) fisheries throughout the Convention Area while ensuring sustainability of the Pacific halibut population. It defines biological and economic objectives that apply to the development of a harvest strategy for Pacific halibut. It also identifies a management procedure and 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)*[1], provides the basis to manage the risk to Pacific halibut fisheries and the Pacific halibut population.

The IPHC is responsible for determining the coastwide mortality limit and the allocation of this limit among eight (8) IPHC Regulatory Areas. The mortality limit in each IPHC Regulatory Area consists of all fishing mortality of all sizes and from all sources, except for discard mortality of under 26-inch (U26) Pacific halibut from non-directed commercial (e.g. trawl) fisheries, which is accounted for at the coastwide level. The distribution of the mortality limit to each sector within an IPHC Regulatory Area is determined by Contracting Party domestic agencies. Therefore, this Harvest Strategy Policy is specific to the mortality limit in each IPHC Regulatory Area, across all sectors (i.e. TCEY).

Being a framework, the harvest strategy policy encompasses the entire process of the management procedure and decision-making process to determine mortality limits as well as other important considerations such as objectives, key principles, and responses to specific events. A harvest strategy, which may also be referred to as a management strategy, is the decision framework necessary to achieve defined biological and economic objectives for Pacific halibut.

> **Management Procedure (MP)**: A formulaic procedure to determine a management outcome (e.g. mortality limit) that has been simulation tested and produces a repeatable outcome.
>
> **Harvest Strategy**: The framework for managing a fish stock, including the MP and objectives.
>
> **Harvest Strategy Policy (HSP)**: The harvest strategy and decision-making process that results in endpoint management outcomes.

A goal of the IPHC Harvest Strategy Policy is the long-term 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. The Commission's current priority objectives to achieve this goal, which may be updated, are to:

- maintain Pacific halibut female spawning biomass, above a 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 female spawning biomass, at least 50% of the time, at or above a threshold reference (fixed or dynamic) female spawning biomass that optimises fishing activities on a spatial and temporal scale relevant to the fishery;

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[1] https://www.iphc.int/uploads/pdf/basic-texts/iphc-1979-pacific-halibut-convention.pdf

- optimise average coastwide yield given the constraints above;
- limit annual changes in the coastwide mortality limit (TCEY) given the constraints 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.

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.

A transparent and systematic approach to meet the objectives of the Harvest Strategy Policy is supported by a number of requirements. These include accounting for all mortality of all sizes and from all sources; accounting for multiple sources of uncertainty including environmental and biological; balancing risk, cost, and catch; developing threshold and limit reference points as indicators for managing Pacific halibut; robust simulation testing of management procedures; and identifying circumstances when the harvest strategy may be reconsidered and possibly updated. One threshold reference point and one biological limit reference point are currently defined.

Reference point	**Definition**	**Proxy**
Threshold reference point SB_{THRESH}	The female dynamic spawning biomass level at maximum economic yield (SB_{MEY}).	36% of the unfished spawning biomass ($SB_{36\%}$).
Biological limit reference point SB_{LIM}	The female dynamic spawning biomass level where the ecological risk to the population is regarded as unacceptable.	20% of the unfished female spawning biomass ($SB_{20\%}$).

The coastwide reference mortality limit from the management procedure is currently determined using the stock assessment and a fishing intensity ($F_{SPR=43\%}$). The reference SPR is linearly reduced when the stock status is estimated below 30% and is set to 100% (no fishing for directed fisheries) when the stock status is estimated at or below 20% (SB_{LIM}). A rebuilding strategy must be developed if the stock is estimated to be below SB_{LIM}.

The management of Pacific halibut is an annual process with a coastwide mortality limit and allocation to each IPHC Regulatory Area decided upon by the Commission at each Session of the IPHC Annual Meeting with the input of management supporting information including mortality tables, the harvest decision table, stakeholder input, and any other requests by the Commission. A mortality table shows the resulting allocation of mortality limits to each sector within each IPHC Regulatory Area. The harvest decision table is a stock assessment output that provides an estimate of risk relative to stock trend, stock status, fishery trends, and fishery status for a range of short-term (3-year) coastwide mortality levels including the coastwide reference fishing mortality.

Chapter 1 INTRODUCTION

The *IPHC Harvest Strategy Policy* (HSP) provides a framework for applying a consistent and transparent science-based approach to setting mortality limits for Pacific halibut (*Hippoglossus stenolepis*) fisheries throughout the Convention Area while ensuring sustainability of the Pacific halibut population.

It defines biological and economic objectives that apply to the development of a harvest strategy for Pacific halibut. It also identifies a management procedure and 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)*[2], 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 consistent and transparent science-based approach to setting mortality limits. A harvest strategy consistent with this policy will provide all interested sectors with confidence that the Pacific halibut fisheries are being managed for long-term economic viability while ensuring long-term ecological sustainability of the Pacific halibut population. The implementation of a clearly specified harvest strategy will also provide the fishing industry with a more certain operating environment.

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. coordinated management between the IPHC and Contracting Party domestic agencies) the IPHC will seek to apply and encourage the adoption of this policy in negotiating and implementing cooperative management arrangements.

The IPHC is responsible for determining the coastwide mortality limit and the allocation of this limit among eight (8) IPHC Regulatory Areas (Figure 1). The mortality limit in each IPHC Regulatory Area consists of all fishing mortality of all sizes and from all sources, except for discard mortality of under 26-inch (U26) Pacific halibut from non-directed commercial (e.g. trawl) fisheries, which is accounted for at the coastwide level. This mortality limit without U26 non-directed commercial discard mortality has been termed the Total Constant Exploitation Yield, or the TCEY, but mortality limit is used here.

The distribution of the mortality limit to each sector within an IPHC Regulatory Area is determined by Contracting Party domestic agencies. Therefore, this Harvest Strategy Policy is specific to the mortality limit in each IPHC Regulatory Area, across all sectors (i.e. TCEY).

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[2] https://www.iphc.int/uploads/pdf/basic-texts/iphc-1979-pacific-halibut-convention.pdf

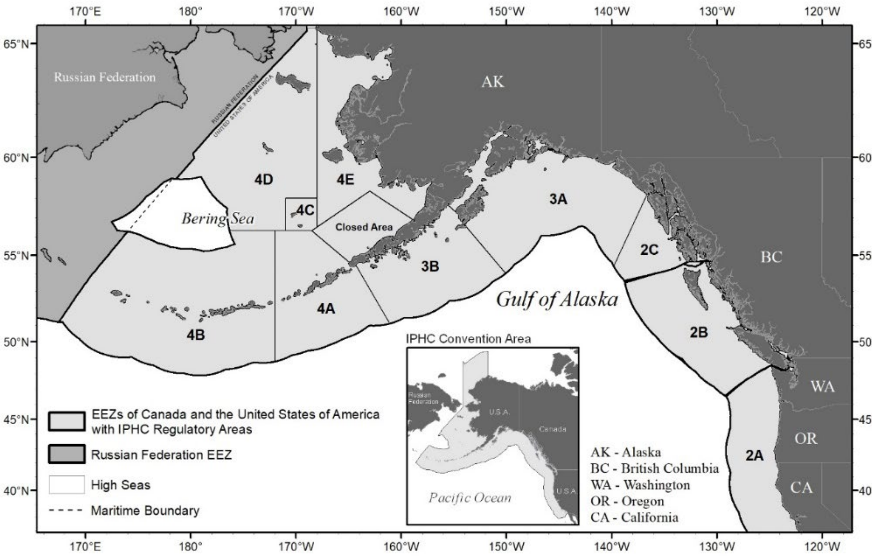

Figure 1. IPHC Regulatory Areas, where 4C, 4D, 4E, and the closed area are considered one IPHC Regulatory Area (4CDE). The IPHC Convention Area is shown in the inset.

1.2 WHAT IS A HARVEST STRATEGY POLICY (HSP)?

Being a framework, the harvest strategy policy encompasses the entire process of the management procedure and decision-making process to determine mortality limits (Figure 2) as well as other important considerations such as objectives, key principles, and responses to specific events. To determine mortality limits, the process begins with determining the coastwide scale of fishing mortality (the Management Procedure or MP). The decision-making process then occurs at the Annual Meeting of the IPHC where various forms of supporting information are used by subsidiary bodies to provide a recommendation to the Commission of the coastwide mortality limit and allocation to each IPHC Regulatory Area. The Commission uses all this information to arrive at a final decision defining mortality limits for that year. Due to many considerations in this decision-making process, the final coastwide mortality limit may deviate from the coastwide reference mortality limit determined from the management procedure.

1.3 WHAT IS A HARVEST STRATEGY?

A harvest strategy, which may also be referred to as a management strategy, is the 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 conditions of the Pacific halibut population and economic conditions of Pacific halibut fisheries in relation to biological and fishery reference levels (reference points).
- Pre-determined rules that adjust fishing mortality according to the biological status of the Pacific halibut stock and economic conditions of the Pacific halibut fishery (as defined by monitoring and/or assessment). These rules are referred to as harvest control rules or decision rules.

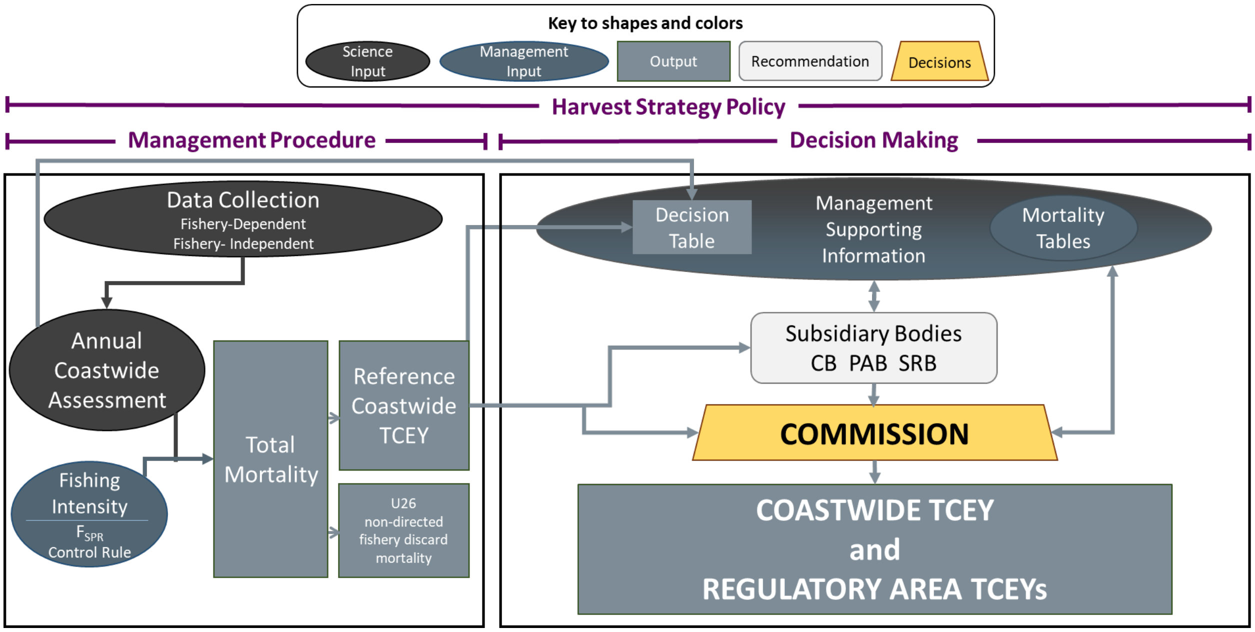

Figure 2. Illustration of the interim IPHC harvest strategy policy process to determine mortality limits showing the management procedure affecting the coastwide scale and the decision-making component, that considers inputs from many sources to distribute the coastwide TCEY to IPHC Regulatory Areas and may result in the coastwide TCEY deviating from the reference coastwide scale management procedure.

A management procedure (MP) contains many of the components of a harvest strategy and is sometimes synonymous with harvest strategy. Here, we define an MP as the formulaic procedure that defines data collection, assessment, and harvest rules to determine the coastwide reference mortality limit. The MP has been shown to meet the objectives through simulation testing while also being robust to uncertainty and variability. Harvest strategy is a more general concept containing the MP as well as objectives. Simulation testing of MPs is done using Management Strategy Evaluation (MSE) models with decision-making variability to ensure that a harvest strategy policy is robust to this uncertainty as well as other sources of uncertainty.

Management Procedure (MP): A formulaic procedure to determine a management outcome (e.g. mortality limit) that has been simulation tested and produces a repeatable outcome.

Harvest Strategy: The framework for managing a fish stock, including the MP and objectives.

Harvest Strategy Policy (HSP): The harvest strategy and decision-making process that results in endpoint management outcomes.

Chapter 2 OBJECTIVES AND KEY PRINCIPLES

A goal of the IPHC Harvest Strategy Policy is the long-term 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.

To achieve this goal the IPHC will implement a harvest strategy that minimises risk to the stock and pursues maximum economic yield (MEY) for the directed Pacific halibut fisheries. Maximising the net economic returns (NER) from the fishery may not always equate with maximising the profitability of the fishery. Net economic returns may consider inter-annual stability to maintain markets, and economic activity may also arise from recreational and Indigenous fishing. The need to share the resources appropriately will also be considered where necessary. The Commission's current priority objectives to achieve this goal, which may be updated, are:

- maintain Pacific halibut female spawning biomass, above a 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 female spawning biomass, at least 50% of the time, at or above a threshold reference (fixed or dynamic) female spawning biomass that optimises fishing activities on a spatial and temporal scale relevant to the fishery;
- optimise average coastwide yield given the constraints above;
- limit annual changes in the coastwide mortality limit (TCEY) given the constraints 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 to 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. In this case, a stock rebuilding strategy will be developed to rebuild the stock, with high certainty, to the limit female spawning biomass level, whereby the harvest control rules would then take effect to build the stock further to the threshold reference female spawning biomass level.

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.

Chapter 3 DEVELOPMENT OF THE HARVEST STRATEGY

The following requirements provide the basis for a transparent and systematic approach used when developing the harvest strategy to assist in meeting the objectives of the Harvest Strategy Policy.

3.1 ACCOUNTING FOR FISHING MORTALITY ON ALL SIZES AND FROM ALL SOURCES

The harvest strategy accounts for all known sources of fishing mortality on the stock and all sizes of Pacific halibut mortality, including directed commercial, recreational, subsistence, and fishing mortality from fisheries targeting species other than Pacific halibut and may be under the management of another jurisdiction, such as non-directed fishing mortality. Discard mortality of released fish is accounted for using best available knowledge.

3.2 VARIABILITY IN THE ENVIRONMENT AND BIOLOGICAL CHARACTERISTICS

The productivity of Pacific halibut is affected by variability in the environment and by changes in biological characteristics. The environment fluctuates naturally and is altered due to climate change and other factors, which may affect biological characteristics such as size-at-age and recruitment of age-0 fish. The following types of variability were considered when developing the harvest strategy for Pacific halibut:

- Variability in recruitment of age-0 Pacific halibut due to unknown causes
- Variability in average recruitment of age-0 Pacific halibut due to the environment (e.g. indexed by the Pacific Decadal Oscillation, PDO).
- Variability in the geographical distribution of age-0 recruits linked to the PDO.
- Changes in weight-at-age due to unknown causes
- Variability in movement throughout the Convention Area due to the environment (e.g. linked to the PDO).

Some potential impacts of climate change were taken into account when developing the harvest strategy policy and future research on additional effects of climate change on Pacific halibut fisheries and stocks will be incorporated as knowledge improves.

3.3 MONITORING

The harvest strategy includes best practices for monitoring the stock and fisheries and the collection of fishery-dependent and fishery-independent data on the distribution, abundance, and demographics of Pacific halibut, as well as other key biological data. These observations are used in the stock assessment and inform other management supporting information. Fisheries-dependent data include observations from the fisheries and should be collected across the entire geographical range and across all sectors, including landed catch and discards. Fishery-independent data include observations collected from scientifically designed surveys providing standardised biological and ecological data that are independent of the fishing fleet.

3.4 ESTABLISHING AND APPLYING DECISION RULES

The harvest strategy developed under this policy specifies all required management actions or considerations for Pacific halibut, at the stock or IPHC Regulatory Area level, necessary to achieve the ecological and economic management objectives for the fishery. Specifics are provided in Chapter 4.

3.5 BALANCING RISK, 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.

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 the 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 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.

3.6 REFERENCE POINTS AND PROXIES

A reference point is a specified level of an indicator used as a basis for managing Pacific halibut. A reference point will often be based on indicators of the female spawning stock size (relative or absolute spawning biomass), the amount of harvest (fishing mortality), or on other factors such as economic return from the fishery.

A harvest strategy for Pacific halibut shall be based on 'threshold' reference points and 'limit' reference points. A threshold reference point is a level that achieves the policy objectives (e.g. acceptable levels of biological impact on the stock and desired economic outcomes from the fishery) if the indicator is at or above that level. When the stock is at or above a threshold reference point, optimal yield is possible. A limit reference point indicates a point beyond which the long-term biological health of the stock or the performance of the commercial fishery is considered unacceptable and should be avoided. Fishing when the Pacific halibut population is below the biological limit reference point places the Pacific halibut stock at a range of biological risks, including an unacceptable risk to recruitment and productivity, and an increased risk that the stock will fail to maintain its ecological function, although risk of extinction is not a major concern. A fishery limit reference point indicates a stock level below which the fishery is unlikely to remain profitable. Proxy reference points are described in Table 1.

Spawning biomass reference points may be dynamic or absolute calculations. A dynamic calculation pertains to relative spawning biomass (RSB) being the estimated value relative to the estimated spawning biomass that would have occurred without any fishing given natural variability (e.g. recruitment deviations, changes in size-at-age, etc). This measures the effect of only fishing, rather than the effect of fishing and the environment. Absolute spawning biomass is not relative to another value and is typically presented as a number or a value estimated in a particular year. Absolute spawning biomass may be useful as a threshold reference point where being below would result in low catch rates and possibly other concerns. Currently there are no absolute spawning biomass reference points, but they may be a useful addition to dynamic reference points.

Table 1. Proxy reference points

Reference point	**Definition**	**Proxy**
Threshold reference point SB_{THRESH}	The female dynamic spawning biomass level at maximum economic yield (SB_{MEY}).	36% of the unfished spawning biomass ($RSB_{36\%}$).
Biological limit reference point SB_{LIM}	The female dynamic spawning biomass level where the ecological risk to the population is regarded as unacceptable.	20% of the unfished female spawning biomass ($RSB_{20\%}$).

3.7 TECHNICAL EVALUATION OF THE HARVEST STRATEGY

A harvest strategy should be formally tested to demonstrate that it is highly likely to meet the objectives and key principles of this policy, and outcomes of that testing should be made publicly available. Management strategy evaluation (MSE), a procedure where alternative management strategies are tested and compared using simulations of stock and fishery dynamics, is one of the best options to test harvest strategies. MSE involves determining objectives, identifying MPs to evaluate, simulating those MPs with a closed-loop simulation framework, evaluating the MPs to determine which one best meets the objectives (Chapter 2) , and finally adopting that MP as part of the harvest strategy. This process receives input from stakeholders through meetings of the Management Strategy Advisory Board (MSAB) and is reviewed by the IPHC Scientific Review Board (SRB).

The MSE supporting this HSP incorporates variability and uncertainty, such as described in Section 3.2, structural uncertainty in an operating model (OM), and implementation variability from decision-making and realized fishing mortality. The MSE also represents all fishing sectors as necessary to appropriately remove different cohorts from the population and to determine if objectives are met for each sector. An important component to this HSP is the decision-making component (Figure 2) where the Commission considers management inputs and additional relevant factors when deciding on the coastwide TCEY and distribution of the TCEY to IPHC Regulatory Areas to balance risk, cost, and catch (Section 3.5). The MSE uses historical decisions to determine how to simulate decision-making variability, ensuring that an MP is robust to that variability as well as other sources of uncertainty.

3.8 RE-EVALUATING THE HARVEST STRATEGY AND MANAGEMENT PROCEDURE

A harvest strategy is a transparent and science-based approach to determining mortality limits and is meant to remain in place for many years. Frequent modifications or departures from the harvest strategy reduce the transparency and science-based approach. Therefore, it is important to specify, as part of the harvest strategy, time periods for re-evaluation of management procedures and to identify exceptional circumstances that would trigger a re-evaluation before that time period.

The IPHC currently operates of a schedule of three-years for full stock assessments, with update stock assessments in the intervening two years, and the MSE OM is updated following each full stock assessment to maintain consistent approaches and paradigms. Therefore, MPs are re-evaluated at a minimum of three years after implementation. An exceptional circumstance may trigger a re-evaluation before then and are defined as follows.

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

Exceptional circumstances would be reviewed by the SRB to determine if one should be declared.

In the event that an exceptional circumstance is declared, the following actions are to be completed.

- Review the MSE simulations to determine if the OM can be improved and MPs should be re-evaluated.
- 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.
- Further consult with the SRB and MSAB after simulations are complete to identify whether a new MP is appropriate.

MSE work is currently ongoing to supplement this interim harvest strategy policy. Current elements of MPs being investigated include conducting a stock assessment every second or third year and using an empirical rule based on the FISS WPUE in years without a stock assessment to determine the coastwide TCEY. With the harvest strategy currently being evaluated, updates to this interim harvest strategy policy may occur before three years.

Chapter 4 APPLYING THE HARVEST STRATEGY

4.1 COORDINATED MANAGEMENT OF DOMESTIC STOCKS

Consistent 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), the IPHC will pursue the sustainable use of Pacific halibut within fisheries managed by other jurisdictions.

4.2 COORDINATED MANAGEMENT OF INTERNATIONAL STOCKS

The IPHC Harvest Strategy Policy does not prescribe management arrangements in the case of fisheries that are managed by a Party external to the IPHC Convention. This includes management arrangements for commercial and traditional fishing in the US Treaty Tribes and Canadian First Nations, that are governed by provisions within relevant Treaties. However, it does articulate the IPHC preferred approach.

4.3 STOCK ASSESSMENT

A full stock assessment occurs triennially and incorporates all available data through the current year, investigates all data and modelling aspects, and potentially makes changes to any of these components as needed. In the intervening years, an update stock assessment is completed to include all available data through the most current year. The stock assessment includes a summary of the data available for analysis, estimates of current stock size, recent trends of stock size relative to reference points, and uncertainty in the estimates of stock size.

The stock assessment also produces a harvest decision table containing short-term projections of various risk metrics under different levels of future harvest (input as a specific amount of fishing mortality, e.g. TCEY). Risk metrics include the probability of a decline in spawning biomass for the next 1 to 3 years, the probability of a decline in spawning biomass that is greater than 5% for the next 1 to 3 years, the probability that the spawning biomass is less than 20% or 30% of unfished spawning biomass in the next 1 to 3 years, the probability that the TCEY is less than the selected TCEY in the next 1 to 3 years, the probability that the TCEY is at least 10% less than the selected TCEY in the next 1 to 3 years, and the probability that the fishing intensity in the upcoming year is greater than the reference fishing intensity as specified in the MP (currently $F_{SPR=43\%}$). The harvest levels including the reference fishing mortality (i.e. TCEY determined from the MP), a range less than and greater than the reference fishing mortality , no fishing mortality (to assess short-term maximum biological productivity), various levels based on status quo (the previous year's coastwide mortality), a 3-year surplus that would maintain the spawning biomass at the same level in three years with a 50% probability, fishing mortality based on the SPR proxy for MEY, and the fishing mortality based on the SPR proxy for MSY.

4.4 COASTWIDE REFERENCE MORTALITY LIMIT

The coastwide reference mortality limit is determined using the stock assessment and a fishing intensity (i.e. F_{SPR}) defined by a harvest control rule (Figure 3). The stock assessment estimates the stock status (dynamic RSB) which is used in the harvest control rule to determine if fishing intensity should be reduced from the reference SPR (currently 43%). The reference SPR is linearly reduced when the stock status is estimated below 30% and is set to 100% (no fishing for directed fisheries) when the stock status is estimated at or below 20% (SB_{LIM}).

This management procedure determining the coastwide reference mortality limit (TCEY) is brought into the decision-making step as a reference value from which the Commission uses additional management supporting information to account for other relevant factors during the annual decision-making process on the coastwide TCEY and the distribution of the coastwide TCEY to IPHC Regulatory Areas. The MP provides a reference value in the decision table (see Section 4.3). The MSE simulations account for this decision-making variability (see Section 3.7).

The decision table represents short-term projections that are useful for tactical decision-making and are an important item in the management supporting information. Longer-term strategic implications of the choices in the decision table could be determined from the MSE simulations. If available, performance metrics associated with the four priority objectives (Chapter 2) determined from the most recent MSE simulations should be presented for, at a minimum, some F_{SPR} values associated with the fishing mortality options presented in the decision table.

4.5 REBUILDING IF THE STOCK BECOMES OVERFISHED

If Pacific halibut is determined to be overfished (when the probability that female spawning stock biomass is below the limit reference point (SB_{LIM}) is greater than 50%), immediate action is required to constrain directed fishing and rebuild the stock to levels that will ensure long-term sustainability and productivity, i.e. at or above SB_{LIM}. A rebuilding strategy must be developed to rebuild the stock to above its limit reference point, for agreement by the Commission. A rebuilding strategy will be required until the stock is above the limit reference point with a reasonable level of certainty (at least a 70% probability that the stock has rebuilt to or above the limit reference point). It must ensure adequate monitoring and data collection is in place to assess the status of the stock and rebuilding progress.

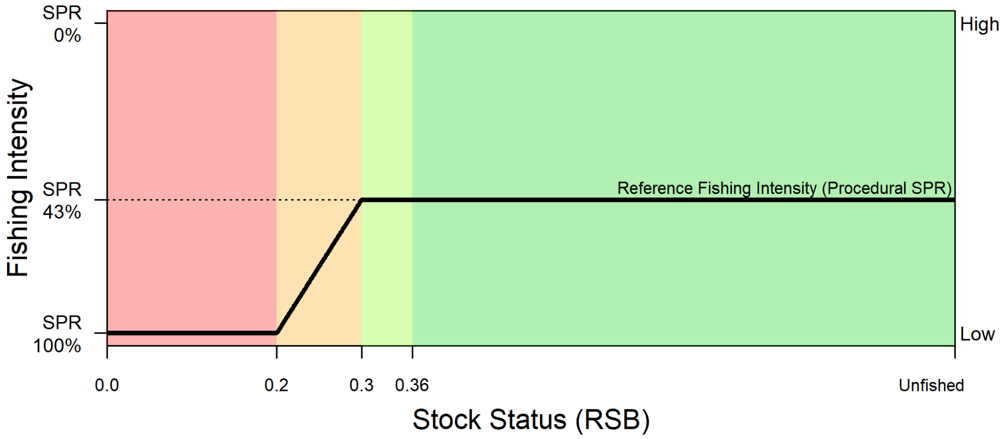

Figure 3. Harvest control rule for the fishing intensity (i.e. F_{SPR}) to determine the coastwide total mortality limit. The stock status is the dynamic relative spawning biomass (RSB) determined from the stock assessment. The reference fishing intensity is $F_{SPR=43\%}$, and is applied when stock status is above the trigger of 30%. SPR is linearly reduced between a stock status of 30% and 20%, and set to 100% when at or below

20% (no directed fishing). A stock status of 20% is also the reference point SB_{LIM}. The threshold RSB, 36%, is related to an objective to maintain the relative spawning biomass at or above $SB_{36\%}$ at least 50 percent of the time. Colours show the area below B_{LIM}, the area 'on the ramp', the area above the trigger and below SB_{THRESH}, and the area above SB_{THRESH}.

Directed fishing and incidental mortality of Pacific halibut, if determined to be overfished, should be constrained as much as possible to levels that allow rebuilding to the limit reference point (SB_{LIM}) within the specified timeframe. Once a stock has been rebuilt to above the limit reference point with a reasonable level of certainty, it may be appropriate to increase directed fishing, and increase incidental mortality in line with the harvest strategy, noting that the usual harvest strategy requirements regarding the application of the harvest control rule and risk of breaching the limit reference point will apply.

The rebuilding strategy should note where sources of mortality exist that cannot be constrained by the IPHC, and must take this mortality into account. Where practical and appropriate, the IPHC will coordinate with other jurisdictions to ensure other sources of mortality from fishing are reasonably constrained consistent with any catch sharing arrangement.

When a rebuilding strategy is being developed, it must include performance measures and details on how and when these measures will be reported. Where there is no evidence that a stock is rebuilding, or is going to rebuild in the required timeframe and probability, the IPHC will review the rebuilding strategy and make the result of the review public. If changes to the rebuilding strategy are considered necessary, such changes should be made in a timely manner.

Rebuilding timeframes

Rebuilding timeframes are explicitly related to the minimum timeframe for rebuilding in the absence of fishing. Rebuilding timeframes should take into account Pacific halibut productivity and recruitment; the relationship between spawning biomass and recruitment; and the stock's current level of depletion.

4.6 MORTALITY LIMITS FOR EACH IPHC REGULATORY AREA

The final outputs of the harvest strategy policy before domestic management is applied are mortality limits for each IPHC Regulatory Area. These are decided upon by the Commission at the Annual Meeting with the input of management supporting information (Figure 2) requested by the Commission including mortality tables and the harvest decision table (see Section 4.3).

Mortality table: A mortality table shows the resulting allocation of mortality limits to each sector within each IPHC Regulatory Area. Domestic catch-sharing plans and Commission agreements on projecting non-directed discard mortality are used to fill out the details. This table can be produced for any projected year but is commonly presented for only the first projected year. Mortality limits for each IPHC Regulatory Area are defined by the Commission as part of the decision-making process.

4.7 STAKEHOLDER AND SCIENTIFIC INPUT

Stakeholder and scientific input into the application of the harvest strategy is an important process to support the sustainable and profitable management of the Pacific halibut fishery. Input from both sources occurs at meetings throughout the year.

Stakeholder input

Stakeholder input can occur via public testimony at any public IPHC meeting or at meetings of various IPHC subsidiary bodies. In particular, the MSAB, Research Advisory Board (RAB), Conference Board (CB), and Processor Advisory Board (PAB) are populated by individuals representing various interests related to Pacific halibut. Terms of reference and rules of procedure are provided for each subsidiary body.

MSAB: The Management Strategy Advisory Board suggests topics to be considered in the MSE process, provide the IPHC Secretariat with direct input and advice on current and planned MSE activities, and represent constituent views in the MSE process. The MSAB meets at least once per year and makes recommendations to the Commission regarding the MSE analyses.

CB: The Conference Board consists of individuals representing Pacific halibut harvesters, organisations, and associations. The CB provides a forum for the discussion of management and policy matters relevant to Pacific halibut and provides advice to the Commission on these matters. This subsidiary body also reviews regulatory proposals received by the Commission and IPHC Secretariat reports and recommendations, and provides its advice concerning these items to the Commission at its Annual Meeting, or on other occasions as requested. The CB meets during the week of the Annual Meeting.

PAB: The Processor Advisory Board represents the commercial Pacific halibut processing industry from Canada and the United States of America and advises the Commission on issues related to the management of the Pacific halibut resource in the Convention Area. The PAB meets during the week of the Annual Meeting.

RAB: The Research Advisory Board, composed of members of the Pacific halibut community, provides the IPHC Secretariat staff with direct input and advice from industry on current and planned research activities contemplated for inclusion in the IPHC 5-year program of integrated research and monitoring. This subsidiary body suggests research topics to be considered and comments upon operational and implementation considerations of those research and monitoring activities. The RAB meets once per year, typically before the Interim Meeting.

Scientific input

Scientific input occurs through independent, external reviews, including, but not limited to, semi-annual meetings of the SRB. The SRB reviews science/research proposals, programs, products, strategy, progress, and overall performance, as well as the recommendations arising from the MSAB and RAB.

4.8 ANNUAL PROCESS

A series of meetings occurs throughout the year, leading up the Annual Meeting in January when mortality limit decisions are made. The MSAB meets at least once a year in spring to provide guidance on the MSE and may also meet in autumn if necessary. The SRB meets in June and September to peer review IPHC science products, including the stock assessment and MSE. The CB and the PAB meet during the week of the Annual Meeting to advise the Commission on issues related to the management of the Pacific halibut resource in the Convention Area.

An Interim Meeting, typically late November, precedes the Annual Meeting and is when the stock assessment, stock projections, and harvest decision table are first publicly presented. The final stock assessment, stock projections, and harvest decision table are presented at the Annual Meeting, typically in late January, to support mortality limit decisions.

IPHC-2025-AM101-PropA1

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

PREPARED BY: IPHC SECRETARIAT (09 DECEMBER 2024)

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 outlines a framework for amending IPHC Fishery Regulations Section 5, '*Mortality and Fishery Limits,*' to reflect Total Constant Exploitation Yield (TCEY) values adopted by the Commission and the corresponding fishery sector limits resulting from those TCEY values, as determined by the existing domestic catch sharing arrangements of the Contracting Parties.

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 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 101st Session of the IPHC Annual Meeting (AM101) in January 2025.

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 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.

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[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.

RECOMMENDATIONS

That the Commission:

1) **NOTE** regulatory proposal IPHC-2025-AM101-PropA1, that 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 101st Session of the IPHC Annual Meeting (AM101) in January 2025.

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*.

** In IPHC Regulatory Area 2A, the USA (NOAA Fisheries) may take in-season action to reallocate the recreational fishery limits between Washington, Oregon, and California after determining that such action will not result in exceeding the overall IPHC Regulatory Area 2A recreational fishery limit and that such action is consistent with any domestic catch sharing plan. Any such reallocation will be announced by the USA (NOAA Fisheries) and published in the Federal Register.

IPHC Fishery Regulations:
Commercial Fishing Periods (Sect. 9)

PREPARED BY: IPHC SECRETARIAT (09 DECEMBER 2024)

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.

The Commission may also decide to change the start or end time of the fishing period.

DISCUSSION

The IPHC Secretariat proposes that the commercial fishing periods for all IPHC Regulatory Areas be set at AM101 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.

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[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.

RECOMMENDATIONS

That the Commission:

1) **NOTE** regulatory proposal IPHC-2025-AM101-PropA2, that provides the Commission with an opportunity to recall the format of the IPHC Pacific Halibut Fishery Regulations: *Commercial Fishing Periods* (Sect. 9), to be populated at the 101st Session of the IPHC Annual Meeting (AM101) in January 2025.

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 06:00 local time on ~~15 March~~DD MMMM.

(3) All commercial fishing for Pacific halibut in all IPHC Regulatory Areas shall cease for the year at 23:59 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:

minor amendments

PREPARED BY: IPHC SECRETARIAT (27 DECEMBER 2024)

PURPOSE

To improve consistency in the IPHC Fishery Regulations.

BACKGROUND

This proposal makes minor clarifying amendments to the existing IPHC Fishery Regulations.

DISCUSSION

Periodically, the IPHC Fishery Regulations are reviewed to ensure they remain clear, concise, consistent, and up-to-date. The proposed revisions, outlined in detail below, result from a review conducted by the Secretariat in collaboration with domestic agencies.

Proposed amendments to the 2025 IPHC Fishery Regulations:

1. Consistent use of the term *commercial fishing period* to refer to the timeframe during which the commercial fishery is accessible to fishers, as defined in Section 9 of the IPHC Fishery Regulations. The term *fishing season* has previously been used more broadly and applied to other fisheries, including the recreational (sport) fishery.

Note: The Secretariat intends to offer an extended version of this proposal for discussion (as IPHC-2025-AM101-PropA3 Rev_1) in January 2025 providing additional edits that would apply consistent use of fishing period to all fishing sectors. These changes will be subject to review conducted in collaboration with domestic agencies.

Benefits/Drawbacks: The benefit of this proposal is to create clearer, more consistent regulations that are easier to understand and apply. No known drawbacks have been identified.

Sectors Affected: This proposal updates the language pertaining to the commercial Pacific halibut fishery sector but does not directly impact fishery management practices.

Appendix A provides details on the suggested regulatory language.

RECOMMENDATIONS

That the Commission:

1) **NOTE** regulatory proposal IPHC-2025-AM101-PropA3, which improves consistency in the IPHC Fishery Regulations.

APPENDICES

Appendix A: Suggested regulatory language.

APPENDIX A
SUGGESTED REGULATORY LANGUAGE

6. In-Season Actions

(1) The Commission is authorized to establish or modify regulations during the fishing season or commercial fishing period after determining that such action:

  (a) will not result in exceeding the fishery limit established pre-season for each IPHC Regulatory Area;

  (b) is consistent with the Convention between Canada and the United States of America for the Preservation of the Halibut Fishery of the Northern Pacific Ocean and Bering Sea, and applicable domestic law of either Canada or the United States of America; and

  (c) is consistent, to the maximum extent practicable, with any domestic catch sharing plans or other domestic allocation programs developed by the governments of Canada or the United States of America.

9. Commercial Fishing Periods

(1) The commercial fishing periods for each IPHC Regulatory Area apply where the fishery limits specified in Section 5 have not been taken.

17. Fishing Gear

[…]

(9) No person on board a vessel used to fish for any species of fish anywhere in IPHC Regulatory Areas 2B, 2C, 3A, 3B, 4A, 4B, 4C, 4D, or 4E during the 72-hour period immediately before the opening of the Pacific halibut ~~fishing season~~ commercial fishing period shall catch or possess Pacific halibut anywhere in those areas until the vessel has removed all of its gear from the water and has either:

  (a) made a landing and completely offloaded its entire catch of other fish; or

  (b) submitted to a hold inspection by an authorized officer.

(10) No vessel used to fish for any species of fish anywhere in IPHC Regulatory Areas 2B, 2C, 3A, 3B, 4A, 4B, 4C, 4D, or 4E during the 72-hour period immediately before the opening of the Pacific halibut ~~fishing season~~ commercial fishing period may be used to catch or possess Pacific halibut anywhere in those areas until the vessel has removed all of its gear from the water and has either:

  (a) made a landing and completely offloaded its entire catch of other fish; or

  (b) submitted to a hold inspection by an authorized officer.

19. Logs

[..]

(5) The logbooks referred to in paragraphs (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 an authorized representative of the Commission upon demand;

  (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; and

(f) submitted to the Commission within 30 days of the ~~season~~ commercial fishing period closing date if not previously collected by an authorized representative of the Commission or otherwise made available to the Commission.

26. Recreational (Sport) Fishing for Pacific Halibut—IPHC Regulatory Area 2A

[…]

(2) When the Commission has determined that a subquota under paragraph (8) of this Section is estimated to have been taken, and has announced a date on which the fishing season will close, no person shall recreational (sport) fish for Pacific halibut in that area after that date for the rest of the year, unless a reopening of that area for recreational (sport) Pacific halibut fishing is scheduled in accordance with the Catch Sharing Plan for IPHC Regulatory Area 2A, or announced by the Commission.

IPHC Fishery Regulation Proposal:

Recreational (Sport) Fishing for Pacific Halibut—IPHC Regulatory Areas 2C, 3A, 3B, 4A, 4B, 4C, 4D, 4E (Sect. 28): Charter management measures in IPHC Regulatory Areas 2C and 3A

SUBMITTED BY: UNITED STATES OF AMERICA (NOAA-FISHERIES) (20 DECEMBER 2024)

Directed Commercial ☐ Recreational ☒ Subsistence ☐ Non-directed commercial ☐ All ☐

All Regulatory Areas ☐ All Alaska Regulatory Areas ☐ All U.S. Regulatory Areas ☐

2A ☐ 2B ☐ 2C ☒ 3A ☒ 3B ☐ 4A ☐ 4B ☐ 4C ☐ 4D ☐ 4E ☐

PURPOSE

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.

EXPLANATORY MEMORANDUM

The NPFMC recommended management measures for guided recreational (sport) Pacific halibut fisheries in IPHC Regulatory Areas 2C and 3A for application in 2025. The purpose of the management measures is to achieve the Pacific halibut charter allocation under the NPFMC Halibut Catch Sharing Plan. NPFMC selected these management measures at its December 2024 meeting, following a review of the Alaska Department of Fish and Game (ADF&G) Analysis of Management Options for the Area 2C and 3A Charter Halibut Fisheries for 2025 (ADF&G analysis) and after receiving input from the NPFMC Charter Halibut Management Committee, which is comprised of stakeholder representatives from both IPHC Regulatory Areas 2C and 3A.

The proposed annual management measures for 2025 are as follows:

IPHC Area 2C

Management measures for all allocations shown below include a daily bag limit of one Pacific halibut, and a reverse slot size limit where the upper limit is fixed at O80 (*i.e.*, Pacific halibut 80 inches or over in length may be retained), a restriction of one charter vessel fishing trip per day with retention of Pacific halibut, and one charter vessel fishing trip per charter halibut permit (CHP) per day.

1) If the allocation falls within the range of 0.897 Mlb and 1.013 Mlb:
    - Begin with a lower size limit of U38 (retained halibut must be less than or equal to 38 inches in length) and increase this limit until the allocation is reached, as indicated in **Table 2C.7.2a** (page 44) of the ADF&G analysis.

2) If the allocation is less than 0.897 Mlb but greater than or equal to 0.752 Mlb:

- Begin with a lower size limit of U38 (retained halibut must be less than or equal to 38 inches in length) closing Tuesdays starting September 9 working to May 13 until the allocation is reached, as indicated in **Table 2C.7.2a** (page 44) of the ADF&G analysis.

3) If the allocation is less than 0.752 Mlb but greater than or equal to 0.715 Mlb:
    - Begin with a lower size limit of U37 (retained halibut must be less than or equal to 37 inches in length) closing Tuesdays from Sept 9 to June 24, and closing additional Tuesdays working to May 13 until the allocation is reached, as indicated in **Table 2C.7.2a** (page 44) of the ADF&G analysis.

4) If the allocation is less than 0.715 Mlb but greater than or equal to 0.691 Mlb:
    - Begin with a lower size limit of U36 (retained halibut must be less than or equal to 36 inches in length) closing Tuesdays from Sept 9 to June 24, and closing additional Tuesdays working to May 13 until the allocation is reached, as indicated in **Table 2C.7.2a** (page 44) of the ADF&G analysis.

5) If the allocation is less than 0.691 Mlb but greater than or equal to 0.651 Mlb:
    - Begin with a lower size limit of U35 (retained halibut must be less than or equal to 35 inches in length) closing Tuesdays from Sept 9 to July 8, and closing additional Tuesdays working to May 13 until the allocation is reached, as indicated in **Table 2C.7.2a** (page 44) of the ADF&G analysis.

6) If the allocation is less than 0.651 Mlb but greater than or equal to 0.627 Mlb:
    - Begin with a lower size limit of U34 (retained halibut must be less than or equal to 34 inches in length) closing Tuesdays from Sept 9 to June 24, and closing additional Tuesdays working to May 13 until the allocation is reached, as indicated in **Table 2C.7.2a** (page 44) of the ADF&G analysis.

7) If the allocation is less than 0.627 Mlb but greater than or equal to 0.608 Mlb:
    - Begin with a lower size limit of U33 (retained halibut must be less than or equal to 33 inches in length) closing Tuesdays from Sept 9 to July 1, and closing additional Tuesdays working to June 10 until the allocation is reached, as indicated in **Table 2C.7.2a** (page 44) of the ADF&G analysis.

IPHC Area 3A

Management measures for all allocations shown below include, unless otherwise specified, a daily bag limit of two halibut; one fish of any size and one fish with a maximum size limit of 28 inches (one retained halibut must be less than or equal to 28 inches in length); one charter vessel fishing trip per charter vessel per day with retention of Pacific halibut; one charter vessel fishing trip per charter halibut permit (CHP) per day.

1) If the allocation is less than or equal to 2.079 Mlb, but greater than or equal to 1.762 Mlb:
    - Close Wednesdays as needed to keep charter harvest removals within the Area 3A allocation, as indicated in **Table 3A.13** (page 33) of the ADF&G analysis.

2) If the allocation is less than 1.762 Mlb, but greater than 1.497 Mlb:

  - In addition to closing all Wednesdays, close as many Tuesdays as needed to keep the charter harvest removals within the Area 3A allocation, as indicated in **Table 3A.14** (page 34) of the ADF&G analysis.

3) If the allocation is below 1.497 Mlb, but greater than 1.425 Mlb:
   - In addition to closing all Tuesdays and Wednesdays, lower the maximum size of the second fish to as low as 26 inches (one retained halibut must be as less than or equal to 26 inches in length), until the projected charter harvest removals meet the allocation, as indicated in **Table 3A.16** (page 36) of the ADF&G analysis.

Supporting information

The December 2024 NPFMC final motion for Charter Halibut Management Measures, the minutes of the December 2024 NPFMC Charter Halibut Management Committee, and the ADF&G analysis are available on the NPFMC website at:

- https://meetings.npfmc.org/Meeting/Details/3066 (see Agenda Item C4, 2025 Charter Halibut Management Measures – Final Action).

RECOMMENDATIONS

That the Commission:

1) **NOTE** IPHC Fishery Regulation proposal IPHC-2025-AM101-PropB1, that proposes 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.

APPENDICES

Appendix A: Suggested Regulatory Language.

APPENDIX A

SUGGESTED REGULATORY LANGUAGE

28. Recreational (Sport) Fishing for Pacific Halibut—IPHC Regulatory Areas 2C, 3A, 3B, 4A, 4B, 4C, 4D, 4E

(1) […]

[omit "and" at the end of paragraph (1)(g) and add semicolon followed by "and" (rather than a period) at the end of paragraph (1)(h)]

(i) in IPHC Regulatory Areas 2C and 3A:

(1) a "charter halibut permit" as defined at 50 CFR 300.61 may only be used for one charter vessel fishing trip in which Pacific halibut are caught and retained per calendar day;

(2) a "charter vessel" as defined at 50 CFR 300.61 may only be used for one charter vessel fishing trip in which Pacific halibut are caught and retained per calendar day; and

(3) for purposes of subsections (1) and (2) of this paragraph, a "charter vessel fishing trip" is defined as the time period between: (a) the first time Pacific halibut are caught and retained on a charter vessel by a charter vessel angler (as defined at 50 CFR 300.61); and (b) whichever comes first: 2359 (Alaska local time) on the same calendar day that the charter vessel fishing trip began; when any charter vessel angler is offloaded from the charter vessel; or when Pacific halibut are offloaded from the charter vessel.

(2) For guided recreational (sport) fishing (as referred to in 50 CFR 300.65) in IPHC Regulatory Area 2C:

(a) no person on board a charter vessel (as referred to in 50 CFR 300.65) shall catch and retain more than one Pacific halibut per calendar day; and [omit this "and" if paragraph 2(c) is added to this Section as described below]

(b) no person on board a charter vessel (as referred to in 50 CFR 300.65) shall catch and retain any Pacific halibut that with head on is greater than [x] inches ([x.x cm) and less than 80 inches (203.2 cm) [as described above, the lower size limit may be adjusted to meet the 2025 Area 2C charter harvest allocation] as measured in a straight line, passing over the pectoral fin from the tip of the lower jaw with mouth closed, to the extreme end of the middle of the tail; and [omit this "and" and end this paragraph with a period (rather than a semicolon) if paragraph (2)(c) is not added to this Section as described below]

(c) [as described above, this section may be added according to the progressive management measures described in the NPFMC recommendation] no person on board a charter vessel may catch and retain Pacific halibut on the following Tuesdays in 2025: [a list of dates of 2025 Tuesdays would follow].

(3) For guided recreational (sport) fishing (as referred to in 50 CFR 300.65) in IPHC Regulatory Area 3A:

(a) no person on board a charter vessel (as referred to in 50 CFR 300.65) shall catch and retain more than two Pacific halibut per calendar day; and [omit this "and" if paragraph (2)(c) is added to this Section as described below]

(b) at least one of the retained Pacific halibut must have a head-on length of no more than [x] inches (x.x cm) [as described above, the size limit may be adjusted to meet the 2025 harvest allocation in Area 3A] as measured in a straight line, passing over the pectoral fin from the tip of the lower jaw with mouth closed, to the extreme end of the middle of the tail. If a person sport fishing on a charter vessel in IPHC Regulatory Area 3A retains only one Pacific halibut in a calendar day, that Pacific halibut may be of any length; and [omit this "and" and end this paragraph with a period (rather than a semicolon) if paragraph (2)(c) is not added to this Section as described below]

(c) no person on board a charter vessel may catch and retain Pacific halibut on the following Wednesdays, or on the following Tuesdays, in 2025: [as described above, some Wednesday closures and some Tuesday closures may be necessary to meet the 2025 harvest allocation in Area 3A, a list of dates of Wednesday closures and Tuesday closures to Pacific halibut retention would follow].

IPHC-2025-AM101-PropC1

IPHC Fishery Regulations:

Commercial Fishing Periods (Sect. 9) – year-round commercial Pacific halibut fishery in IPHC Regulatory Area 2B

PREPARED BY: ROBERT HAUKNES (COMMERCIAL FISHER) (09 DECEMBER 2024)

Directed Commercial ☒ Recreational ☐ Subsistence ☐ Non-directed commercial ☐ All ☐

All Regulatory Areas ☐ All Alaska Regulatory Areas ☐ All U.S. Regulatory Areas ☐

2A ☐ 2B ☒ 2C ☐ 3A ☐ 3B ☐ 4A ☐ 4B ☐ 4C ☐ 4D ☐ 4E ☐

PURPOSE

To propose year-round commercial Pacific halibut fishery in IPHC Regulatory Area 2B.

EXPLANATORY MEMORANDUM

This is a proposal to have a year-round commercial halibut fishery in Canadian waters, IPHC Regulatory Area 2B. This proposal would allow the retention and sale of Pacific halibut year-round in Canadian waters.

Date requested: 21 February to 20 February 20 of the following year. These proposed dates coincide with the other groundfish fisheries in Canada.

This proposal was originally submitted on 26 September 2024.

Appendix A provides details on the suggested regulatory language, as provided by the proponent.

RECOMMENDATIONS

That the Commission:

1) **NOTE** regulatory proposal IPHC-2025-AM101-PropC1 that proposes year-round commercial Pacific halibut fishery in IPHC Regulatory Area 2B.

APPENDICES

Appendix A: Suggested regulatory language, as provided by the proponent**.**

APPENDIX A

SUGGESTED REGULATORY LANGUAGE, AS PROVIDED BY THE PROPONENT

9. Commercial Fishing Periods

[…]

(2) Unless the Commission specifies otherwise, commercial fishing for Pacific halibut in all USA IPHC Regulatory Areas may begin no earlier in the year than 06:00 local time on 15 March.

(3) All commercial fishing for Pacific halibut in all USA IPHC Regulatory Areas shall cease for the year at 23:59 local time on 7 December.

(4) Unless the Commission specifies otherwise, commercial fishing for Pacific halibut in IPHC Regulatory Area 2B may be permitted from 20 February 00:01 hours to 20 February 23:59 hours of the following year on an annual basis.

IPHC-2025-AM101-PropC2

IPHC Fishery Regulations:

Application of Commercial Fishery Limits (Sect. 12) – addressing concerns regarding localized depletion around St. Matthew Island

PREPARED BY: SHAWN MCMANUS (COMMERCIAL FISHER) (10 DECEMBER 2024)

Directed Commercial ☒ Recreational ☐ Subsistence ☐ Non-directed commercial ☐ All ☐

All Regulatory Areas ☐ All Alaska Regulatory Areas ☐ All U.S. Regulatory Areas ☐

2A ☐ 2B ☐ 2C ☐ 3A ☐ 3B ☐ 4A ☐ 4B ☐ 4CDE ☒

PURPOSE

To propose closing the one-way door for halibut IFQ/CDQ holders from halibut Area 4C into Area 4D North of 60 degrees North latitude and East of 174 degrees West longitude.

EXPLANATORY MEMORANDUM

Through several years of recent fishing experience as well as supporting IPHC data, I feel that St. Matthew Island waters are facing localized depletion.

Beginning in 2005, the North Pacific Fishery Management Council (NPFMC) made a recommendation to change the IPHC Regulatory Area 4 Catch Sharing Plan and the IFQ/CDQ regulations to incorporate the NPFMC's recommendation that IPHC Regulatory Area 4C Pacific halibut IFQ or CDQ may be harvested in either IPHC Regulatory Area 4C or in IPHC Regulatory Area 4D.

At that time, the NPFMC based its decision(s) on presentations such as "*Area 4D has approximately ten times more fishing grounds at 5,605 square nautical miles than Area 4C at 561 square nautical miles*". However, recent IPHC data (see Appendix A) shows that nearly 70% or one million pounds of all 4CDE landings are occurring each year just off the 28 mile long (138 square mile) island of St. Matthew. Keep in mind that for the most part, only half of the 28-mile-long island supports Pacific halibut abundance.

In 2005, the IPHC noted "*that the ratio of halibut harvest to available fishing grounds would remain much lower in Area 4D than Area 4C. Therefore, the likelihood that the localized depletion problem in Area 4C would simply be transposed to Area 4D would remain low*". Given this quoted assumption, I feel the IPHC is more than culpable in what I feel is the localized depletion of halibut in St. Matthew Island waters. Therefore, I implore the IPHC to take responsibility in this matter by pushing for regulatory change at both the IPHC and NPFMC bodies with feverish haste. A lot of environmental changes have occurred in the 20 years since this assumption. Killer whale depredation has exploded exponentially to the point where the vast majority of fishing on the IPHC Regulatory Area 4D edge is nothing more than a lesson in futility. This proposal will spread some fishing concentration away from the island of St. Matthew thus reducing the amount of localized depletion.

PROPOSED REGULATORY LANGUAGE

This proposal would remove the provision under Section 12 (Application of Commercial Fishery Limits), par. 6:

12. Application of Commercial Fishery Limits

[…]

(6) Notwithstanding the fishery limits described in Section 5, the total allowable catch of Pacific halibut that may be taken in the IPHC Regulatory Area 4D directed commercial fishery is equal to the combined annual fishery limits specified for IPHC Regulatory Areas 4C and 4D. The annual IPHC Regulatory Area 4C fishery limit will decrease by the equivalent amount of Pacific halibut taken in IPHC Regulatory Area 4D in excess of the annual IPHC Regulatory Area 4D fishery limit.

SUPPORTING DATA AND OTHER INFORMATION

Appendix A provides supplementary data provided by the proposal proponent.

Link to Federal Register, Proposed Rule from 5 May 2025:

- https://www.federalregister.gov/documents/2005/05/05/05-9003/pacific-halibut-fisheries-fisheries-of-the-exclusive-economic-zone-off-alaska-individual-fishing

RECOMMENDATIONS

That the Commission:

1) **NOTE** regulatory proposal IPHC-2025-AM101-PropC2 that proposes closing the one-way door for halibut IFQ/CDQ holders from halibut Area 4C into Area 4D North of 60 degrees North latitude and East of 174 degrees West longitude.

APPENDICES

Appendix A: Supplementary data provided by the proposal proponent.

APPENDIX A

SUPPLEMENTARY DATA PROVIDED BY THE PROPOSAL PROPONENT.

Year	4C landings	4C vessels fishing	4D total landings	4D vessels fishing	St Matthew landings	St. Matthew vessels fishing	4E landings	4E vessels fishing	4CDE landings (summed)
2018	492,845	24	824,964	34	597,486	17	95,000	27	1,412,809
2019	482,048	24	1,035,691	39	803,219	20	120,000	31	1,637,739
2020	103,803	7	1,411,823	36	1,194,025	19	93,000	18	1,608,626
2021	197,226	7	1,145,724	29	1,010,631	18	41,000	16	1,383,950
2022	374,754	7	1,176,727	29	1,049,660	19	20,000	7	1,571,481
2023	319,149	10	930,563	32	836,235	19	5,000	4	1,254,712

Year	4C Regulatory limit	4D Regulatory limit	4E Regulatory limit	4CDE Combined limit	% of Total limit landed 4CDE	% of all vessels fishing in 4D fishing at St Matthew	% of all 4D landings occurring at St. Matthew	% of all 4CDE landings occurring at St. Matthew
2018	752,000	752,000	196,000	1,700,000	83%	50%	72%	42%
2019	910,000	910,000	220,000	2,040,000	80%	51%	78%	49%
2020	766,000	766,000	198,000	1,730,000	93%	53%	85%	74%
2021	738,000	738,000	194,000	1,670,000	83%	62%	88%	73%
2022	920,000	920,000	220,000	2,060,000	76%	66%	89%	67%
2023	900,000	900,000	220,000	2,020,000	62%	59%	90%	67%

Source: IPHC. 2024. Table IPHC-2024-TSD-038: Commercial landings from St. Matthew Island and IPHC Regulatory Areas 4C/4D, Accessed [9 December 2024].

Notes:

- See metadata for description of St. Matthew area and other details. All commercial landings and limits in net lbs; 2023 landings preliminary as of January 2024.
- 4D CDQ and IFQ quota can be shifted to 4E CDQ, 4C quota can be shifted to 4D.

IPHC Fishery Regulations:

Mortality and Fishery Limits (Sect. 5) - TCEY in Regulatory Area 2A

PREPARED BY: TIMOTHY GREENE (MAKAH TRIBE) (23 DECEMBER 2024)

Directed Commercial ☐ Recreational ☐ Subsistence ☐ Non-directed commercial ☐ All ☒

All Regulatory Areas ☐ All Alaska Regulatory Areas ☐ All U.S. Regulatory Areas ☐

2A ☒ 2B ☐ 2C ☐ 3A ☐ 3B ☐ 4A ☐ 4B ☐ 4C ☐ 4D ☐ 4E ☐

PURPOSE

To propose a TCEY for IPHC Regulatory Area 2A of 1.65Mlb for 2025.

EXPLANATORY MEMORANDUM

Recalling Rule 8, para 6 of the IPHC Rules of Procedure (2024) that states:

> "*6. New regulatory proposals or amendments to existing regulations (including catch limit proposals) shall be submitted to the Executive Director no less than 30 days before the date fixed for the opening of the Session at which they are to be considered. The Executive Director shall make the proposals available on the public access area of the IPHC website no later than two (2) business day after receipt.*"

From 2019 to 2024, Regulatory Area 2A has received a constant TCEY allocation of 1.65Mlb. This allocation, initially put in place in 2019, has provided a consistent TCEY for Area 2A while posing no conservation concern on the coastwide Pacific halibut biomass, as acknowledged by the Secretariat at each Commission meeting since. The Makah Tribe is submitting this proposal for the 2025 annual IPHC process in support of a continued TCEY of 1.65 Mlb for Area 2A.

Additionally, the Makah Tribe is submitting this proposal to ensure that the IPHC Secretariat speaks to a continued TCEY allocation of 1.65 Mlb for Area 2A, in terms of whether there are any conservation concerns with this proposal for 2025, and the impacts this may have had on the stock from 2019-2024.

SUGGESTED REGULATORY LANGUAGE

Adopt a TCEY for IPHC Regulatory Area 2A in 2025 of 1.65Mlb.

Appendix A provides details on the suggested regulatory language.

RECOMMENDATIONS

That the Commission:

1) **NOTE** regulatory proposal IPHC-2025-AM101-PropC3, that proposes a TCEY for IPHC Regulatory Area 2A of 1.65Mlb for 2025.

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)	748	1.65

IPHC-2025-AM101-PropC4

Other proposal (Non-IPHC Fishery Regulations): Rebuilding Plan for Pacific halibut

PREPARED BY: MICHAEL LAUKITIS (COMMERCIAL FISHER) (27 DECEMBER 2024)

Directed Commercial ☐ Recreational ☐ Subsistence ☐ Non-directed commercial ☐ All ☒

All Regulatory Areas ☒ All Alaska Regulatory Areas ☐ All U.S. Regulatory Areas ☐

2A ☐ 2B ☐ 2C ☐ 3A ☐ 3B ☐ 4A ☐ 4B ☐ 4C ☐ 4D ☐ 4E ☐

PURPOSE

To propose a Rebuilding Plan for Pacific halibut.

EXPLANATORY MEMORANDUM

My proposal for a Pacific Halibut Rebuilding Plan consists of three parts: 1) changes to control rule policies, 2) an alternative risk adverse model, 3) and needed research. As a fisherman I have strong conviction we are fishing on a depleted stock and biomass estimates are far too optimistic for status quo management to result in any recovery. We need more precautionary management. I am a fisherman. I am not a scientist. Don't judge the proposals by my mistakes or errors or misunderstandings. Judge the proposal by my intention to help to further the IPHC's mission to provide long-term optimum yield to the fisheries and to conserve the resource. Hopefully this starts the discussion.

1) Proposal for a Spatially Explicit Control Rule for Pacific Halibut Management with specific minimum biomass levels (Or don't chase the stock down proposal)

Title:

A Spatially Differentiated Control Rule for Rebuilding Pacific Halibut Across Its Northern Pacific Range

Rationale:

The Pacific halibut (*Hippoglossus stenolepis*) spans a vast geographic range from Oregon to northern Alaska and extends to Russian waters along the Aleutian chain. This wide distribution presents unique management challenges:

- **Disproportionate Spawning Biomass Loss**: Different regions might experience disproportionate declines in spawning biomass due to localized fishing pressures, environmental changes, or biological factors. A control rule that treats the entire range uniformly could fail to address these disparities, potentially leading to localized depletion or collapse.
- **Migration and Connectivity**: Pacific halibut are known to migrate across regulatory areas, meaning that fishing in one area can impact stock in others. An area-specific decline could affect recruitment and spawning in adjacent regions due to the interconnected nature of Pacific halibut populations.

- **Variable Productivity**: Productivity can vary significantly by area due to different environmental conditions, leading to different recovery rates and resilience across the range.

Proposed Control Rule:

1. **Spatial Subdivision:**

- Management by Regulatory Areas: Utilize the existing International Pacific Halibut Commission (IPHC) regulatory areas (e.g. Area 2, Area 3, Area 4) as management units. This approach acknowledges that different areas might require different management strategies based on local conditions.

2. **Biomass Thresholds and Dynamic Adjustments:**

- Area-Specific Biomass Thresholds: Establish specific biomass thresholds for each regulatory area based on historical data and current assessments. When the biomass in any area falls below this threshold:

- Immediate Reduction in Fishing Mortality: Implement a substantial reduction in fishing mortality, potentially up to 30-50% or more, depending on the severity of the decline. This could mean shorter seasons, lower catch limits, or increased minimum sizes.

- Adaptive Management: Use a 5-year review cycle to assess the effectiveness of these measures. If an area isn't showing signs of recovery, further reductions or area closures might be necessary. Conversely, if recovery is evident, fishing mortality could be cautiously increased.

3. **Inter-Regional Considerations:**

- Migration and Recruitment: Recognize that halibut from one area can contribute to the spawning stock in another. Therefore, if one area is overfished, adjacent areas might also need to reduce fishing to support broader stock recovery.

- Cross-Regional Quotas: If one area is nearing collapse, it might be prudent to redistribute quotas from areas with healthier stocks to support recovery, although this must be balanced with local economic impacts.

4. **Long-Term Rebuilding Strategy:**

- Rehabilitation Zones: Designate certain areas as "rehabilitation zones" where fishing is severely restricted or prohibited if spawning biomass is critically low, aiming to rebuild these areas as sources of recruitment.

- Scientific Monitoring: Increase monitoring efforts in areas with low biomass to gather more precise data on stock recovery, including juvenile survival, migration patterns, and local environmental impacts.

5. **Community and Economic Considerations:**

- **Stakeholder Engagement**: Regular consultations with local communities, fishers, and other stakeholders to discuss the implications of management changes, ensuring buy-in and addressing economic impacts.

- Economic Support: Implement support mechanisms for communities heavily dependent on halibut fishing during periods of reduced fishing activity, like retraining or alternative income sources.

Implementation:

- Legislation and Policy: Work with the IPHC, national fisheries management agencies (like NMFS for U.S. waters and DFO in Canada), and international bodies to enact these rules through regulation.

- Education and Compliance: Conduct outreach to ensure fishers understand the new rules and their rationale, emphasizing the long-term benefits of stock recovery.

- Adaptive Learning: Continuously refine the control rule based on new scientific data, ensuring it remains responsive to the dynamic nature of the Pacific halibut population.

Conclusion:

This control rule aims to balance the ecological needs of Pacific halibut with the socio-economic realities of the fishing communities across its vast range. By managing halibut in distinct areas, we can tailor our response to the specific conditions of each region, promoting a more robust and sustainable recovery of the stock while acknowledging the complex migratory behaviors and varying productivity of this species.

2. **Proposal for an Enhanced Spatially Explicit Control Rule for Pacific Halibut Management: Addressing Additional Factors**

Title:

Refined Spatially Explicit Control Rule for Sustainable Management of Pacific Halibut.

Narrative:

The current control rules for managing Pacific halibut by the International Pacific Halibut Commission (IPHC) rely on fixed percentages of spawning biomass to adjust fishing mortality. However, these rules have limitations that can compromise the sustainability of the fishery. This proposal seeks to refine these control rules by incorporating spatial considerations, addressing the shortcomings of fixed percentages, and providing a more dynamic and responsive management approach.

Additional Factors to Address:

1. Fixed Percentage vs. Absolute Biomass:

- Issue: Using a fixed percentage (e.g. 20% or 30% of spawning biomass) doesn't account for the absolute numbers needed for a viable population. This can lead to overly optimistic management if the baseline biomass is overestimated or if there's significant inter-annual variability in stock assessments.

- **Rationale**: An absolute biomass threshold ensures that there's a minimum viable population regardless of historical highs or lows. For instance, setting a minimum absolute biomass floor could prevent fishing from continuing at levels that might not support population recovery.

2. Unspecified Reduction at 30% Biomass:

- Issue: The current control rule at 30% does not specify the extent or duration of fishing reductions, leading to potential inconsistency in management responses. Making up prescriptive policies as you go does not lead to sound decision making.

- Rationale: Clearly defining the reduction (e.g. a 30-50% cut in ALL fishing mortality) and its duration (e.g., at least 5 years or until biomass recovery is observed) provides consistency and clarity. This would help in calculating the biological and economic impacts more accurately and aid in long-term planning.

3. Retrospective Triggering of Control Rules:

- Issue: In scenarios like the 2011 biomass reassessment where the stock was retrospectively found to be below thresholds, there's no clear protocol for immediate management response.

- Rationale: Introducing a retrospective adjustment mechanism is crucial. When a significant revision in biomass estimates occurs, the following should be enacted:

- Immediate Review: Conduct an emergency review to assess the new data's implications.

- Retroactive Management: If the stock was below critical thresholds, apply the control rule's reduction measures retroactively for the current season or implement them for the next season with adjustments like emergency closures or quota reductions.

4. Handling Large Biomass Revisions:

- Issue: The IPHC has experienced significant year-to-year changes in biomass estimates (2015), which can lead to abrupt changes in management measures, causing confusion and economic disruption.

- Rationale:

- Smoothing Over Time: Use a multi-year average for biomass estimates to smooth out annual fluctuations, providing a more stable basis for management decisions.

- Uncertainty Buffers: Incorporate buffers into the biomass estimates to account for assessment uncertainty. If there's a large revision, management actions might be phased in over several years to allow for adjustment by stakeholders.

Conclusion:

By addressing these additional factors, the IPHC can foster a more resilient and sustainable Pacific halibut fishery. This proposal moves away from overly simplistic percentage-based thresholds towards a nuanced, spatially aware, and temporally adaptive management strategy that better reflects the biology and ecology of this valuable species.

Weakness of this proposal: Incentives equal outcomes. If there are enough incentives to not hit the B30 control rule, then it is easy to see how the stock assessment will always remain above that value.

RECOMMENDATIONS

That the Commission:

1) **NOTE** regulatory proposal IPHC-2025-AM101-PropC4, which proposes a Rebuilding Plan for Pacific halibut.

APPENDICES

IPHC Secretariat comment: Not applicable.

Specific regulatory language has not been developed for this proposal as none currently exists to amend.

Adoption would require MSAB and SRB input throughout 2025 as part of the Harvest Strategy Policy finalisation.

IPHC Fishery Regulations: Mortality and Fishery Limits (Sect. 5) – definition of reaction to overfishing

PREPARED BY: MALCOLM MILNE (NORTH PACIFIC FISHERIES ASSOCIATION) (28 DECEMBER 2024)

Directed Commercial ☐ Recreational ☐ Subsistence ☐ Non-directed commercial ☐ All ☒

All Regulatory Areas ☒ All Alaska Regulatory Areas ☐ All U.S. Regulatory Areas ☐

2A ☐ 2B ☐ 2C ☐ 3A ☐ 3B ☐ 4A ☐ 4B ☐ 4C ☐ 4D ☐ 4E ☐

PURPOSE

To propose a reaction to the Pacific halibut stock overfishing.

EXPLANATORY MEMORANDUM

The North Pacific Fisheries Association has grave concerns that the current trigger points of SB20 and SB30 are a percentage of Unfished Biomass estimates that are re-estimated annually, do not represent estimates of long-term potential yield, and can be expected to respond very slowly, if at all, to continued stock declines.

We are proposing that the IPHC establish a measurable objective related to absolute spawning biomass as an additional trigger to invoke a rebuilding strategy.

"*Mortality from all sources decreased by 5% to an estimated 32.7 million pounds (~14,800 t) in 2024, the lowest value in 100 years, based on preliminary information available for this assessment.*" (Page 3,4 IPHC-2025-AM101-11).

We are building on the following Scientific Review Board recommendation:

SRB025–Rec.08 (para. 31) The SRB **RECOMMENDED** adding a measurable objective related to absolute spawning biomass under the general objective 2.1 “maintain spawning biomass at or above a level that optimises fishing activities” to be included in the priority Commission objectives after, or in place of, the current relative biomass threshold objective.

Para. 32: **NOTING** that the definitions of “overfished” and “overfishing” are consistent with the use of these terms in the USA federal fishery management systems under the Magnuson-Stevens Act, but differ from the terms and definitions elsewhere, the SRB **REQUESTED** a broader investigating of terms and definitions related to B and F reference points used by fishery managements organisations throughout the world.

Appendix A provides details on the suggested regulatory language.

RECOMMENDATIONS

That the Commission:

1) **NOTE** regulatory proposal IPHC-2025-AM101-PropC5, which proposes a reaction to the Pacific halibut stock overfishing.

APPENDICES

Appendix A: Suggested regulatory language.

APPENDIX A
SUGGESTED REGULATORY LANGUAGE

3. Definitions

(1) In these Regulations,

[…]

(w) "overfished" means the probability that the female spawning biomass is below the limit reference point (SB_{LIM}) is greater than 50%. SB_{LIM} is the lowest absolute SB the stock is known to have recovered from or 20% of the unfished female spawning biomass (SB20%);

(x) "overfishing" means the probability that the stock will move into an "overfished" state within 3 years is greater than 50%.

5. Mortality and Fishery Limits

[…]

(3) If the stock is in a state of "overfishing", the mortality and fishery limits defined in this Section, paragraph (1) and (2), would be reduced to achieve a 'not overfished' state within 5 years.

Stakeholder comments on IPHC Fishery Regulations or published regulatory proposals

PREPARED BY: IPHC SECRETARIAT (B. HUTNICZAK; 13, 27 DECEMBER 2024 & 26 JANUARY 2025)

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 101st Session of the IPHC Annual Meeting (AM101).

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 13 December 2024.

Appendix No.	Title and author	Date received
Appendix I	James Kearns, Halibut Forever	24 October 2024
Appendix II	Buck Laukitis, commercial fisher	27 December 2024
Appendix III	Eric Wickham, retired commercial fisher	28 December 2024
Appendix IV	Buck Laukitis, commercial fisher	23 January 2025
Appendix V	Malcolm Milne, president, North Pacific Fisheries Association	24 January 2025

RECOMMENDATION

That the Commission:

1) **NOTE** paper IPHC-2025-AM101-INF01 Rev_2 that provides the Commission with a consolidated list of comments from stakeholders on IPHC Fishery Regulations or published regulatory proposals submitted to the Commission for its consideration at the 101st Session of the IPHC Annual Meeting (AM101).

APPENDICES

As listed in Table 1.

APPENDIX I

Statement by James Kearns (Halibut Forever)

Section of IPHC Fishery Regulations or regulatory proposal reference the comment will refer to	Section 28: Recreational (Sport) Fishing for Pacific Halibut—IPHC Regulatory Areas 2C, 3A, 3B, 4A, 4B, 4C, 4D, 4E
Submitted comment	There are three kinds of halibut fishermen: 1 commercial, 2 recreational, 3 subsistence. Commercial fishermen do it to make a living by selling their catch. Recreational fishermen do it for fun, for entertainment, and to enjoy some of the bounty of the sea. Subsistence fishermen do it to feed their families Because of the different reasons that these 3 groups fish for halibut, I encourage this body to set three different allocations for the halibut resource, one for each group. A commercial allocation (currently the only one); a recreational allocation that includes all recreational fishermen (both guided and unguided recreational halibut anglers); and a subsistence allocation that provides for those who depend on halibut to feed their families. I propose that you determine the percentage of the annual TCEY that should be allocated to each of those three groups and manage the halibut fishery within those allocations. Further I propose that the recreational only allocation be set at the average of the last 24 years combined guided/unguided halibut removals for each area. Then manage the recreational fishery for each area within that allocation with a 1 fish of any size daily bag limit (to help reduce handling mortality), an annual limit, and a requirement that any recreational halibut kept that is 60 inches or greater in length be counted as two fish on the fishermen's annual limit. Additionally, provide that the RQE stamp be required for every recreational halibut fisherman and that it be used as a monitoring mechanism with a requirement to fill in the size, gender, and location of every halibut kept. That means that the RQE stamp fee would be based annually on the annual limit. And since it will most likely be a $20 per day flat fee-it would be one stamp per fish and the stamp would have to be turned in when used or by Dec 1 of each year. This proposal will give an accurate accounting of annual recreational halibut removals. It will give size, gender, and location data for halibut abundance studies. It will treat all recreational halibut fishermen equally and fairly-the old idea of "same license same rules" unless there is a resident/nonresident application. It will support the RQE concept of no uncompensated re-allocation of the resource. It will not promote killing the larger fecund halibut.

It will simplify enforcement.

And it will totally solve the concerns of the expanding removals for the rental unguided recreational halibut fishery.

And finally, while it is true that resident Alaskan unguided halibut fishermen will have to also abide an annual limit, it is imperative that all recreational halibut fishermen participate in helping maintain the resource. I am an Alaskan resident and I eat a lot of halibut, but I can certainly get enough halibut to enjoy eating within an annual limit. And if an Alaskan resident lives in a rural area or is an indigenous Alaskan who relies on wild meat resources to provide for their family, they would be eligible for a subsistence permit and be able to harvest under the subsistence allocation.

Now there may be some who are still concerned about the charter boat operators who make a living by taking recreational halibut fishermen out to the fishing areas. The whole guided vs unguided issue came about trying to control the increasing fleet of such operators and the resulting increase of recreational halibut removals. Because of the commercial nature of the business (taking money in trade for services), those operators were put into a catch sharing plan with commercial fishermen. Most of you know that I have always felt like that was inappropriate because the charter boat operators were not paid by the pound of fish taken, but rather by the number of persons who paid for their Coast Guard licensed expertise to safely pilot a charter vessel. Definitely not commercial fishing.

But that has already been managed by limiting the entry into that occupation, the CHP program.

I propose that the IPHC recommend to the NPFMC that Alaska halibut fishermen be given an allocation that is not a CSP (Catch Sharing Program) with the commercial sector. I further propose that you recommend that all recreational halibut anglers who fish in Alaska participate in maintaining a healthy halibut stock by establishing a daily bag limit of just 1 halibut of any size with an annual limit that will keep the recreational removals within their allocation. Additionally, that any halibut retained that is 60 inches or more in length be counted as 2 fish on the angler's annual limit.

APPENDIX II

Statement by Buck Laukitis (commercial fisher)

Section of IPHC Fishery Regulations or regulatory proposal reference the comment will refer to	NA

Submitted comment

Proposal for Implementing a Risk-Averse Model for Pacific Halibut Stock Assessment

Title: Enhancing Pacific Halibut Management with a Risk-Averse Stock Assessment Model

Introduction:

The International Pacific Halibut Commission (IPHC) currently employs an ensemble model for assessing the stock of Pacific halibut across its extensive range. While this approach has served to integrate various sources of uncertainty, there are concerns that current risk assessments might underestimate conservation challenges. This proposal suggests the development and implementation of a supplementary, risk-averse model to coexist with the existing assessment framework, offering a more precautionary perspective to guide management decisions.

Rationale for Risk-Averse Modeling:

- Conservation Over Economic Yield: With the Pacific halibut facing pressures from climate change, habitat alteration, and potentially underestimated natural threats, a risk-averse model focuses on long-term sustainability rather than short-term economic gains.
- Public Trust and Transparency: Providing an alternative, more conservative model can enhance public trust by demonstrating a commitment to precautionary management. It also offers decision-makers a spectrum of scenarios to consider, fostering more informed decision-making.

Proposed Risk Factors and Their Implications:

1. High Harvest Rate:

- Current Issue: The use of a 20% harvest rate might be too aggressive for a long-lived species like halibut, especially considering that over 80% of the commercial catch has been female for over a decade.

- Risk: This could lead to a decline in spawning biomass, as the removal of a large number of mature females might disrupt reproductive success.

- Proposal: Incorporate a model scenario where the harvest rate is reduced to 10% or less, examining the impacts on stock recovery and population structure.

2. Underestimated Natural Mortality:

- Current Issue: The natural mortality rate used in assessments might not account for significant but unmeasured factors like:

- Whale Depredation: Killer whales and other predators might be taking a larger share of halibut than currently estimated.

- Bycatch: Unreported or underestimated bycatch in other fisheries could be higher, especially in non-target fisheries like trawling.

- Habitat Loss: Fishing activities might degrade habitat, reducing juvenile survival rates and overall productivity.

- Risk: Overlooking these can lead to an overestimation of stock resilience and productivity.

- Proposal: Increase the natural mortality rate in model scenarios to reflect these potential increases, perhaps by 20-30%, to simulate these additional pressures and assess their impact on stock forecasts.

3. Poorly Understood Factors:

- Current Issue: There are likely many factors affecting halibut populations that are not well understood or quantified, such as: changes in oceanographic conditions, fecundity, maturation schedule, Russian fishery impacts, etc.

- Risk: Without accounting for these, the stock assessment might be overly optimistic about recovery and sustainability.

- Proposal: Establish a comprehensive research program focusing on:

    - Environmental impacts on halibut life stages.

    - Disease prevalence and impact.

    - Interactions with other marine species and ecosystems.

4. Recruitment and growth rates. The slow growth of halibut (compared to previous epochs) is pretty well understood, but perhaps the risks of slow growth, a minimum size limit and having a predominantly female commercial fishery vs. a predominantly u26 bycatch fishery are not well understood.

- more precaution is needed because of the lag time between spawning and maturity

5.In addition: this approach may require modeling of broad separate geographic management areas

    -separate risk adverse models for area 2, area 3 and, area 4.

Differentiation from Current IPHC Risk Assessment:

- Scope of Risk: While the IPHC's risk table considers various management scenarios and their probabilities of leading to overfishing or stock decline, this proposal expands the scope by incorporating risks that are currently less emphasized or quantified, such as those related to sex-specific harvest and natural mortality.

- Precautionary Principle: This model would be explicitly designed to prioritize conservation outcomes, potentially recommending lower catch limits or more restrictive management measures than the current ensemble model.

- This risk adverse model could be used by the public and decision makers and applied to the risk tables to show alternative probabilities of stock decline or growth.

Implementation:

- Parallel Use: Continue using the current ensemble model but introduce the risk-averse model as a parallel assessment tool during annual reviews and management meetings.

- Education and Communication: Clearly communicate to stakeholders how this model complements rather than replaces the current model, emphasizing its role in precautionary management.

- Research Investment: Allocate funds for the research program to better understand and quantify the proposed risk factors, ensuring that the model's assumptions are as robust as possible.

Conclusion:

By adopting a risk-averse model alongside the existing ensemble approach, the IPHC can provide a broader spectrum of management options that prioritize the long-term health of the Pacific halibut stock. This proposal does not seek to discount the current model but rather to enhance the management framework with a more conservative lens, ensuring sustainable fishing practices in the face of uncertainty and environmental change.

Research Proposal: Assessing the Impact of Fishing Intensity on Pacific Halibut Spawning Success in the Bering Sea

Title:

Evaluating the Effects of Year-Round Fishing on Spawning Success of Pacific Halibut in the Bering Sea

Background:

The Pacific halibut (*Hippoglossus stenolepis*) in the Bering Sea is subject to fishing pressure from various fleets under a predominantly rationalized, cooperative, year-round fishing regime. This continuous fishing intensity might disrupt the natural spawning behavior and success of halibut, potentially preventing them from schooling up in sufficient numbers to spawn effectively.

Hypothesis:

The constant fishing activity throughout the year, particularly in spawning months, does not allow Pacific halibut in the Bering Sea to aggregate in sufficient numbers for successful reproduction.

Objectives:

1. Historical Analysis of IPHC Longline Fleet Activity:

- Examine changes in the length of the fishing season over time, focusing on the intensity of fishing during the spawning months (March, November, December).

- Map and analyze where and how much harvest occurs across all months, U26 and O32.

2. Impact of NMFS Fleets on Pacific halibut:

- Assess fishing intensity by other National Marine Fisheries Service (NMFS) fleets (trawl, longline, pot) during the spawning season using observer data and other sources. U26 and O32.

- Evaluate encounter rates, assigned mortality rates, and identify areas with high CPUE (catch per unit effort) for halibut bycatch - all 12 months, U26 and O32.

3. Whale Interactions and Bycatch Mortality:

- Investigate the interaction rates between halibut and whales, especially during the spawning season, using data from both the directed halibut fleet and other NMFS fleets.

- Special emphasis should be on comparing assigned observer mortality rates at the time of release from the vessel when killer whales are in the proximity. Are viable halibut eaten by whales before they get to the bottom? Are estimated mortality values correct?

- Conduct a mark-recapture tagging study to reassess halibut bycatch mortality rates, with a focus on the catcher-processor vessels and the A80 trawl fleet's deck sorting practices.

Methods:

- Data Collection:
    - Historical Data: Compile data from IPHC on fishing seasons, areas, and harvest amounts from 1990 to present, with emphasis on spawning months.
    - Observer Data: Use NMFS observer programs data to analyze halibut bycatch in other fisheries, focusing on mortality rates, encounter rates, and CPUE.
    - Tagging Study: Implement a mark-recapture study where halibut are tagged during bycatch events, with special attention to those sorted on the deck of A80 trawlers. Monitor tag returns to estimate true survival rates post-capture.
- Analysis:
    - Spatial and Temporal Analysis: Map and analyze the spatial distribution and temporal patterns of fishing activities, correlating these with spawning grounds.
    - Bycatch and Interaction Analysis: Use statistical models to assess the relationship between fishing intensity, whale interactions, and halibut mortality.
    - Survival Rate Revision: Use mark-recapture data to revise existing estimates of halibut mortality from bycatch, considering deck sorting practices.

Expected Outcomes:

- Understanding of how extended fishing seasons impact halibut spawning aggregations.

- Quantification of the effects of bycatch and whale predation on halibut during critical spawning periods.

- Recommendations for fishery management adjustments, potentially including changes to season lengths or area restrictions to protect spawning.

Significance:

This research will provide critical insights into whether current management practices are sustainable for Pacific halibut in the Bering Sea, potentially guiding policy changes to enhance spawning success and stock recovery. It will also contribute to the broader understanding of how cooperative, rationalized fisheries can affect long-lived species.

Budget and Timeline:

- Budget: Estimated at $xxxx, covering data acquisition, tagging, analysis, and personnel.

- Timeline: 2 years - Year 1 for data collection and initial tagging; Year 2 for data analysis, fieldwork continuation, and report compilation.

Deliverables:

- A comprehensive report detailing findings and policy recommendations.

- Scientific publications on the impact of fishing regimes on halibut spawning success.

- Data sets and models that can be used for future research or management decisions.

Footnote: Please stop all cost recovery/ fund raising research projects.

APPENDIX III

Statement by Eric Wickham (retired commercial fisher)

Section of IPHC Fishery Regulations or regulatory proposal reference the comment will refer to

NA

Submitted comment

Reflections on a Persistent Challenge: A Study on the Impact of Draggers on Halibut Grounds

I am a retired halibut fisherman from British Columbia, though my early years of fishing—about 40 years ago—were spent in Alaska.

I retired early and sold my Pacific halibut quota out of frustration with the lack of political will, both in the USA and Canada, to address the issue of draggers operating on halibut grounds. Unfortunately, this problem persists, and there seems to be little resolve among fishermen to apply meaningful pressure to tackle it.

From what I understand, there are now only a few remaining locations in British Columbia where halibut can be commercially fished at sustainable levels. Yet, draggers continue to operate in these areas, causing significant damage to the ecosystem—and seemingly, no one is taking action to address it.

I recognize that different terms are used to describe these bottom-trawling vessels that devastate marine habitats, but the issue remains critical regardless of terminology. As someone who has long respected the Commission, I am left wondering why the Commission has yet to address this long-standing and pressing challenge

APPENDIX IV

Statement by Buck Laukitis (commercial fisher)

Section of IPHC Fishery Regulations or regulatory proposal reference the comment will refer to	IPHC-2025-AM101-PropC4 IPHC-2025-AM101-PropC5

Submitted comment

A Spatially Differentiated Control Rule for Rebuilding Pacific Halibut Across its Northern Pacific Region

Considering that the stock status is at one of its lowest levels in the history of the fishery, the logical first step in stock conservation would be to adopt an absolute lower limit on coastwide spawning stock biomass, below which all directed fishery removals would cease. (See comments to proposal C5 by NPFA IPHC-2025-AM101-PropC5) Using unfished biomass as the primary indicator of the health of the stock, while allowing that metric to be estimated over very short periods of time (annually) allows the stock to be fished down without any changes in target exploitation rates, as long as the models estimate that incoming recruitment has been low. In other words, as long as the models conclude that the primary reason for current poor stock status is the environment ("we're just going through a period of low productivity"), then this policy places no burden on fisheries to reduce their impacts.

First, this seems somewhat inconsistent with the basic philosophy of fishery management, which is typically designed to respond most strongly when stock status is poor. Second, it also rests on what may be a flawed assumption: that declining recruitment has little or nothing to do with declining stock status. Specifically, the assumption behind this policy is that there is no stock-recruitment relationship at any as-yet observed stock size and there will not be at the level to which the stock will be reduced (or held) at current harvest rates. For Pacific halibut, this has been suggested as a hypothesis. But, it would be an exaggeration to suggest that this is a known reality, especially at historically low spawning stock abundances. And, if this hypothesis is wrong, then continuing to fish the stock even lower could result in reduced recruitment potential from which the stock may not be able to easily recover.

The danger of damaging the stock's recruitment potential only increases when all sources of pre-recruit mortality are not known or cannot be accurately estimated in the models: that is, when the models have difficulty properly gaging early-age abundance and therefore have increased potential to errantly assume environmental causes as the reason for low recruitment at first fishable (or, surveyable) ages.

For Pacific halibut, true abundance on nursery grounds is simply unknown, causes of early natural mortality are not well understood, and juvenile mortality from bycatch fisheries is not easy to quantify. The latter has likely become more difficult with the adoption of expedited release in trawl fisheries (Deck sorting… see research needs), reducing the amount and quality of data on fish condition prior to release, and therefore associated discard mortality rates.

Again: the logical solution for preventing the spawning stock from being fished to critical levels – and for buffering assessment recommendations and underlying harvest policy against uncertainty about pre-recruit mortality – would be to adopt an absolute-abundance "floor" on spawning stock biomass.

This would be consistent with the SRB's recommendation. Below this floor, all targeted fishing should cease. At some level above that floor, fishing at "full" exploitation rates could resume. The IPHC once used such an approach. The model for doing this was developed by Bill Clark and Steven Hare, and could easily be adapted for current use: 1) use the current assessment ensemble to estimate the lowest coastwide spawning stock that has been observed during the history of the fishery; 2) close the fishery if and when the stock reaches that level in the future; 3) allow fishing to resume at full target exploitation rate at 1.5 times that level (or some other reasonable multiple of the minimum, as MSE exercises might suggest); 4) apply a sloping harvest control rule between those two points.

No allocation procedures should allow for removals that are forgone in one region (for example, as a result of reduced fishing pressure) to be reallocated to another region. In other words, the "zero sum game" should be prohibited. Moving removals from one area to another – on paper, after stock distribution has been determined via the assessment models – is not consistent with actual movement of fish among areas and should be expected to result in harvest rates in excess of target in the areas to which quota is "moved", potentially leading to local depletion. The intent of the proposed measure is to relieve the spawning stock from excessive directed fishing pressure, not simply move that pressure from one region to another.

Additionally, it would be helpful to take a closer look at stock demographics – perhaps by Regulatory Area or Bioregion – to look for additional signs of reduced stock health beyond simply biomass. For example, has there been an erosion of age structure or sex ratio in any region over the last decade or so? Reduced age structure can be a sign of having harvested at levels that are higher than optimal. Similarly, skewed sex ratios represent unnatural conditions in most stocks and tracking the amount of skew as cohorts progress can provide a logical check on the effects of harvest rates and the degree to which they may be mis-specified. Perhaps these analyses have already been conducted and their results simply need to be shared with the fleet? Simple plots of these types of information used to be part of stock assessment presentations (they were routinely presented by Bill Clark and Steven Hare) but seem largely absent in recent history.

Once a lower limit on spawning stock biomass has been established, then take a harder look at spatial stock structure and how best to account for that. Halibut are known to occupy distinct spawning grounds along the shelf edge – generally in submarine canyons – and larvae settle into and are reared in specific nursery grounds that are located in shallow water along the coast. The pelagic larval phase connects spawning grounds to specific nurseries, which can only be populated by the limited number of spawning grounds that are "within reach of them" with respect to coastal currents. Because of this, not all spawning stock is equal in terms of its contribution to recruitment. And the loss of any spawning ground might result in the loss of an unknown number of nursery grounds. Throughout the history of the IPHC, a basic objective of the harvest policy has been to maintain spawning stock distribution over time, and one of the best reasons to pursue that objective is to make sure that recruitment potential – defined as nursery output – is maintained throughout the entire range of the stock. Calculating spawning stock biomass metrics based on a single, coastwide value cannot ultimately achieve this objective and should be reviewed and modified as soon as possible; after a coastwide minimum spawning stock biomass limit has been adopted.

Action:

The proposer requests that the Commission direct staff to develop spatial control rules by bioregion as well as an absolute overall minimum spawning biomass amount as NPFA proposes.

As a stakeholder we do not want to see SSB fall any further. We are willing to sacrifice the economics of the fishery to protect future spawning potential. We request the Commission adopt this as a policy:

“Maintain the coastwide female absolute spawning biomass above the level estimated for 2023.”

“The MSAB noted that a new objective to maintain the coastwide TCEY above a threshold may also be useful” (IPHC-2024-MSAB020-R, para 16) A new objective related to fishery performance could be phrased as:

Maintain the coastwide female absolute spawning biomass (or FISS WPUE) above the level estimated for 2023.”

https://www.iphc.int/uploads/2024/12/IPHC-2025-AM101-12-MSE-and-HSP.pdf

APPENDIX V

Statement by Malcolm Milne (President, North Pacific Fisheries Association)

Section of IPHC Fishery Regulations or regulatory proposal reference the comment will refer to	IPHC-2025-AM101-PropC5

Established 1955

North Pacific Fisheries Association, NPFA
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January 23, 2025

International Pacific Halibut Commissioners and Subsidiary Bodies,

The North Pacific Fisheries Association (NPFA) is a commercial fishing industry group based in Homer, Alaska. NPFA is comprised of around 70 members who fish multiple gear types for a variety of species throughout Alaska, many of whom are directed halibut fishermen. NPFA has a long history of participation on the IPHC Conference and at least two former Commissioners, Drew Scalzi and Don Lane, were members of our association.

NPFA introduced regulatory proposal C5 in response to our serious concerns with the state of the pacific halibut fishery.

IPHC-2025-AM101-11 Page 15

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 2023-24. This shift from older to younger (and smaller fish) has contributed to observed reduced catch rates. The current spawning stock is heavily reliant on the 2012 and now 2016 year-classes. 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.

The anecdotal information from NPFA fishermen corroborates these concerns. Where a bad set used to be measured by a few hundred pounds it's now a few fish. IPHC-2025-AM101-08 Rev_1 Table 2 shows that Directed commercial fishery landings were only 82.6% compared to 95% in 2019 (iphc-2020-am096-05 Table 2). Red flags abound.

At these low levels and uncertain times we urge the IPHC to be precautionary and adopt an absolute spawning biomass threshold to protect the Pacific halibut stock from unknown consequences.

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On the dangers of using "Dynamic B_0"as an SSB reference value, with no lower biomass bound:

The IPHC employs harvest control rules in which pre-established harvest rates are applied regionally if female spawning stock biomass (SSB) is above a specified reference level (i.e., "threshold"), then decline to zero as SSB approaches a critical minimum value (i.e., the "limit") below which fishery closure would occur. The rule is sound in principle. However, its real-time application is dependent upon the definition of an appropriate SSB reference level, the nature of which has changed over the last ~20 years. At one point threshold and limit levels were established as empirical values that referenced the lowest historically observed SSB, based on the logic that (Clark and Hare 2006): "*We can have some confidence … of stock dynamics at those spawning biomass levels, but not at lower levels. There is no compelling reason to allow spawning biomass to drop below the minimum limit. … If a stock has been monitored long enough to observe a descent to, and recovery from, a low point then that low point may be a "safe' minimum limit.*"

The minimum historical SSB level and yearly estimates were calculated solely within IPHC Regulatory Areas 2B+2C+3A (i.e., the "Core Areas"; Clark and Hare 2006). The limit (fishery closure) based on minimum observed Core Area SSB was estimated to be 64 million pounds of mature females (Clark and Hare 2006) and the threshold (i.e., resulting in reduced harvest rates) was set at 1.5 times the minimum observed SSB. From what we can tell, with the development of a coastwide stock assessment, the SSB reference level was broadened to be an estimate of coastwide "Unfished Biomass" (B_0): i.e., the estimated coastwide biomass of mature females that would theoretically occur in the absence of fishing mortality. Initially, this was calculated as a long-term average (Hare and Clark 2008), thereby representing an SSB equivalent of using Maximum Sustainable Yield (MSY) to estimate long-term stock productivity. The change to coastwide B_0 would theoretically achieve the same management result as the use of Core Area SSB; but, allow for the entire distribution of SSB in IPHC Convention Waters to be considered and conserved. In 2007, coastwide B_0 of mature females was estimated to be ~750 million pounds, with a "30-20" rule applied to derive the threshold and limit values (Hare and Clark 2008). That is, the threshold was defined as 30% of coastwide long-term B_0 (i.e., ~225M pounds) and the limit set at 20% of B_0 (i.e., ~150M pounds). By 2018, Management Strategy Evaluation included calculation of B_0 as a "dynamic" value that was annually recomputed, as opposed to simply representing a long term "static" average (Hicks and Stewart 2018). Since 2019 the reference points have "*been based on recent biological conditions rather than a long-term static average*" (Stewart and Hicks 2022). In theory, the use of static B_0 should work well in stocks that demonstrate at least some degree of stock-recruitment relationship, because reductions in fishing effort should then be expected to result in increases in spawning biomass that will translate into increased recruitment and stock productivity. Alternatively, in stocks whose recruitment levels and productivity are driven exclusively by environmental conditions, and in cases where changes in the ecosystem alter average productivity to such a degree that long-term averages (of both yield and SSB) do not reflect current conditions, static B_0 may not reflect the stock's current functioning. Using dynamic B_0 reference points in cases where stock status is governed by environmental drivers may improve management responses to changing biomass (Bessel-Browne et al 2022). However, "*where environmental drivers are not responsible for stock decline, the stock may be overfished to collapse as the limit reference point is allowed to decrease to low levels*" (Bessel-Browne et al. 2022). Prior analyses (Clark and Hare 2002) have suggested that recruitment variability in Pacific halibut may be governed by prevailing environmental conditions, such that dynamic B_0 may represent a logical choice for this species across at least some range of absolute abundances.

However, the use of dynamic reference points while a stock is trending downward, or using assessment models whose recruitment estimates rely on abundance data that are collected at ages that are older than the those at which the species is first subjected to fisheries-induced mortality (including non-directed fishing mortality), may fail to respond to fisheries-induced stock declines by continually downgrading the expectation of stock health: that is, by ratcheting B_0 downward every year, along with its associated threshold and limit values, and therefore assuming that further reductions in biomass would be inconsequential. Ultimately, stock failure can be expected even in stocks for which empirical stock-recruitment relationships cannot be defined, once spawning biomass is reduced to some, generally unknown, level. For example, the failure of Atlantic cod stocks in New England and eastern Canada to fully recover from accidentally prescribed overfishing in the 1980s is thought to have been the result of having depressed that stock below a critical level, at which recruitment potential remained chronically depressed due to a variety of ecological processes that the depleted stock could not overcome (for example, see: Lilly 2008, Sguotti et al. 2019). Additionally, continually fishing SSB downward in populations that are spatially structured (for example, are composed of a series of spawning grounds connected to distinct nursery areas; for Pacific halibut, see: St. Pierre 1984, Norcross et al. 1997, and Sadorus et al. 2020) runs the risk of eliminating spawning components and behavioral contingents to such a degree that stock components are eventually taken “off line” and recruitment is reduced to a greater degree than the observed decline in SSB (for example, see: Bui et al. 2011, Guan et al. 2018). **Unless it is clear that further declines in spawning biomass will have no impacts on recruitment potential or yield, then using dynamic B_0 in conjunction with no empirical lower limits may amount to an experiment whose result is to determine at what point the harvest strategy will fail, by causing recruitment and yield to decrease to a level from which the stock should not be expected to recover.**

<u>On use and computation of a fixed threshold and limit:</u>

It is unclear whether the reduction in coastwide halibut biomass over the last ~15 years represents a shift in the ecosystem that no longer supports high abundance, or the decrease is the result of having persistently fished the spawning biomass to a point where recruitment has finally been compromised. To account for the possibility of the latter, it would make sense to establish an empirical lower limit for coastwide spawning stock biomass (SSB), below which directed removals would cease, and above which the sloping harvest control rule (HCR) would be applied. The low-biomass HCR could take the same form as the current rule but would reference an empirical lower limit instead of short-term B_0. The existing ensemble of assessment models produces estimates of historical and current SSB (See: IPHC-2025-AM101-11, Figure 7) that should be appropriate for generating an empirical lower limit and the associated threshold above which harvests would return to maximum target levels. Using the logic of Clark and Hare (2006), the coastwide lower limit would be set at the coastwide SSB from the current ensemble (e.g., average the four models) that is estimated to have occurred in approximately 1974 (IPHC-2022-sa-01.pdf, Figure 5), noting that the even lower values estimated to have occurred around 1930 are likely to be imprecise due to lack of abundance data and directed halibut fisheries having not yet expanded westward. To account for uncertainty in the models, this empirical lower limit would be “buffered” (i.e., increased to become more conservative) by a proportion that is equivalent to no less than the magnitude of any retrospective bias currently observed in the recent models. For example, IPHC-2025-AM101-11, Figure 7, demonstrates that the SSB that was estimated for 2023 was downgraded in both the 2024 and 2025 assessments.

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The minimum proportional buffer (increase) to the lower limit, based on these observations, would then be the percentage that the estimated 2023 value decreased between the 2023 and 2025 model runs. This buffer might be increased further to account for additional uncertainties in stock status, such as current relative status of directed fishery CPUE, harvested age structure, shifts in spatial distribution of the stock, and concerns over the potential for “hyperstability” in model estimates due to incomplete survey coverage that is biased toward high-CPUE stations. Following Clark and Hare (2006), the threshold at which full target harvest levels would resume would be set at 1.5 times the buffered empirical lower limit. Harvest rates would decline linearly between that threshold and the empirical lower limit. When B_0 is estimated to be above the empirical lower limit, current harvest control rules (i.e., based on B_0) would apply.

Sincerely,

G Malcolm Milne

G Malcolm Milne

President, North Pacific Fisheries Association

IPHC-2025-AM101-INF02

The IPHC mortality projection tool for 2025 mortality limits

PREPARED BY: IPHC SECRETARIAT (I. STEWART; 10 DECEMBER 2024)

PURPOSE

This document provides a description of the IPHC's web-based mortality projection tool (https://www.iphc.int/data/projection-tool) for setting mortality limits in 2025.

BACKGROUND

Since 2019, IPHC Secretariat has provided an interactive tool in support of the IPHC's process for setting Pacific halibut mortality limits based on the coastwide TCEY and the distribution of that mortality among IPHC Regulatory Areas. The tool has been updated each year to reflect the IPHC's interim management procedure and all associated modifications and agreements in place each year.

THE MORTALITY PROJECTION TOOL

The tool relies on previously calculated stock assessment outputs representing a broad range of total mortality. These include projections of spawning stock size and fishing intensity, such that alternative harvest levels can be evaluated in the context of the harvest decision table as well as relative trends. The tool is divided into five components:

1) Inputs
2) Summary results
3) Biological distribution
4) Detailed sector mortality information
5) Graphics

A brief description of each of these is provided below.

Inputs

The first section of the tool provides the user with two primary inputs:

1) The total distributed mortality limit (TCEY) in millions of net[1] pounds.
2) The percent of the distributed mortality limit (TCEY) assigned to each IPHC Regulatory Area.

Previous versions of this tool have provided default values that reflected the IPHC's interim management procedure, as it was specified at the time. The previous interim agreement was specified to apply for the period from 2019-2022 (AM095; para. 69). As there is no interim agreement currently in place for 2025 (as in 2023-24), there are no default values in the current version of the tool and the user must input both the total coastwide TCEY and the percentage distributed to each IPHC Regulatory Area.

The distribution percentages for each IPHC Regulatory Area are input manually, and are intended to sum to 100%, if they do not, the total will be highlighted in red, and the inputs for all

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[1] Net pounds refer to the weight with the head and entrails removed; this is approximately 75% of the round (wet) weight.

IPHC Regulatory Areas will be automatically rescaled so that the sum of the distributed mortality limits across all IPHC Regulatory Area will exactly match the coastwide total input.

There are two optional inputs, with drop-down menus, specifying:

1) The basis for projecting non-directed discard mortality. The default projection, consistent with the IPHC's recent Interim Management Procedure (specified during AM096 para. 97), is to use the three-year average non-directed discard mortality from the most recent year. Alternatives include the previous year's estimates and the values consistent with full regulatory attainment of domestic non-directed discard mortality limits.
2) The units of mortality measurement. This can either be millions of net pounds (default) or net metric pounds.

Summary results

The second section of the tool provides the projected coastwide SPR for comparison with the harvest decision table. In addition, this section reports the distributed mortality limit (TCEY) for each IPHC Regulatory Area; the total can be compared to the total input above to verify that the calculations are working properly. The total mortality limit (all sizes and sources of mortality, including U26 non-directed discard mortality of Pacific halibut) is also summarized by IPHC Regulatory Area.

Biological and fishery distribution

The third section of the mortality projection tool provides the most current modelled estimates of stock distribution by Biological Region, compared to the distributed mortality limits (TCEY). These two values are then used to project a harvest rate by Biological Region, standardized such that Region 3 (IPHC Regulatory Areas 3A and 3B) is always equal to a value of 1.0 and the other Regions (2, 4 and 4B) are relative to that value.

Detailed sector mortality information

This section provides a full distribution of mortality among IPHC Regulatory Areas and fishery sectors. Calculations are based on catch sharing agreements used by the domestic agencies for IPHC Regulatory Areas 2A, 2B, 2C, 3A, and 4CDE (4CDE allocating among sub-Areas). Static projections are used for non-directed discard mortality (see above), and subsistence mortality (based on the most recent estimates available). Discard mortality in directed fisheries scales with the landings based on the most recently observed rates for each fishery. The total of this section (matching the total in the summary results) provides the best projection of all sizes and sources of Pacific halibut mortality based on the specified mortality limits.

Graphics

The last section of the projection tool provides a series of five graphical results updated to reflect the inputs made by the user. These graphics are similar to those provided in the annual stock assessment and/or presentation material.

The first figure uses previously calculated three-year projections for a range of coastwide TCEY (and corresponding SPR) values to illustrate the coastwide spawning biomass trend associated with the specified inputs to the tool. Uncertainty is shown as a shaded region, with the projected period highlighted by the brighter color relative to the darker estimated time-series. Importantly, not all possible SPR values are available, so the closest value available is reported. The projected SPR is reported above the figure, and a warning will be returned if the user has specified a coastwide TCEY outside of the range of values available, or if the value lies between the pre-calculated grid.

The second figure provides a bar chart of the time-series of estimated relative fishing intensity with 95% confidence intervals. The inputs to the projection tool provide the basis for the projected fishing intensity, shown as the hatched bar at the end of the series. Values are relative to the IPHC's Interim Management procedure, currently based on an SPR of 43% (see description above), such that values above the target represent higher fishing intensity.

The third figure provides a graphical display of the relative harvest rates by Biological Region as reported in the ***Biological and fishery distribution*** section.

The fourth and fifth figures provided the detailed sector mortality information (allocations) in both absolute values (millions of net pounds) and relative values (percent of the projected mortality) by IPHC Regulatory Area.

DISCUSSION

There may be some alternatives may require additional analyses beyond those available in this tool. Such alternatives will continue to be produced by the Secretariat staff as needed to support all meetings and decision-making.

UPDATE SCHEDULE

The mortality projection tool will be updated and posted to the IPHC's website in early January 2025 for use during the 2025 Annual Meeting (AM100). The update includes final end-of-year 2024 mortality estimates from various fisheries, including non-directed discard mortality estimates that affect projections for 2025.

REFERENCES

IPHC. 2020. Report of the 96th Session of the IPHC Annual Meeting (AM096).

IPHC-2025-AM101-INF03

Using artificial intelligence (AI) for supplementing Pacific halibut age determination from collected otoliths

PREPARED BY: IPHC SECRETARIAT (B. HUTNICZAK, J. FORSBERG, K. SAWYER VAN VLECK, & K. MAGRANE; 10 JANUARY 2025)

PURPOSE

This document summarizes the information available on the use of artificial intelligence (AI) for determining the age of fish from images of collected otoliths and provides an update on the exploratory work of implementing an AI-based age determination model for Pacific halibut.

The purpose of this document is twofold. First, to provide a background in support of developing a protocol for creating a database of pictures with expert-provided labels for ageing use. Second, to propose an AI-based modeling approach for supplementing current Pacific halibut ageing protocol.

BACKGROUND

Otoliths are crystalline calcium carbonate structures, mostly in the form of aragonite, found in the inner ear of fish. They contain growth rings, that are often compared to tree growth rings. By analyzing the growth patterns in otoliths, scientists estimate the age of fish (Campana, 1999; Campana & Neilson, 1985), supporting the estimation of fish population demographics and population dynamics (Campana & Thorrold, 2001). In turn, fish age is a key input to stock assessment models that inform management decisions related to fish exploitation (Methot & Wetzel, 2013). It is estimated that the number of otoliths from captured fish that are read annually worldwide is on the order of one million (Campana & Thorrold, 2001).

The current method for determining ages of most fish species relies on manually extracting, preparing (embedding, sectioning), and reading otoliths. The simplest approach to reading the otolith is to immerse it in a clear liquid, such as water or alcohol solution, illuminate it from above, and view it against a dark background, using a stereo microscope. This method is suitable only for otoliths that are relatively thin with all annual bands visible from the surface. For species such as Pacific halibut, as the growth rate of the fish slows down, the outer growth bands become increasingly compressed and difficult to read from the surface of the whole otolith. To correctly determine the number of annual bands in such cases, otoliths are typically viewed in cross section which allows viewing the bands that are not visible from the surface view. In addition, the contrast between the growth rings can be enhanced through the baking process. Pacific halibut otoliths are aged using the ‘break and bake’ technique.

This manual ageing process is expensive, time-consuming,[1] and can be subject to bias[2] as well as imprecision due to variations in age estimations between readers and within readers over

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[1] While the actual reading may account only for a fraction of the total cost and time required to process the otolith from collection to age determination, skilled readers require years of training, which should be considered when conducting a cost-benefit analysis.

[2] While the count of annual rings on Pacific halibut otoliths was found to provide unbiased age estimate using validation against bomb radiocarbon isotopes (Piner & Wischniowski, 2004), an earlier oxytetracycline (OTC) mark-

time. Recent advances in imaging technologies and machine learning suggest that AI can assist in this process by automating the analysis of otolith images[3] and identifying and measuring the growth rings to determine age. AI algorithms can be trained on a large dataset of otolith images with known ages to learn the patterns and variations in growth rings. Once trained, the AI model can analyze new otolith images and predict the age of the fish based on the identified patterns in the image.

Using AI for age determination of Pacific halibut could improve consistency and replicability of age estimates, as well as provide time and cost savings to the organization, providing age data for reliable management advice. However, it's important to note that the AI model's accuracy depends on the quality and diversity of the training data, as well as the expertise of the scientists involved in training and validating the model. Regular validation and calibration with manual age determinations is necessary to ensure the accuracy and reliability of the AI predictions. Thus, the proposed approach integrates AI-based age determination and traditional ageing methods for maximum accuracy of the estimates.

MODEL

The model framework (Figure 1) includes a continuous process of training the model using available labelled data (aged otoliths), querying the model to select the next sample, labeling or relabeling the selected sample, and enriching the model with newly labelled samples.

This model relies on automatized ageing that is supplementing the expert-derived age estimates continuously improving the model in the *Label* phase and the *Enrich* phase.

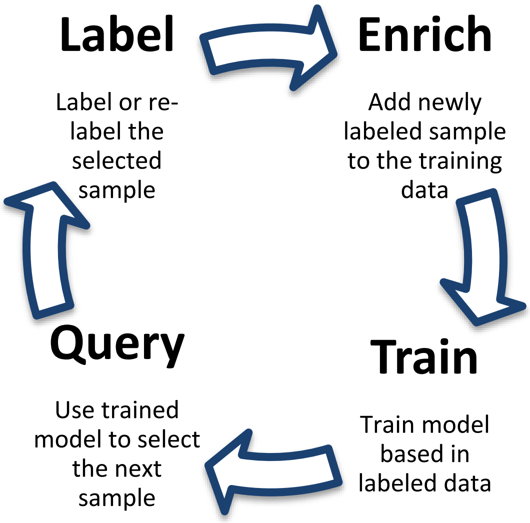

Figure 1: Model framework.

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recapture study indicated biases among age readers (Blood, 2003). In the 1980s, the IPHC applied injections with the antibiotic oxytetracycline (OTC) during routine tagging operations to evaluate validity of ageing method (IPHC, 1985). Upon injection, the OTC is absorbed by the fish's bony structure, including the otoliths, and leaves a mark that is easily seen when viewed under an ultraviolet light. When an OTC-injected tagged fish is recovered, the otoliths are removed and examined under the ultraviolet light. By comparing the number of annuli laid since the OTC mark to the fish recovery, the accuracy of the age readings can be determined.

[3] Although the idea of taking pictures of Pacific halibut otoliths is not new. See 1960 report by G. Morris Southward, *Photographing Halibut Otoliths for Measuring Growth Zones* (Southward, 1962).

Modeling approach

Previous literature (see perspective piece by Malde et al., 2020) suggests adapting a pre-trained convolutional neural network (CNN) designed for image classification to estimate age using otolith images obtained via microscope camera. This type of model is trained on a large collection of images of otoliths previously aged by human readers. Moen et al. (2018) presents the first case of the use of deep learning and CNN to estimate age from images of whole otoliths of Greenland halibut (*Reinhardtius hippoglossoides*).[4]

Artificial neural networks (ANNs) are computational structures inspired by biological neural networks. They consist of simple computational units referred to as neurons, organized in layers. The neuron parameters (or weights) are estimated by training the model using supervised learning. This process consists of two steps: forward propagation, where the network makes a prediction based on the input; and back propagation, where the network learns from its mistake by calculating the gradient of a loss function, and then uses the gradient to update the neuron weights. The ANNs approach has been used for fish ageing by Robertson & Morison (1999) and Fablet & Le Josse (2005) with a limited success.

The neural networks approach significantly improved in recent years with the increase in the number of layers, applying an approach often referred to as deep learning. Deep learning neural networks are known for their generality. With sufficient training data, they can be used to classify raw data (e.g., an array of pixels) directly, without explicit design of low-level features. The deep learning algorithm lower layers learn to distinguish between primitive features automatically, typically identifying sharp edges or color transitions. Subsequent layers then learn to recognize more abstract features as combinations of lower layer features, and finally merge this information to provide a high-level classification.

In CNNs (LeCun et al., 1998; Simonyan & Zisserman, 2015), the layers are structured as stacks of filters, each recognizing increasingly abstract features in the data. Convolutional layers may be understood as an efficient way to transform an input image into another image, highlighting meaningful patterns, learned from data during training. The training is sequential, meaning the output of each layer is the input of the next layer, and the useful features are learned in the various layers during training. This approach is very effective for many image analysis problems, where objects are often recognized independent of their location. During network training, the performance is monitored over sequential epochs. Epochs represent the number of times that the training dataset is passed forward and backward through the network to refine model weights. Whenever the validation loss decreases, the trained model is saved, ending up with the network that corresponds to the minimum loss and highest accuracy on the validation set. The trained network is then evaluated on the testing set.

In the CNN model, prediction of age can be defined as a classification task (age as a class category) or image regression, that is a task of predicting a continuous variable from an image, in this case prediction of age as a numeric value from an otolith image. Both approaches can be tested for devising a method better suited for Pacific halibut. Considering fish age as a discrete parameter is a common approach used to identify the individual year class, i.e. grouping fish originating from the spawning activity in a given year (Moen et al., 2018), although this may be

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[4] CNN was also applied for other tasks related to fisheries management, e.g. fish species identification (Allken et al., 2019).

less appropriate for long-living species with a larger number of age categories in the sample. The oldest Pacific halibut on record were aged at 55 years (Keith et al., 2014).

Software options

The proposed approach follows that of Moen et al. (2018) and Moore et al. (2019) who chose TensorFlow and Keras libraries to implement and train the model. TensorFlow is currently the largest and most popular library available for deep learning. Keras is a high-level API which runs on top of TensorFlow and simplifies implementation of TensorFlow models.

The approach uses a transfer-learning technique to develop a CNN for otolith age estimation. Transfer learning is the process of repurposing a machine learning model that has been pre-trained for another, related, task. Specifically, it starts with the Inception v3 model from Google, pre-trained on the ImageNet database. ImageNet database contains over 14 million (14,197,122) annotated images classified intro 1000 categories. The CNN layers are loaded with pre-trained (with ImageNet data) and publicly available weights, as opposed to using random initialization. Various training meta-parameters contribute substantially to final accuracy by using a stochastic gradient descent (SGD) optimizer and by leaving all network layers as trainable.

For the application to otolith ageing for Pacific halibut, the input layer was scaled to match the images' resolution.[5] The output layer was changed from a multi-dimensional output vector representing class probabilities to a single numeric output, effectively transforming it to a new regression layer.[6] This design follows the following pattern: Input → InceptionV3 (feature extractor) → Classifier/Regressor → Output. At this point, the neural network is trained to minimize the mean squared error (MSE) between predicted ages and human expert age estimates,[7] using the otolith images as inputs.

A similar approach, although adopting classification approach, was applied for ageing Greek Red Mullet (*Mullus barbatus*) (Politikos et al., 2022) and the associated code is available on GitHub (github.com/dimpolitik/DeepOtolith). The available open-source code was adapted for testing the approach for Pacific halibut.

Use of auxiliary data

Precision of age predictions of otoliths using neural networks from geometric features could be potentially improved by using auxiliary data, for example, fish size or date and location of capture (Moen et al., 2018). Past IPHC work suggests a good deal of spatial variation in Pacific halibut growth ring patterns. This points to the importance of good spatial coverage in the training sample. Additionally, the project plans to explore the use of additional spatial covariates for better

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[5] Resolution is the total number of pixels along an image's width and height, expressed as pixels per inch (PPI). The Inception v3 model processes images that are 299 x 299 pixels in size. The original images, which were 2548 x 2548 pixels, were resized to 400 x 400 pixels.

[6] Alternatively, Politikos et al. (2021) replaced the last layer with a feed-forward network with two hidden layers replacing the default 1000-categories output layer with a fully-connected layer with six hidden nodes, corresponding to a limited number of age categories [Age-0 – Age-5+], with the last one representing fish of age 5 and older, In this case, the network outputs probabilities using the softmax function, a function that performs multi-class classification and transforms the outputs to represent the probability distributions over a list of potential outcomes. The IPHC uses in its stock assessment bins Age-2 – Age 25+ for the current age data and Age-2 - Age-20+ for the historical surface read ages. The adoption of a larger number of age categories prompted the decision to incorporate a regression layer in place of class probabilities.

[7] In practice, the neural network minimizes the MSE of normalized age values, i.e., age values divided by the maximum age provided as input.

age prediction. Other available auxiliary data include year collected, which could be applied to account for variation between cohorts and prevalent environmental conditions throughout the aged fish life histories, and the collection dates, which provides insights into seasonal variation to the interpretation of the otolith edge.

Database

The IPHC annually ages a considerable number of otoliths (see *Appendix* for details). Since 1925, over 1.5 million otoliths have been aged and stored for potential future use. Otoliths collected by the IPHC for ageing purposes undergo additional processing. Otoliths are sectioned (broken in half) and baked to enhance the contrast between the growth rings. These stored and previously aged otoliths serve as a valuable resource for creating a database of images for training purposes. To optimize model training, the selection of otoliths included in the model covers a broad spectrum of fish sizes, ages, sexes, and collection locations.

Before photographing, processed otoliths were placed in a monochrome tray featuring an elongated groove designed to keep the otolith upright and immersed in water. The pictures were taken with AmScope 8.5MP eyepiece cameras,[8] under consistent lighting conditions and magnification. The input database includes images of standardized size, 2548 by 2548 pixels, which are later resized to the desired resolution based on the model's specification.[9]

It is important to note that it may not be necessary to image the otoliths at resolutions sufficient for human viewers to resolve, because the CNN may be able to arrive at an age estimate without directly counting bands (Moore et al., 2019).

Figure 2 shows an example of a range of images used in the CNN training dataset.

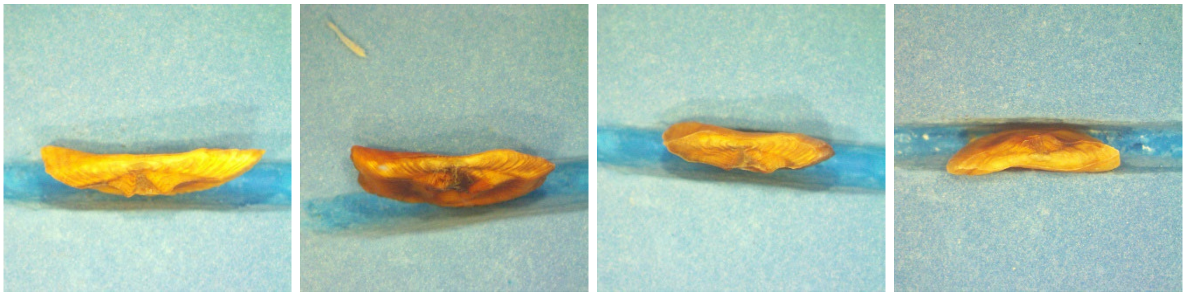

Figure 2: Examples of Pacific halibut otolith images taken for inclusion in the training set.

Note: In due course, the IPHC will create a database comprising labelled images of otoliths both pre- and post-processing and conduct a cost-benefit analysis of processing the otoliths for ageing using AI. The analysis will look at the accuracy improvement when using an image database containing images of processed (broken and baked) otoliths with enhanced contrast vs. those captured prior to processing (i.e. surface pictures). In their research, Politikos et al. (2022) utilized digital images of otoliths that were not subject to any additional processing in the

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[8] The camera fits in one of the microscope eyepieces, eliminating the need to purchase a separate camera mount for the microscope.

[9] Moen et al. (2018) used images 400 by 400 pixels, which required the input layer to be scaled to match the images size as Inception v3 classifies by default images with a size of 299 by 299 pixels. Ordoñez et al. (2020), using the same set of images, built a CNN with images resized to 224 by 224 pixels, the default input of the VGG-19 model. Higher resolution images offer the flexibility to adapt the model in the future to more detailed and complex image analysis tasks, potentially improving the accuracy and effectiveness of image recognition capabilities.

laboratory, immersed in water and placed under a stereomicroscope on a white background with transmitted light. However, it is important to note that even if results indicate that breaking and baking is not necessary for age determination using AI, a subsample chosen for the Label and Enrich phases would have to be fully processed for age determination with traditional methods by an expert reader.

Presorting otoliths

The adopted procedure excludes broken otoliths, applying manual presorting at the image-taking stage. Presorting has also occurred at the collection stage when crystalized otoliths[10] are omitted when collecting samples.

Image collection

The image collection is associated with labels storing:

1. Otolith reference number – using referencing system already in place;
2. Image name and location – exact path for image access;
3. Resolved age – human reader derived age (**rsvage**);
4. Year collected – to account for variation between cohorts and prevalent environmental conditions;
5. Date collected – to account for the 'edge effect' reflecting seasonal changes;
6. Geospatial characteristics (latitude and longitude) – to capture regional variation;
7. Resolved sex – to determine whether otolith characteristics (possibly not directly visible to human eye) could be used for sex determination.[11]

PRELIMINARY RESULTS

The current model run utilized 2,682 images of otoliths collected during the 2019 IPHC fishery-independent setline survey (FISS). The 2019 FISS provides an ideal foundation for creating an image database, as its extensive coverage is expected to capture regional variations in otoliths, offering a robust dataset for initial modeling efforts.

The images were divided into training, validation, and test datasets. The training set (1,595) was used for training purposes. The validation set (282) was used to evaluate the model during the training process, allowing for adjustments without using the test set, which was reserved for the final evaluation. The test dataset (30%, 805) was used to assess the performance of the model after training, providing an unbiased evaluation of its generalization capability to new, unseen data. Additional set of 91 images (referred to as secondary test set) was used to compare the results between different model configurations. All images were resized to 400x400 pixels. Images of broken otoliths were excluded. The number of epochs was set to 1000, with EarlyStopping applied and patience set to 100. Learning rate was set to 0.0002 and batch size to 16.

Normalized age MSE in training set was 0.000198 and 0.0015 in validation set. The model was trained for 417 epochs (i.e., 317 effective epochs with patience=100). The model achieved RMSE in the test set of 1.90, and 1.94 when applied to rounded results. Correct age was

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[10] Crystalized otoliths have an altered composition – specifically, where the aragonite in the otolith is partially or mostly replaced by vaterite, a phenomenon known as otolith crystallization. Crystallized otoliths are not suitable for ageing.

[11] IPHC is currently using genotyping for Pacific halibut sex determination.

predicted for 30.3% individuals, with an additional 40.7% being within 1 year of error. Figure 3 shows accuracy adjustment over the training process, while Figure 4 compares manually-derived age with AI predicted age. Figure 5 compares age composition derived manually with model predictions.

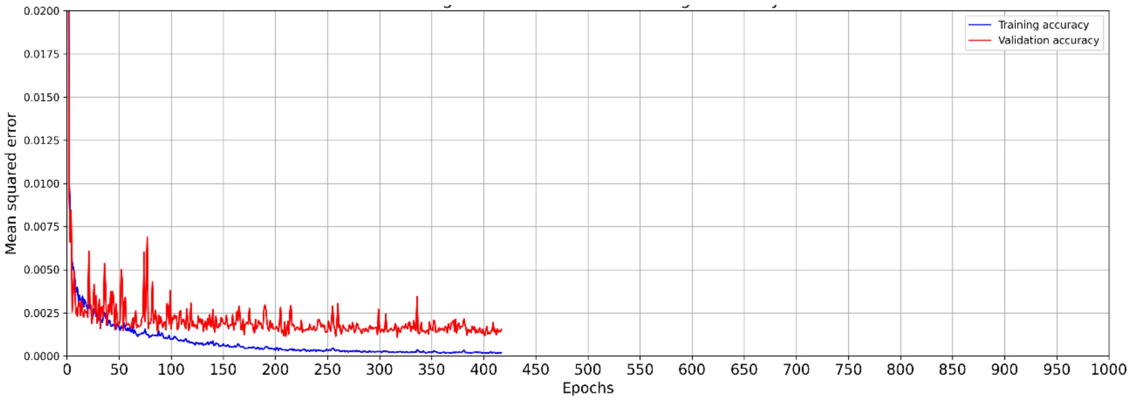

Figure 3: Age accuracy (measured as normalized age MSE) throughout the training process.

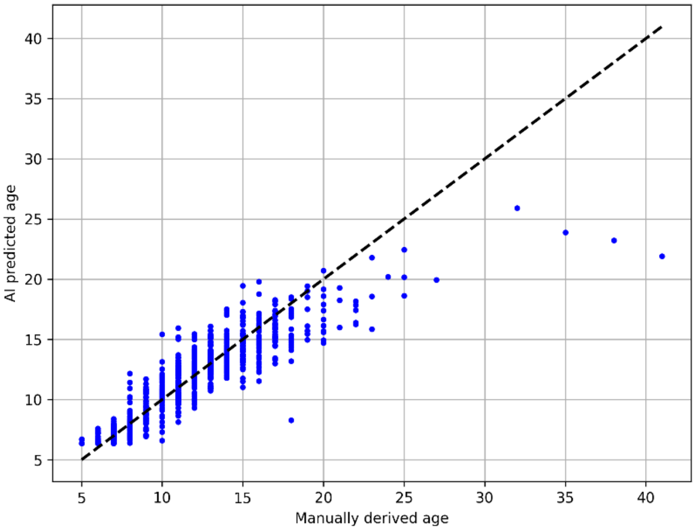

Figure 4: Comparison between manually derived age with AI predicted age.

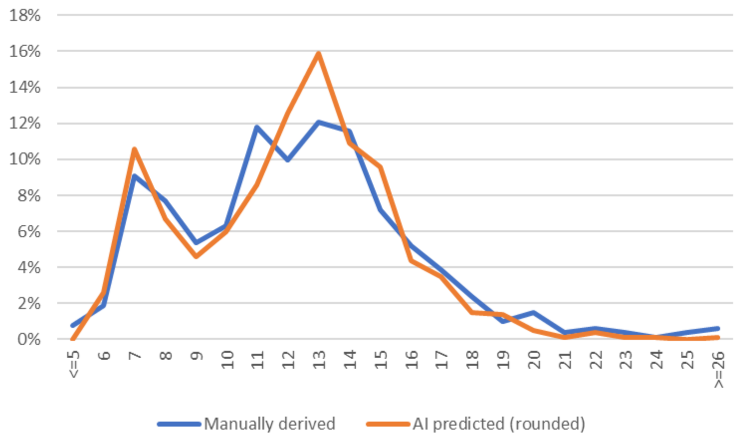

Figure 5: Comparison between manually derived age with AI predicted age – age composition.

CONCLUSIONS

In conclusion, the ongoing advancement of AI technologies in the field of marine science offers considerable potential to enhance the efficiency of age determination of Pacific halibut using otolith images. Preliminary results presented here suggest that AI could serve as a promising alternative to the current ageing protocol, which relies entirely on manual age reading. AI is also evolving rapidly, and adapting to new developments may further improve results over time However, it is important to continue verifying whether achieved accuracy of CNN-based predictions do not learn biased prediction rules based on changes in the relationship between age and covariates used by the model, noise or other irrelevant imaging artefacts present in the data (Ordoñez et al., 2020). Therefore, it is key to continuously diagnose performance problems and find ways to fix them (Belcher et al., 2023; Norouzzadeh et al., 2018). Moreover, the automated ageing process will still depend on trained readers for training the model with inputs that capture temporal changes, which is increasingly important in the face of changing environmental conditions and climate change.

RECOMMENDATION

That the Commission:

1) **NOTE** paper IPHC-2025-AM101-INF03 that summarizes the information available on the use of artificial intelligence (AI) for determining the age of fish from images of collected otoliths and provides an update on the exploratory work of implementing an AI-based age determination model for Pacific halibut.

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APPENDIX
COUNTS OF OTOLITHS AGED BY THE IPHC

Collection year	Ageing method	IPHC FISS*	Commercial (Market Sample)*	NOAA Trawl survey*	Tag recovery*	ADF&G recreational*	Clean collection
pre-1960	surface	70,984			10,068		
1960	surface	6,606			681		
1961	surface	4,727		4,576	842		
1962	surface	2,605		1,692	594		
1963	surface	8,257		2,209	440		
1964	surface	10,295	27,828	1,001	353		
1965	surface	5,169	27,252	1,186	493		
1966	surface	3,750	24,638	1,777	796		
1967	surface	6,325	29,797	2,271	1,151		
1968	surface	2,314	29,772	1,887	1,813		
1969	surface	1,510	23,361	1,019	1,869		
1970	surface	1,138	24,686	1,184	867		
1971	surface	2,702	16,374	2,294	732		
1972	surface	2,597	23,381	1,180	490		
1973	surface	1,747	16,683	893	244		
1974	surface	1,021	11,569	1,189	128		
1975	surface	1,212	14,128	1,136	131		
1976	surface	1,843	14,103	969	72		
1977	surface	1,853	13,514	1,102	83		
1978	surface	1,933	11,434	1,309	61		
1979	surface	2,021	7,219	730	93		
1980	surface	5,022	10,317	717	168		
1981	surface	7,942	8,267	460	129		
1982	surface	5,720	9,644	443	208		
1983	surface	5,822	9,262	1,355	286		
1984	surface	6,508	10,233	1,089	455		
1985	surface	5,872	12,986	1,192	778		
1986	surface	5,139	12,426	1,120	1,020		
1987	surface	42	16,137		859		
1988	surface	1,179	17,154	98	761		
1989	surface	6,130	14,122		710		
1990	surface	2,201	14,800	4,802	397		
1991	surface	1,315	13,461	2,598	280		
1992	surface/BB	7,530	14,564	222	182		
1993	surface/BB	3,384	13,747		147		
1994	surface/BB	2,618	13,311		99		
1995	surface/BB	4,512	12,297	433			
1996	surface/BB	10,893	13,452	2,211			
1997	surface/BB	14,784	15,501	834	148		

1998	surface/BB	8,587	14,395	1,145	98		
1999	surface/BB	11,971	12,858	3,029	70	3,672	
2000	surface/BB	14,122	13,982	1,209	46	2,706	
2001	surface/BB	14,731	13,181	2,952	27	2,609	
2002	BB	13,635	17,932	761	24	2,349	
2003	BB	12,626	13,915	3,876	79	2,754	
2004	BB	14,474	11,798	897	450	3,288	
2005	BB	12,651	14,650	2,028	643	3,183	
2006	BB	14,976	13,399	2,621	679	3,179	
2007	BB	16,285	13,964	3,930	455	3,026	
2008	BB	15,545	13,460	1,527	304	1,500	
2009	BB	15,706	13,583	4,922	276	1,500	
2010	BB	14,080	16,106	1,915	21	1,500	625
2011	BB	14,451	11,391	4,592	26	1,500	676
2012	BB	17,896	12,902	1,639	9	1,500	1164
2013	BB	12,717	11,039	2,044	19	1,503	1020
2014	BB	16,194	12,606	1,476	22	1,500	1096
2015	BB	15,815	12,312	2,133	24	1,500	1072
2016	BB	15,113	11,618	742	21	1,502	902
2017	BB	12,565	10,821	1,384	15	1,500	756
2018	BB	12,935	11,013	576	39	1,499	798
2019	BB	17,716	10,711	1,640	34	1,497	925
2020	BB	10,323	10,568		34	1,413	577
2021	BB	12,253	11,051	1,444	38	1,500	547
2022	BB	9,702	10,942	1,902	39	2,334	519
2023	BB	8,506	10,968	(3,147)	(48)	(1,958)	462
2024	BB	5,771	(10,377)	(1,058)	(61)	(1,542)	458

Notes:

- Star (*) indicates blind side otolith.
- BB stands for 'break and bake' approach.
- All otoliths reported in this table were aged with the exception of the clean collection.
- All aged otoliths are stored in glycerol/thymol solution.
- Some small fish from trawl survey collection are still aged by surface method; otoliths with surface age>4 are broken and baked.
- Sample data not entered prior to 1960 for FISS, 1964 for commercial, 1961 for NOAA trawl survey.
- Clean collection is not aged, stored dry, and include paired otoliths.
- Tribal otoliths are included in the Market Sample series.
- Additionally, there are 144 not aged 2A recreational otoliths, all from Hein Bank collected between 2004 and 2009.
- Trawl and recreational otoliths lag one year in ageing.
- In brackets, otoliths available for ageing but ageing not completed.

Using Management Strategy Evaluation to Investigate the Effects of Fishing and the Environment on Pacific Halibut

PREPARED BY: IPHC SECRETARIAT (A. HICKS; 26 JANUARY 2025)

PURPOSE

This document provides an electronic version of a brochure presenting Management Strategy Evaluation (MSE) simulations to examine environmental and fishing effects on Pacific halibut.

BACKGROUND

After presenting to the MSAB at MSAB019 the results of simulations examining the effects of low and high average recruitment tied to environmental conditions, they requested that outreach materials be developed.

> **IPHC-2024-MSAB019-R, para 32:** The MSAB **REQUESTED** that outreach materials be developed by the Secretariat that synthesize the effect of the PDO (e.g. via recruitment) on the coastwide and regional stock dynamics and the relative effect of fishing in simple terms with interpretation and consequences of the outcomes.

Appendix I shows an electronic version of a brochure describing these results. The simulations hold average recruitment constant at low or high values while weight-at-age is allowed to vary randomly over the projection period.

APPENDICES

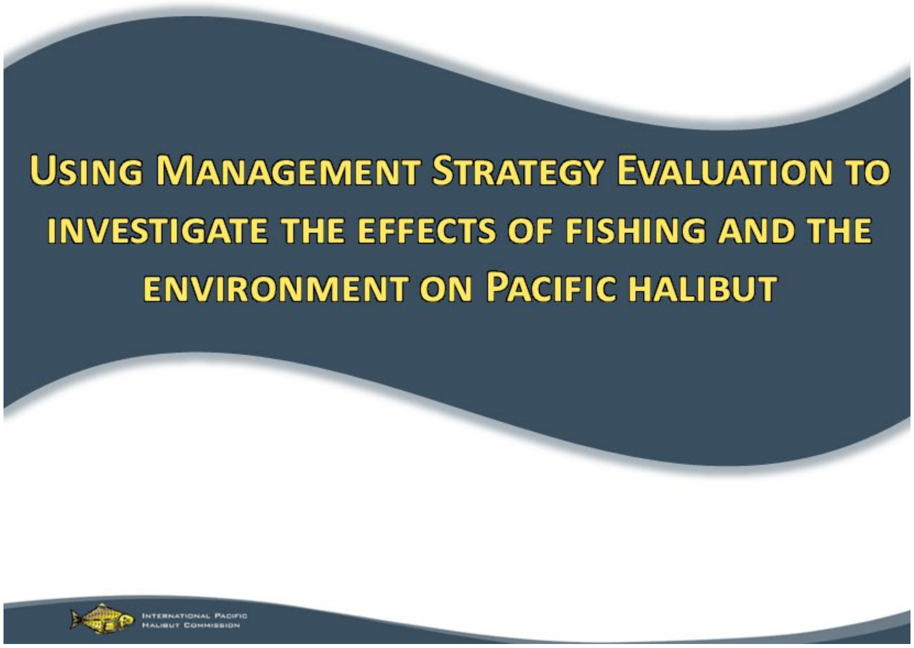
Appendix I: An electronic version of a brochure presenting Management Strategy Evaluation simulations to investigate the effects of fishing and the environment on Pacific halibut.

Appendix I

An electronic version of a brochure presenting Management Strategy Evaluation simulations to investigate the effects of fishing and the environment on Pacific halibut.

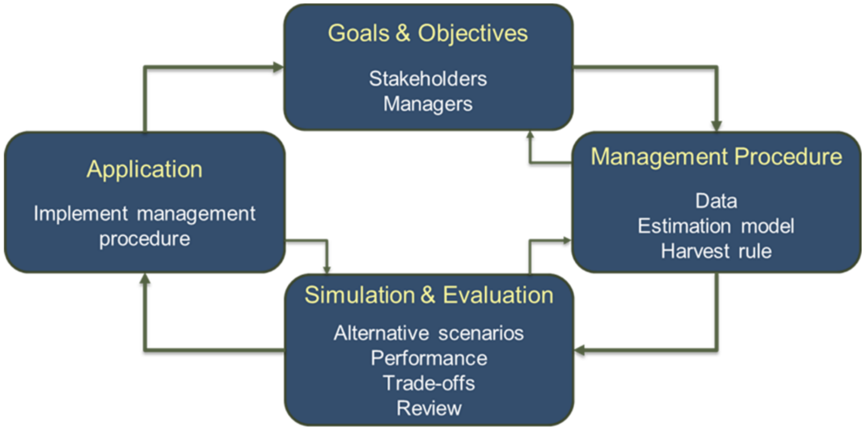
INTERNATIONAL PACIFIC

HALIBUT COMMISSION



USING MANAGEMENT STRATEGY EVALUATION TO INVESTIGATE THE EFFECTS OF FISHING AND THE ENVIRONMENT ON PACIFIC HALIBUT

INTERNATIONAL PACIFIC
HALIBUT COMMISSION



Goals & Objectives
Stakeholders
Managers

Management Procedure
Data
Estimation model
Harvest rule

Simulation & Evaluation
Alternative scenarios
Performance
Trade-offs
Review

Application
Implement management procedure

What is MSE?

Management Strategy Evaluation (MSE) is a process to evaluate the consequences of alternative management procedures. MSE uses a simulation tool to determine how alternative management procedures perform given a set of pre-defined fishery and conservation objectives, taking into account the uncertainties in the system. Processes that cannot be controlled, such as environmental effects, can be included as a source of variability, or by simulating specific scenarios to understand how different levels of the process affect the outcomes.

Undertaking an MSE requires scientists, managers, and stakeholders to be involved throughout the process. While the scientists do the modelling, managers must offer extensive input. Because of the many steps and the iterative process, communication among parties is critical for achieving buy-in on the results of the management strategy evaluation. The MSE is an essential part of the process of developing and agreeing to a harvest strategy policy.

THE MSE PROCESS

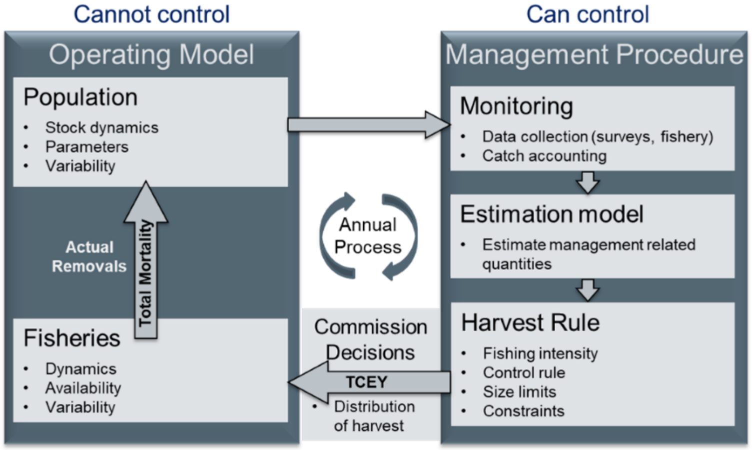
DEFINE FISHERY & CONSERVATION OBJECTIVES

IDENTIFY MANAGEMENT PROCEDURES (MPs) TO EVALUATE

SIMULATE THE PACIFIC HALIBUT POPULATION USING THOSE MPs

EVALUATE RESULTS TO EXAMINE TRADE-OFFS

IMPLEMENT THE CHOSEN HARVEST STRATEGY WITH THE TESTED MP



Cannot control

Operating Model

Population
- Stock dynamics
- Parameters
- Variability

Actual Removals

Total Mortality

Fisheries
- Dynamics
- Availability
- Variability

Annual Process

Commission Decisions

TCEY
- Distribution of harvest

Can control

Management Procedure

Monitoring
- Data collection (surveys, fishery)
- Catch accounting

Estimation model
- Estimate management related quantities

Harvest Rule
- Fishing intensity
- Control rule
- Size limits
- Constraints

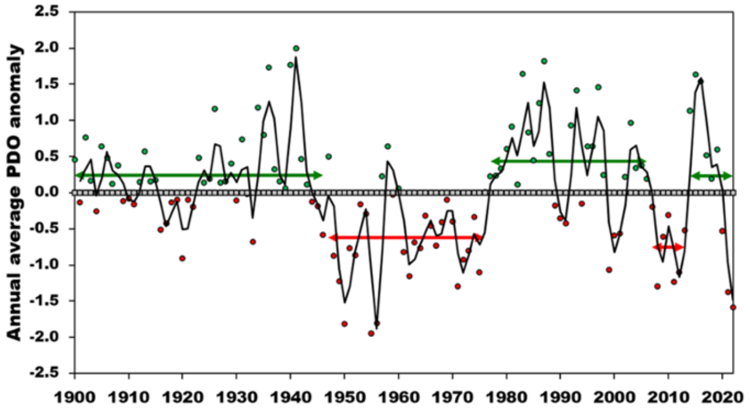
An MSE for Pacific Halibut

An operating model for Pacific halibut simulates the population dynamics within and between four regions across the Northeast Pacific Ocean. Fishing, movement, reproduction, and growth are modelled and simulated forward in time assuming a consistent harvest strategy. Variability in age-0 recruitment and growth are included. Outputs aggregated across all four regions (coastwide) include the future expected stock size, the expected fishery mortality limits (i.e. TCEY), and the interannual variability in the fishery mortality limits. These outputs are also available at the regional level. The IPHC Management Strategy Advisory Board (MSAB) provides input into the MSE process and the Commission uses the results in the development of a Harvest Strategy Policy.

MSE SIMULATION ELEMENTS

AN OPERATING MODEL SIMULATES THE PACIFIC HALIBUT POPULATION INTO THE FUTURE

A MANAGEMENT PROCEDURE DETERMINES THE FISHING MORTALITY LIMITS AND FEEDS BACK INTO THE OPERATING MODEL



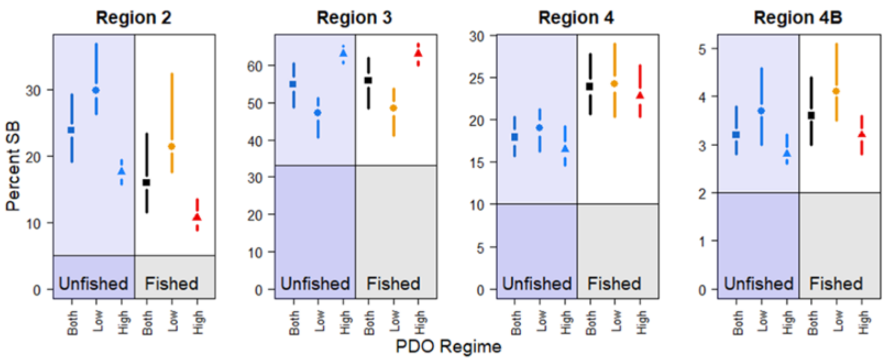
THE EFFECTS OF THE ENVIRONMENT ON PACIFIC HALIBUT

A strong correlation between the environmental conditions in the northeast Pacific Ocean, specifically the Pacific Decadal Oscillation (PDO), and recruitment of Pacific halibut to the commercial fishery during the 1900s has been identified. For Pacific halibut, the positive 'phase' of the PDO (years up to and including 1947, 1977-2006, and 2014-19) appears to have resulted in typically higher average recruitment. Additional work suggests that movement and the distribution of age-0 Pacific halibut are also different depending on the phase of the PDO.

Since the late 1800's the PDO has oscillated between warm and cold phases at least 4 times. Recent research, however, shows many other environmental indicators were highly anomalous in recent years, and it is unclear whether these years represent comparable conditions to previous PDO observations.

INFLUENCES OF THE PDO ON PACIFIC HALIBUT

LOW PDO	HIGH PDO
Low average recruitment	High average recruitment
Typically, less recruitment in Region 4	Typically, more recruitment in Region 4
Less movement from Region 4 to 3	More movement from Region 4 to 3
More movement from Region 3 to 2	Less movememtn from Region 3 to 2



A CHANGING ENVIRONMENT AND THE MANAGEMENT OF PACIFIC HALIBUT

The Pacific halibut population was simulated forward in time, with fishing mortality similar to what has occurred recently, assuming that the PDO was either always low or always high. The environment has a modest effect on the coastwide fishing mortality limits with the expected TCEY being 1.6 times greater in a high PDO regime when compared to a low PDO regime, although the interannual variability is the same. This is because the population size is smaller, thus fewer fish can be harvested in a persistent low PDO regime. Fishing and the environment affect the proportion of spawning biomass in each Biological Region in different ways. Region 2 (CA, OR, WA, BC, and SE AK) is affected by both the PDO and fishing. Region 3 (central Gulf of Alaska) is mostly affected by the PDO regime and fishing has little effect on the proportion of spawning biomass because fish move into this region at different rates depending on the PDO regime. Region 4 (western Gulf of Alaska and the Bering Sea) is mainly affected by fishing as fish generally move out of this region. Region 4B (Aleutian Islands) is affected by both fishing and the PDO regime because few fish move in or out of this region, but recruitment of Pacific halibut is dependent on the PDO regime.

RESULTS OF THE SIMULATIONS

THE COASTWIDE TCEY IS 1.6 TIMES GREATER, ON AVERAGE, WITH A PERSISTENT HIGH PDO

AREAS ARE AFFECTED DIFFERENTLY BY FISHING AND BY THE ENVIRONMENT

Long-Term Performance Metrics			
PDO	**Both**	**Low**	**High**
Median RSB	38.8%	37.6%	39.2%
P(RSB<20%)	<0.001	<0.001	<0.001
P(RSB<36%)	0.238	0.329	0.157
Median TCEY (Mlbs)	65.6	51.4	83.0
Median AAV of TCEY	5.2%	4.5%	4.5%
Median TCEY Region 2 (Mlbs)	20.5	19.1	21.2
Median TCEY Region 3 (Mlbs)	33.7	23.0	48.7
Median TCEY Region 4 (Mlbs)	8.1	6.6	9.4
Median TCEY Region 4B (Mlbs)	2.4	2.2	2.6

IMPORTANCE TO DECISION MAKING

Even though we cannot "manage" the PDO regime, it is useful to understand the effects of the PDO regime on the Pacific halibut population and fisheries, separating the effect of fishing from the effects of the environment. In some cases, the environment may have a bigger effect on yield and the distribution of spawning biomass than fishing at a specific rate does. The environment is certainly influential on management outcomes and investigating the effects of a single regime on the management of Pacific halibut helps to understand the variability and uncertainty in the potential management outcomes.

In reality though, the environment is variable and often unpredictable. Therefore, the MSE simulations informing Commissioners, and the development of a Harvest Strategy Policy, oscillate randomly between PDO regimes and integrate the uncertainty of the environmental regime into the results. Including this variability provides the assurance that a chosen harvest strategy meets management objectives and is robust to uncertainty in the environment.

EFFECTS OF THE ENVIRONMENT AND FISHING

THE ENVIRONMENT IS VARIABLE AND OFTEN UNPREDICTABLE

THE ENVIRONMENT SCALES THE PRODUCTIVITY OF THE STOCK AND CHANGES THE DISTRIBUTION AMONG BIOLOGICAL REGIONS

UNDERSTANDING THE EFFECTS OF THE ENVIRONMENT IS USEFUL, BUT THE GOAL IS TO FIND A MANAGEMENT PROCEDURE THAT IS ROBUST TO THE VARIABILITY IN THE ENVIRONMENT

FOR MORE INFORMATION

https://www.iphc.int/research/management-strategy-evaluation/

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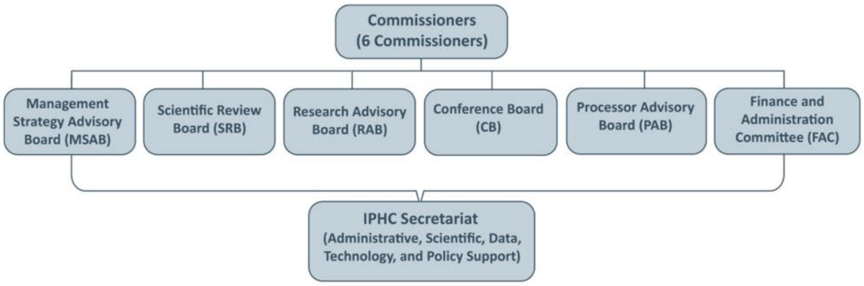
STRUCTURE OF THE COMMISSION



Commissioners
(6 Commissioners)

Management Strategy Advisory Board (MSAB)

Scientific Review Board (SRB)

Research Advisory Board (RAB)

Conference Board (CB)

Processor Advisory Board (PAB)

Finance and Administration Committee (FAC)

IPHC Secretariat
(Administrative, Scientific, Data, Technology, and Policy Support)

THE COMMISSION

The IPHC currently consists of six members, three appointed by each Contracting Party (the Governor General of Canada and the President of the United States of America), who serve their terms at the pleasure of the Contracting Party.

CANADA

Mark Waddell

Neil Davis

Peter DeGreef

UNITED STATES OF AMERICA

Jon Kurland

Richard Yamada

Robert Alverson

INTERNATIONAL PACIFIC HALIBUT COMMISSION