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## Stock projections and the harvest decision table for 2024-2026

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

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### PURPOSE

To provide the Commission with short-term (3 year) stock projections and the harvest decision table for 2024-2026.

### METHODS

Short-term tactical stock projections under varying levels of mortality are conducted using the results from the 2023 stock assessment ([IPHC-2023-IM099-10 Rev 1](#)). Standard projections are based on existing Catch Sharing Agreements/Plans (CSPs) for directed commercial and recreational fisheries where they exist, as well as summaries of the 2023 and earlier directed and non-directed fisheries.

Specifically, the projected mortality levels are based on the three-year running average non-directed discard mortality<sup>1</sup> through the most recent year (2023), per the decision during AM096 [para. 97](#)). Subsistence harvest is assumed to be constant at the most recent year's estimates. The discard mortality for the directed commercial fisheries is assumed to occur at the same rate observed in the most recent year, and to scale up or down with the projected landings.

The harvest decision table provides a comparison of the relative risk (in times out of 100), using stock and fishery metrics (rows), against a range of coastwide alternative harvest levels for 2024 (columns). The block of rows entitled "Stock Trend" provides for evaluation of the risks to short-term trend in spawning biomass, independent of all harvest policy calculations. The remaining rows portray risks relative to the spawning biomass reference points ("Stock Status") and fishery performance relative to the approach identified in the interim management procedure. The alternatives (columns) include several levels of mortality intended for evaluation of stock and management procedure dynamics including:

- No fishing mortality (useful to evaluate the stock trend due solely to population processes)
- The mortality consistent with repeating the coastwide TCEY set for 2023 (the *status quo*)
- Bracketing alternatives 5 and 10% above and below the *status quo*

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<sup>1</sup> The North Pacific Fishery Management Council is expected to adopt a [new method](#) for setting the Prohibited Species Catch (PSC) limit for Pacific halibut mortality in the Amendment 80 (A80) trawl sector in 2024. This approach adjusts PSC limits based on the NOAA Fisheries Eastern Bering Sea trawl survey and the modelled FISS index of abundance for IPHC Regulatory Areas 4A, 4B, and 4CDE. Although this new approach results in a 20% reduction to the A80 sector's PSC limit, the actual halibut mortality has been far below the aggregate PSC limit for all sectors in the Bering Sea and Aleutian Islands (59% in 2023). Therefore, it is unclear whether any future adjustments to the 3-year running average approach might be warranted, as actual mortality could still go up or down from the three year-average under current conditions. Recent actual non-directed discard mortality estimates in both IPHC Regulatory Areas 2A and 2B and in the Gulf of Alaska are similarly far below full regulatory limits.

- The mortality at which there is less than or equal to a 50% chance that the spawning biomass will be smaller in 2025 than in 2024 (“1-year surplus”)
- The mortality at which there is less than or equal to a 50% chance that the spawning biomass will be smaller in 2027 than in 2024 (“3-year surplus”)
- The mortality consistent with the current “Reference” SPR ( $F_{43\%}$ ) level of fishing intensity
- The mortality consistent with the [Maximum Economic Yield \(MEY\) proxy SPR](#) ( $F_{40\%}$ ) level of fishing intensity
- The mortality consistent with the Maximum Sustainable Yield (MSY) proxy SPR ( $F_{35\%}$ ) level of fishing intensity
- Other levels of mortality spaced between the above alternatives to provide for continuous evaluation of the change in risk across alternative yields

For each column of the decision table, the projected total fishing mortality (including all sizes and sources), the coastwide TCEY and the associated level of estimated fishing intensity projected for 2024 (median value with the 95% credible interval below) are reported.

## RESULTS

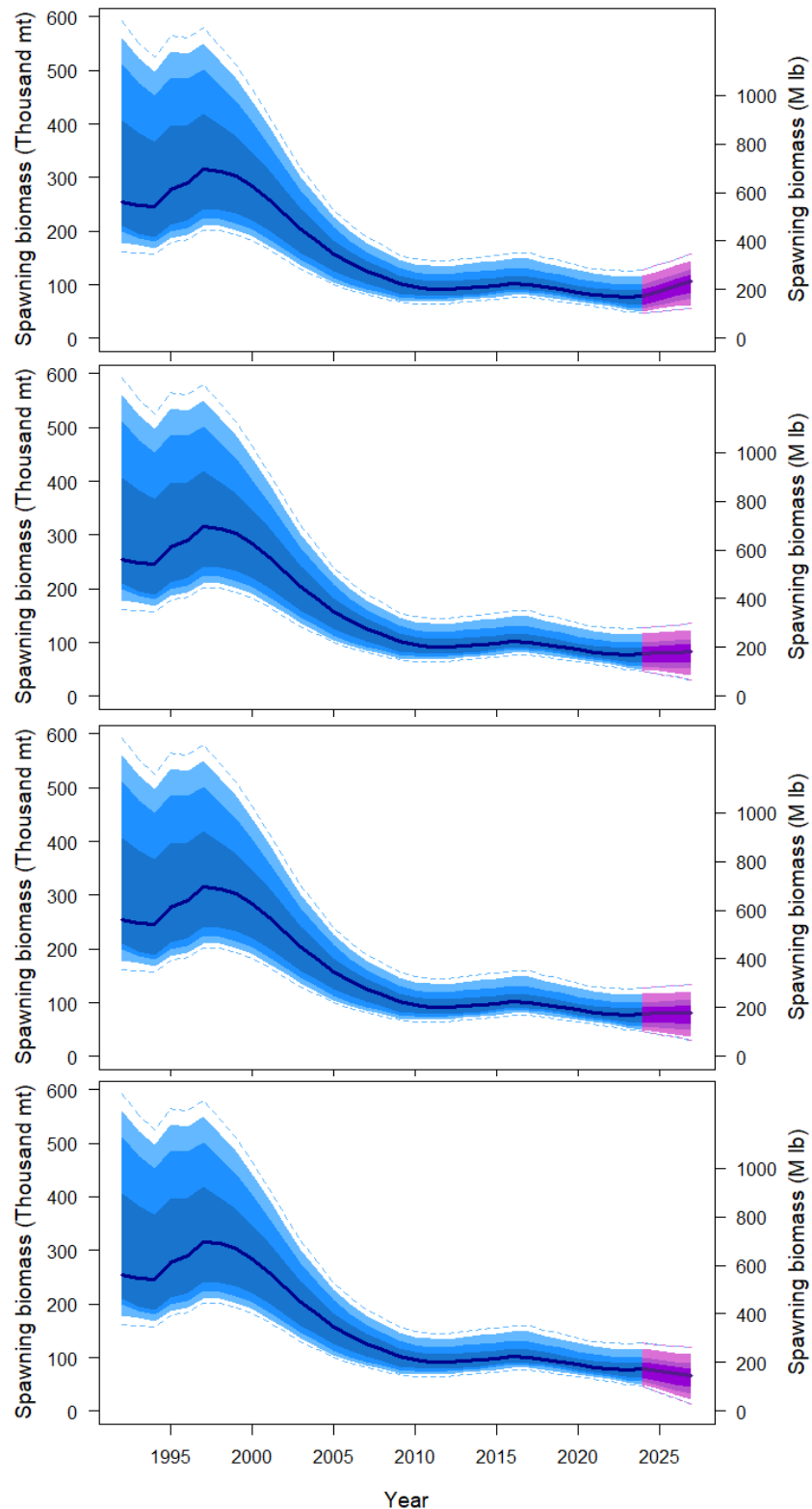
Spawning biomass estimates from the 2023 stock assessment are slightly lower (11%) than those in last year’s stock assessment, but the recent estimated trend is nearly flat. Updated estimates of the 2012 and 2014 year-classes (both larger than all those occurring from 2006-2011) show that these two year-classes will be highly important in the short-term stock projections as both will be maturing over the next several years. However, these two year-classes are insufficient to support short-term fishing mortality appreciably higher than the *status quo* without a decrease in spawning biomass. Risks tend to decrease slightly over the three-year period as both year-classes approach full maturity.

Projections indicate that the spawning biomass would increase relatively rapidly in the absence of any fishing mortality, with risks of stock decline over one and three years both less than 1/100 ([Table 1](#), [Figure 1](#)). At the *status quo* coastwide TCEY (36.97 million pounds; [Table 2](#)), risks of stock decline over one and three years are 45/100. For all harvest levels that exceed the three-year surplus (39.1 million pounds) risks of stock decline are larger than 50/100, and reaching 94/100 for the coastwide TCEY that is projected to correspond to the  $F_{35\%}$  MSY proxy harvest level in 2024. Alternative harvest levels around the *status quo* (+/- 5 and 10%) are projected to result in levels of fishing intensity ranging from  $F_{54\%}$  to  $F_{48\%}$ , similar to those estimated for 2020-2023. At the reference level of fishing mortality ( $F_{43\%}$ ) the 2024 coastwide TCEY is projected to be 48.9 million pounds (50.5 million pounds of mortality including U26 non-directed discard mortality). Stock decline over the next three years is projected to be very likely (72/100) at this level of fishing intensity. The probability of a reduction in the coastwide TCEY in order to maintain a fishing intensity no greater than  $F_{43\%}$  over the next three years is projected to be 52/100.

All projections result in a low probability of the relative spawning biomass dropping below the  $SB_{30\%}$  threshold over the next three years (8-26/100) and an even lower probability of dropping below the  $SB_{20\%}$  limit (<1-19%).

**Table 1.** Harvest decision table for 2024-2026 mortality limits. Columns correspond to yield alternatives and rows to risk metrics. Values in the table represent the probability, in “times out of 100” (or percent chance) of a particular risk.

2024 Alternative			Status quo -10%	Status quo -5%	Status quo	Status quo +5%	3-Year Surplus	Status quo +10%		Reference $F_{43\%}$	MEY proxy	MSY proxy			
Total mortality (M lb)	0.0	21.6	34.9	36.7	38.6	40.4	40.7	42.3	46.6	50.5	56.1	67.3			
TCEY (M lb)	0.0	20.0	33.3	35.1	37.0	38.8	39.1	40.7	45.0	48.9	54.5	65.7			
2024 fishing intensity	$F_{100\%}$	$F_{68\%}$	$F_{54\%}$	$F_{52\%}$	$F_{51\%}$	$F_{50\%}$	$F_{49\%}$	$F_{48\%}$	$F_{45\%}$	$F_{43\%}$	$F_{40\%}$	$F_{35\%}$			
Fishing intensity interval	--	46-79%	32-68%	31-67%	29-65%	28-64%	28-64%	27-63%	25-60%	23-58%	20-55%	17-50%			
<b>Stock Trend</b> (spawning biomass)	in 2024	is less than 2023	<1	7	35	40	45	50	51	55	66	74	85	96	a
		is 5% less than 2023	<1	<1	7	9	12	15	15	18	26	33	44	69	b
	in 2025	is less than 2023	<1	8	35	40	45	50	50	54	65	74	84	95	c
		is 5% less than 2023	<1	2	17	20	24	28	29	32	42	51	64	85	d
	in 2026	is less than 2023	<1	10	36	40	45	49	50	54	64	72	82	94	e
		is 5% less than 2023	<1	4	23	26	30	34	35	39	49	57	69	87	f
<b>Stock Status</b> (Spawning biomass)	in 2024	is less than 30%	25	25	25	25	25	25	25	26	26	26	26	26	g
		is less than 20%	<1	<1	1	2	2	2	2	2	3	4	5	9	h
	in 2025	is less than 30%	21	24	25	25	25	25	25	25	25	25	26	26	i
		is less than 20%	<1	<1	2	2	2	3	3	3	5	7	9	16	j
	in 2026	is less than 30%	8	21	24	25	25	25	25	25	25	25	26	26	k
		is less than 20%	<1	<1	2	2	3	3	3	4	6	8	12	19	l
<b>Fishery Trend</b> (TCEY)	in 2024	is less than 2023	0	<1	25	27	28	30	31	33	41	50	63	85	m
		is 10% less than 2023	0	<1	23	25	26	27	27	29	34	41	52	75	n
	in 2025	is less than 2023	0	1	25	26	28	30	31	33	42	51	65	87	o
		is 10% less than 2023	0	<1	22	24	26	27	27	29	35	42	55	78	p
	in 2026	is less than 2023	0	1	24	26	28	30	31	33	42	52	67	88	q
		is 10% less than 2023	0	<1	21	23	25	27	27	29	35	43	57	81	r
<b>Fishery Status</b> (Fishing intensity)	in 2023	is above $F_{43\%}$	0	<1	26	27	29	31	32	34	42	50	62	82	s



**Figure 1.** Three-year projections of stock trend under alternative levels of mortality: no fishing mortality (upper panel), the *status quo* coastwide TCEY set in 2023 (36.97 million pounds; second panel), the 3-year surplus (39.1 million pounds; third panel), and the TCEY projected for the  $F_{43\%}$  reference level of fishing intensity (48.9 million pounds, fourth panel) and the TCEY projected for the  $F_{35\%}$  MSY proxy level of fishing intensity (65.7 million pounds, bottom panel).

**Table 2.** Recent adopted TCEYs by IPHC Regulatory Area and coastwide (M lbs net).

Year	2A	2B	2C	3A	3B	4A	4B	4CDE	Total
2013	1.11	7.78	5.02	17.07	5.87	2.43	1.93	4.28	45.48
2014	1.11	7.64	5.47	12.05	3.73	1.56	1.49	3.58	36.65
2015	1.06	7.91	6.20	13.00	3.72	1.96	1.53	4.27	39.63
2016	1.26	8.24	6.54	12.75	3.41	1.95	1.37	4.07	39.59
2017	1.47	8.32	7.04	12.96	3.98	1.80	1.34	3.84	40.74
2018	1.32	7.10	6.34	12.54	3.27	1.74	1.28	3.62	37.21
2019	1.65	6.83	6.34	13.50	2.90	1.94	1.45	4.00	38.61
2020	1.65	6.83	5.85	12.20	3.12	1.75	1.31	3.90	36.60
2021	1.65	7.00	5.80	14.00	3.12	2.05	1.40	3.98	39.00
2022	1.65	7.56	5.91	14.55	3.90	2.10	1.45	4.10	41.22
2023	1.65	6.78	5.85	12.08	3.67	1.73	1.36	3.85	36.97

**RISKS NOT INCLUDED IN THE HARVEST DECISION TABLE**

The IPHC's current management procedure uses threshold and limit reference points in relative spawning biomass (current estimate compared to the spawning biomass estimated to have occurred in that year in the absence of any fishing mortality). This calculation measures the effects of fishing on the stock. Other factors affecting the spawning biomass (i.e., trends in recruitment and weight-at-age) have resulted in the absolute spawning biomass in 2023 estimated to be lower than at any time in the last 31 years. Although this does not represent a conservation concern at this time, low stock size results in additional risks to the IPHC's Fishery Independent Setline Survey (FISS) design objective of revenue neutrality and to fishery efficiency and economic viability. Further, the modelled FISS index in 2023 suggests that the stock distribution now shows the lowest proportion of the coastwide biomass in Biological Region 3 observed in the modern time-period (1992+). Finally, increased environmental/climate-related variability in the marine ecosystems comprising the Pacific halibut species range in Convention waters lead to little expectation that historical productivity patterns may be relevant for future planning. Specifically, it is unclear whether long-term productivity levels are likely to occur under continued climate change, or whether increases or decreases may be likely for critical life-history stages of Pacific halibut.

**ADDITIONAL INFORMATION**

An updated document for AM100 will include revisions based on end-of-year 2023 non-directed discard mortality estimates that affect the scale and distribution of projected 2024 mortality. This information will be available in early January.

Detailed stock assessment (IPHC-2024-SA-01) and data overview (IPHC-2024-SA-02) documents will be published directly to the [stock assessment page](#) on the IPHC's website.

**RECOMMENDATION/S**

That the Commission:

- a) **NOTE** paper IPHC-2023-IM099-12 Rev\_1, which provides a summary of projections and the harvest decision table for 2024-2026.
- b) **REQUEST** any additional harvest decision table alternatives for evaluation at AM100.
- c) **REQUEST** any detailed mortality projections<sup>2</sup> for 2024 (by IPHC Regulatory Area and fishery sector) for evaluation at AM100.

**REFERENCES**

IPHC. 2020. Report of the 96th Session of the IPHC Annual Meeting (AM096). Anchorage, Alaska, USA, 3-7 February 2020. IPHC-2020-AM096-R. 51 p.

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<sup>2</sup> Detailed projections will include revised non-directed discard estimates through the end of 2023, available in early January 2024.