



IPHC Harvest Strategy Policy

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PURPOSE

To provide the Commission with a draft of the interim Harvest Strategy Policy (HSP) **for adoption**, and to update the Commission with MSE results completed in 2025.

INTRODUCTION

A draft Harvest Strategy Policy (HSP) has been developed for adoption 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. Three Commissioner workshops were held throughout 2025 where the draft HSP was considered and subsequently updated. The recent draft HSP is provided in document IPHC-2025-IM101-11b Rev_1 where additions since the last Commissioner workshop are shown in red text.

MSAB AND SRB REQUESTS/RECOMMENDATIONS RELATED TO THE HSP

The 21st Session of the Management Strategy Advisory Board (MSAB021) was held on 13–15 May 2025 in Juneau, AK. The MSAB discussed many topics, including productivity regimes, objectives, and the draft HSP. The following subset of recommendations and requests is directly related to the HSP. Additional requests regarding management procedures (MPs) to investigate are not included here, although they would likely influence future updates to the HSP.

IPHC-2025-MSAB021-R, para. 34: *The MSAB **AGREED** that an objective to stay above a threshold based on a TCEY or minimum absolute historical spawning biomass (e.g. SB₂₀₂₄) may be useful to continue investigating at MSAB022.*

IPHC-2025-MSAB021-R, para. 43: *The MSAB **REQUESTED** that the Commission clarify the intent of the phrase “spatial and temporal scale relevant to the fishery” which is stated in the objective in the draft Harvest Strategy Policy (IPHC-2025-MSAB021-09) related to a threshold reference point, but is not in objective b) from AM099 (para. 16 above).*

IPHC-2025-MSAB021-R, para. 44: *The MSAB **RECOMMENDED** the following wording for the objectives in the Harvest Strategy Policy:*

- a) *maintain the long-term coastwide Pacific halibut female relative spawning biomass above a biomass limit reference point (RSB_{20%}) at least 95% of the time;*
- b) *maintain the long-term coastwide Pacific halibut female relative spawning biomass at or above a threshold reference point (RSB_{36%}) at least 50% of the time;*
- c) *subject to meeting the previous two objectives, maximise the sustainable coastwide yield while minimising annual changes in the coastwide mortality limit.*

There was also an informational session for the MSAB on 21 October 2025. Some discussions related to the HSP that occurred at this meeting included the following:

- *The MSAB discussed the concept of depleted and how it relates to overfished. They realised that it may have implications as a conservation tool and look forward to future research defining depleted and associated concepts.*
- *The MSAB feels that trace plots (e.g. “purple plots”) are useful for visualizing short- and long-term spawning biomass projections at given SPR values, along with trade-off plots that compare AAV and TCEY values at differing spawning biomass levels. The MSAB thinks that these will be useful to the Commission decision-making process, but suggests that the Commission be given an example and notified that additional plots at differing SPR levels can be produced as requested.*
- *The section on the rebuilding plan needs additional specification, including a) ensuring this section and other sections in the HSP are consistent (e.g. clarifications of fishing activities when at an overfished state), b) describing the actions for the directed fishery if the stock is declared overfished before a rebuilding plan is in place and when a rebuilding plan is implemented.*

The 26th Session of the Scientific Review Board (SRB026) took place in Seattle, WA, from 10-12 June 2025 and the 27th Session of the Scientific Review Board (SRB027) also took place in Seattle, WA, from 16-18 September 2025. A review of definitions of “Overfished” and “Overfishing” from other fishery management entities was provided by the Secretariat via presentation ([IPHC-2025-SRB026-08-Rev_1-ppt](#)). This led to the following recommendations from the SRB related to the HSP.

IPHC-2025-SRB026-R, para. 30: *NOTING that “Overfished” implies that fishing was the cause of a current biomass state while the term “Depleted” is agnostic about the cause of low biomass, the SRB **RECOMMENDED** that the Secretariat consider defining “Overfished” relative to a dynamic reference point that incorporates productivity change while “Depleted” should refer to an absolute biomass reference point.*

IPHC-2025-SRB026-R, para. 31. *The SRB **RECOMMENDED** that the Secretariat/Commission adopt an absolute biomass limit defining “Depleted” to avoid low*

biomass levels where stock dynamics are poorly understood such that recovery projections would be unreliable.

IPHC-2025-SRB026-R, para. 33. The SRB **RECOMMENDED** that the Secretariat evaluate via simulation the ability to detect overfishing (based on the proposed definition) under scenarios of reduced assessment performance when defining “Overfishing” based on probabilities of stock status.

IPHC-2025-SRB026-R, para. 34. The SRB **RECOMMENDED** that the Secretariat consider and justify alternative timelines to the three-year rebuilding period specified in the proposed definition of “overfishing” since a three-year period is probably unrealistic for rebuilding timelines.

IPHC-2025-SRB027-R, para. 18. The SRB **RECOMMENDED** that the definition of “overfishing” be tied to the Fmsy proxy rather than a probability of becoming overfished or depleted. This is a standard definition of overfishing and distinguishes it from the state of being overfished/depleted.

IPHC-2025-SRB027-R, para. 19. The SRB **NOTED** the definition of “overfishing” in the draft Harvest Strategy Policy and **RECOMMENDED** adopting the revised definition developed at SRB027 to align with the recommendation in [paragraph 18](#).

- a. **Overfishing:** When the annual fishing intensity is higher than the level required to sustain maximum sustainable yield (MSY). The MSY fishing intensity is currently FSPR=35% based on current understanding of Pacific halibut population dynamics and fishery characteristics. The MSY fishing intensity may be revised as new information becomes available.

IPHC-2025-SRB027-R, para. 20. The SRB **NOTED** the paragraphs describing “overfished” and “depleted” in the draft Harvest Strategy Policy and **RECOMMENDED** adopting the revised paragraphs developed at SRB027 which clarify these descriptions while retaining the intended meaning.

- a. Overfished is a relative limit reference point defining an unacceptably low ratio of spawning biomass to dynamic unfished spawning biomass that results from fishing alone rather than the combined effects of fishing and the environment. The dynamic unfished spawning biomass is that which would have occurred without any fishing given natural variability (e.g. recruitment deviations, changes in size-at-age, etc). Therefore, an overfished state may be fully mitigated by management actions.
- b. Depleted is an absolute limit reference point defined by a spawning biomass below which the potential for recovery is uncertain. Natural variability affects stock size

resulting in fluctuations of the spawning biomass, which along with fishing may result in a 'depleted' stock where reductions in fishing mortality may not lead to recovery without a change in the environmental conditions affecting the stock. Therefore, a depleted state may be only partially mitigated by management actions.

- c. Because overfished and depleted represent 'limit' reference points, the Commission may choose additional precautionary actions whenever needed, including when at, or approaching, either of these states.*

IPHC-2025-SRB027-R, para. 21. The SRB **RECOMMENDED** defining an “exceptional circumstance” if the stock is determined to be “depleted” as this state is unlikely to occur under the circumstances in which the HSP is implemented and may be indicative of a need for model revision.

SECRETARIAT RESPONSES TO MSAB AND SRB REQUESTS

Following work and analyses influenced by the above requests and recommendations, the IPHC Secretariat has modified the draft HSP. Below is a summary of that work.

Coastwide Objectives

The Commission previously defined four priority coastwide objectives, which have been consolidated into three objectives to highlight that maximising yield and minimising variability are considered without priority over each other. Edits to the HSP by the Commission following HSPWS01, with consideration of MSAB recommendations, resulted in the following wording for the three priority objectives.

1. Maintain the long-term coastwide Pacific halibut female relative spawning biomass above a biomass limit reference point where the risk to the stock is regarded as unacceptable (RSB_{20%}), at least 95% of the time;
2. Maintain the long-term coastwide Pacific halibut female relative spawning biomass, at least 50% of the time, at or above a threshold reference point that optimises fishing activities on a spatial and temporal scale relevant to the fishery (RSB_{36%});
3. Maximize the sustainable average coastwide yield while minimising annual changes in the coastwide mortality limit, given the constraints above.

One recommendation of the MSAB was to clarify the intent of the phrase “on a spatial and temporal scale relevant to the fishery” in previous versions of the second objective. This objective currently states “coastwide”, which implies a spatial scale. However, the spatial and temporal scale of the fishery when determining the appropriate reference point (e.g. MSY analyses) is important. The Secretariat believes that this statement is there to reflect the “current” fisheries across all areas and sectors and is clear by specifying coastwide.

Definitions of overfished and depleted

The SRB noted that Overfished implies that fishing was the cause of a low biomass state, whereas Depleted is agnostic about the cause of low biomass. Both definitions are important to fisheries management because managers control fishing to avoid precariously low biomass, but the population may be at low biomass for reasons that cannot be controlled by management yet may require management action to ensure recovery. The use of dynamic reference points allows for the separation of fishing effects from other effects on population size. A dynamic relative spawning biomass (as currently used by IPHC) is appropriate to determine if the population is overfished. An absolute spawning biomass is appropriate to determine if the population is at a low population state from which recovery could be compromised, which the SRB suggested calling Depleted following the New Zealand Harvest Strategy Standard¹.

Both Overfished and Depleted are important reference points to include in an HSP. A stock may be Depleted without being Overfished due to environmental conditions or may be Overfished without being Depleted due to high fishing rates. Continued high fishing rates when a stock is Overfished would likely lead to a Depleted stock, thus the HSP is designed to avoid a Depleted state with a high probability. The priority objectives in the IPHC HSP already contain a reference point to determine Overfished. This is $RSB_{20\%}$, using a dynamic relative spawning biomass, and the Secretariat suggests retaining the definition for Overfished that is currently in the draft HSP.

Overfished: when the estimated probability that coastwide female relative spawning stock biomass is below the limit reference point ($RSB_{20\%}$) is greater than 50%.

The SRB also recommended including a reference point based on an absolute spawning biomass to determine if the stock is Depleted, and recovery projections may be unreliable due to uncertain stock dynamics. This implies a spawning biomass below the lowest level observed from which the population is known to have recovered. The Secretariat has currently identified two possible approaches to identify an appropriate absolute spawning biomass reference point.

First, the Secretariat has been suggesting the lowest spawning biomass observed in the estimated time series from the ensemble stock assessment, which is 2024 according to the most recent stock assessment. The estimated spawning biomass in the 1970s is highly uncertain and may have been at similar levels seen in recent years. However, given that recent levels are known to be low with a much greater certainty, the Secretariat suggests using the 2023 or 2024 spawning biomass as this absolute reference point. The advantage of choosing a year to define the absolute reference point (or the lowest estimated spawning biomass in a range of years) is that it scales to changes in the stock assessment due to updates to data and new assumptions, and it accounts for the uncertainty. Although it is likely that the population will recover from the recent low period of spawning biomass, it has not been observed. Therefore, it is a challenge to

¹ <https://fs.fish.govt.nz/Doc/16543/harveststrategyfinal.pdf.ashx>.

determine the correct level relative to the lowest observed spawning biomass that should define Depleted.

Alternatively, simulation (via the MSE framework) could be used to determine a justifiable absolute spawning biomass reference point. To explore this, we simulated the Pacific halibut population forward at a high fishing rate for 40 years under a 'worst-case' scenario, assuming low weight-at-age, low PDO (defining poor recruitment and alternative movement), and a depensation parameter in the stock-recruit curve equal to 5. Depensation, or the Allee effect, is when recruitment is further depressed when the spawning biomass is very low. This may occur because of effects of environmental regimes, difficulties finding mates, low fertilization rates with reduced spawning output, or increased predation with smaller numbers. Depensation is not likely to have occurred at the spawning biomass levels observed for Pacific halibut, but previous research estimated a range of potential depensation levels (see [IPHC-2024-SRB025-07](#)). After 40 years, simulated fishing stops, except for 3 million pounds representing a small amount of bycatch and subsistence fishing, and the population is simulated forward another 50 years. A bifurcation point in the spawning biomass where trajectories either recover or stabilize and those that continue to decline is then determined.

All trajectories with a spawning biomass greater than 90 M lbs recovered and no trajectories recovered when starting at a spawning biomass less than 40 M lbs (see [IPHC-2025-SRB027-08](#) for details). A high proportion of the trajectories (greater than 50%) in the worst-case scenario recovered when above a spawning biomass near 70 M lbs. Additional simulations will be done to bolster this analysis after reconditioning the operating model following the final 2025 stock assessment.

The concept of these two reference points, Overfished and Depleted, is shown in [Figure 1](#). An example level for Depleted is shown, as it is not currently defined. Overfished is currently defined as 20% of unfished spawning biomass and changes over time when calculated as an absolute spawning biomass, depending on current stock conditions. Depleted is a constant absolute spawning biomass and varies in terms of relative spawning biomass.

Defining both Overfished and Depleted reference points in the IPHC HSP highlights the differences between natural fluctuations in the population due to extrinsic forces such as the environment, and the changes in the population due to fishing. Delineation of these factors is important to evaluate the efficacy of management actions; both factors can lead to low population sizes that should be avoided. The Commission will need to consider what response would be taken if a Depleted condition is approached, and the SRB suggested using Depleted to define an exceptional circumstance. The IPHC Secretariat will continue working to further specify Depleted in the HSP.

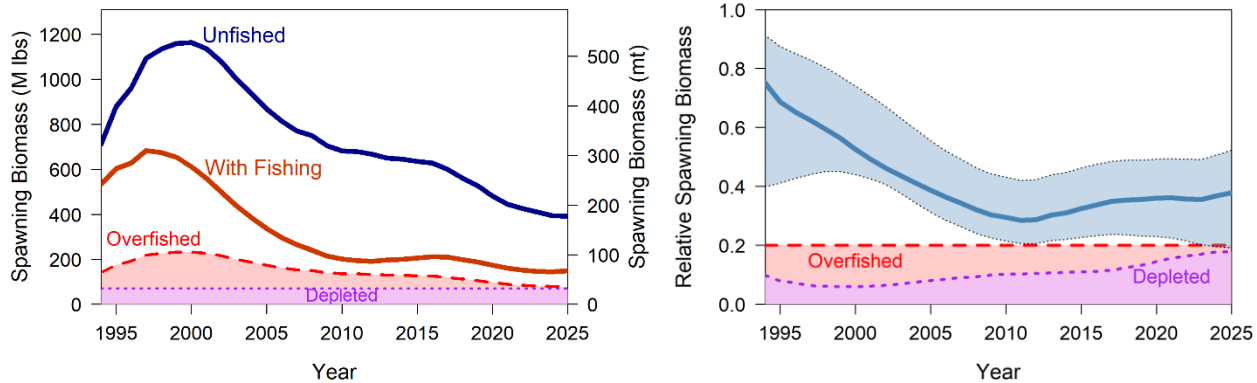


Figure 1. Estimated spawning biomass if fishing had not occurred (unfished) and estimated spawning biomass from the 2024 stock assessment (with fishing). The Overfished threshold of 20% of unfished spawning biomass is shown as a dashed line, and changes over time. An example “Depleted” threshold is shown as a straight horizontal line, assuming that it is defined as a constant absolute spawning biomass. The relative spawning biomass (“with fishing” divided by “unfished”) is shown on the right with a 95% credible interval (accounting for the covariance in the biomass estimated with and without fishing). The Overfished threshold is shown at 20% and the example Depleted value is shown in purple.

Definition of overfishing

The definition of Overfishing was incomplete in previous drafts of the HSP. Following the SRB’s recommendation, overfishing is defined as follows.

Overfishing: when the annual fishing intensity is higher than the level required to sustain maximum sustainable yield (MSY). The MSY fishing intensity is currently $F_{SPR}=35\%$ based on current understanding of Pacific halibut population dynamics and fishery characteristics. The MSY fishing intensity may be revised as new information becomes available

Effects of productivity regimes on the HSP

Pacific halibut exhibit high variability in weight-at-age and recruitment. Over the past 100 years, the average weight of an age 12 Pacific halibut has ranged from below 20 pounds in recent years to near 40 pounds in the mid-1970’s (Figure 2). In the last ten years, the weight of the oldest fish has been declining or stable, but the weight of younger fish has been increasing. Recruitment is variable as well, and 1987 was one of the largest recruitments on record, as estimated in both ‘long time-series’ assessment models (Figure 3). These two models in the IPHC stock assessment (IPHC-2025-SA-01) estimated a link between the Pacific Decadal Oscillation (PDO, Mantua et al. (1997)) and average unfished equilibrium recruitment (R_0), with an estimated average recruitment more than 50% greater during a positive PDO. Previous analyses (Clark and Hare 2002; Stewart and Martell 2016) have also

shown that a positive PDO phase is correlated with enhanced productivity, while productivity decreases in negative PDO phases. Although the PDO is strongly correlated with historical recruitments, it is unclear whether the effects of climate change and other recent anomalous conditions in both the Bering Sea and Gulf of Alaska are comparable to those observed in previous decades (Litzow et al. 2020).

To investigate the effects of these low and high weight-at-age and recruitment regimes, different scenarios were defined from past observations and the population was projected 70 years with an SPR of 43%, assuming constant weight-at-age and average recruitment defined by the scenario. Three levels were developed for weight-at-age: low weight-at-age was defined from a five-year period in the 2010s, high weight-at-age was defined from a five-year period in the 1970s, and current weight-at-age was defined as the most recent five-years (Figure 2). These three weight-at-age levels show different patterns and although the low weight-at-age and current weight-at-age scenarios were both low in general, they differed between the weight of young fish and older fish. The current weight-at-age scenario had larger young fish but smaller older fish. High and low recruitment regimes were defined based on the stock assessment estimates of average recruitment in positive and negative PDO regimes. The PDO also affects movement and distribution of newly recruited (age-0) Pacific halibut. Overall, there were six scenarios crossing current, low, and high weight-at-age with low and high PDO.

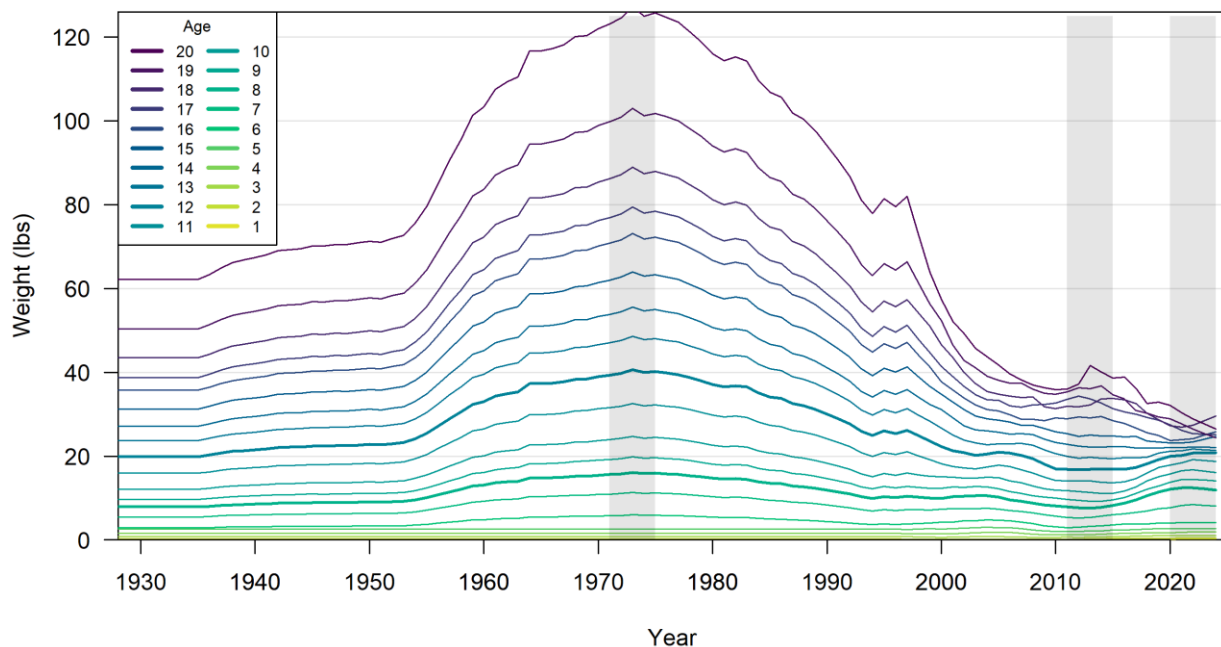


Figure 2. Average historical weight of Pacific halibut for ages one to twenty. Gray bands show three blocks of five years classified as *high* (1970s), *low* (2010s) and *current* (recent).

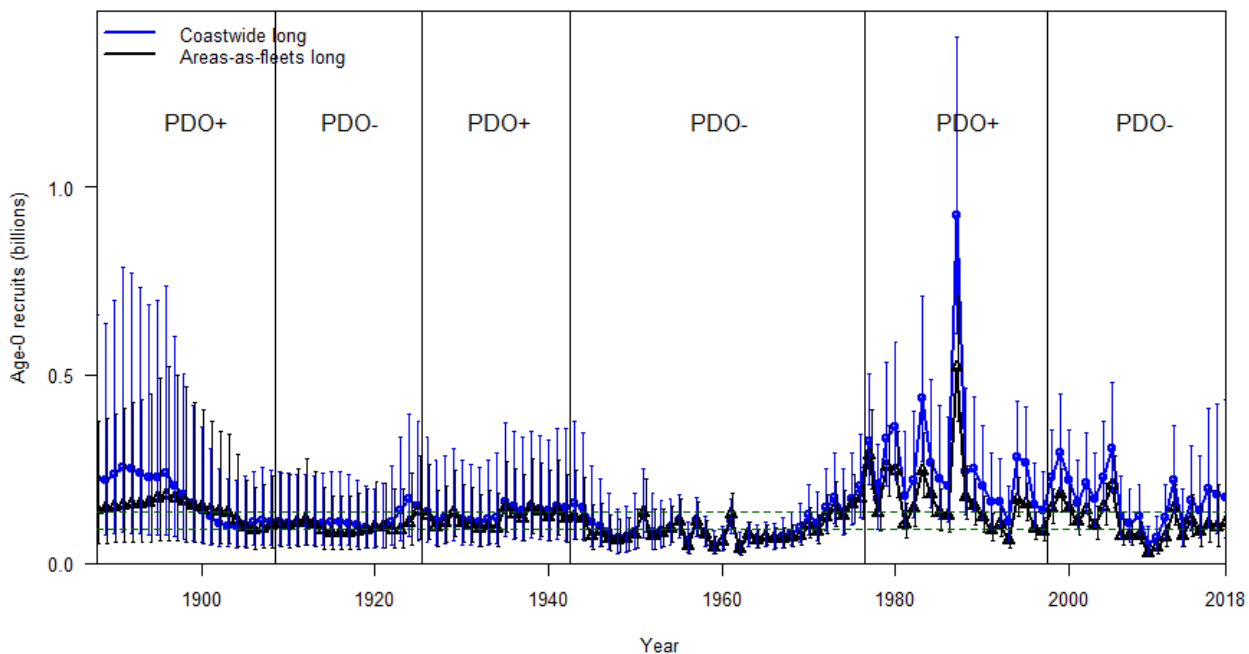


Figure 3. Trend in historical recruitment strengths (by birth year) estimated by the two long time-series stock assessment models, including the effects of the Pacific Decadal Oscillation (PDO) regimes. Figure reproduced from [IPHC-2025-SA-01](#).

The spawning biomass differed substantially across different scenarios, but the high weight-at-age scenarios showed a considerable higher spawning biomass than the others (Figure 4). The sudden increase in the spawning biomass when the projections began indicates that weight-at-age is an important driver to the spawning biomass in both the current year and future years. Average recruitment had a significant effect as well but lagged in its effect on the spawning biomass since the fish must age into the spawning biomass. The differences due to average recruitment were more prevalent with higher weight-at-age. For a given recruitment regime, the current weight-at-age scenario resulted in a smaller spawning biomass than the low weight-at-age scenario. This indicates the importance of the older fish in the spawning biomass.

Simulated TCEYs showed the same pattern for high weight-at-age, but different patterns for low and current weight-at-age scenarios (Figure 4). Weight-at-age and recruitment both had a very large effect on the TCEY with the high weight-at-age and high recruitment scenario supporting TCEYs near 120 Mlb and the high weight-at-age and low recruitment scenario supporting TCEYs near 75 Mlb. The low and current weight-at-age scenarios resulted in TCEYs in the range of 30 to 60 Mlb, on average. The TCEY showed a different pattern in the low and current weight-at-age scenarios when compared to the spawning biomass. The TCEY was higher for the current weight-at-age scenario while the spawning biomass was higher for the low weight-at-age scenario. Young Pacific halibut are more influential to the TCEY than to the spawning biomass because some are selected by the fishery before they become mature.

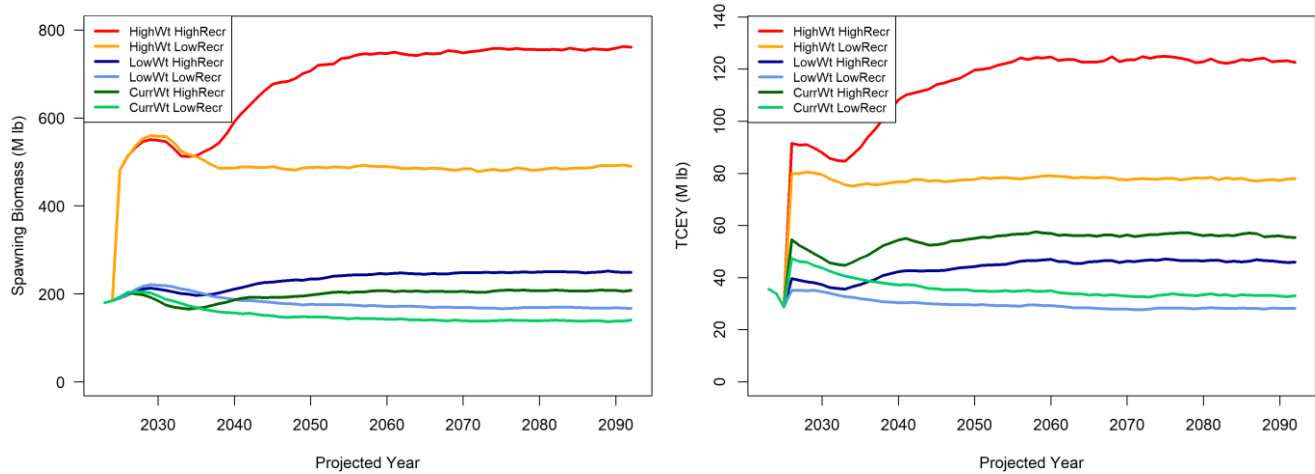


Figure 4. Simulated projections of spawning biomass (left) and TCEY (right) assuming six different regimes for combinations of weight-at-age and recruitment and an SPR of 43%. Each projection held the weight-at-age and average recruitment at the defined level for all projected years.

Pacific halibut have been in what can be called a low productivity period (e.g. low weight-at-age and low recruitment) for at least the last 15 years. MSE simulations assume that weight-at-age will likely increase and the PDO will soon switch to a positive regime, therefore spawning biomass and the TCEY are likely to increase in the simulated near future. However, simulations assuming that weight-at-age remains similar to the recent 5 years (current weight) and the PDO remains in a negative regime (low recruitment) show a potential further decline in the spawning biomass (Figure 5). The plot in Figure 5 is what the MSAB referred to as trace plots (e.g. purple plots).

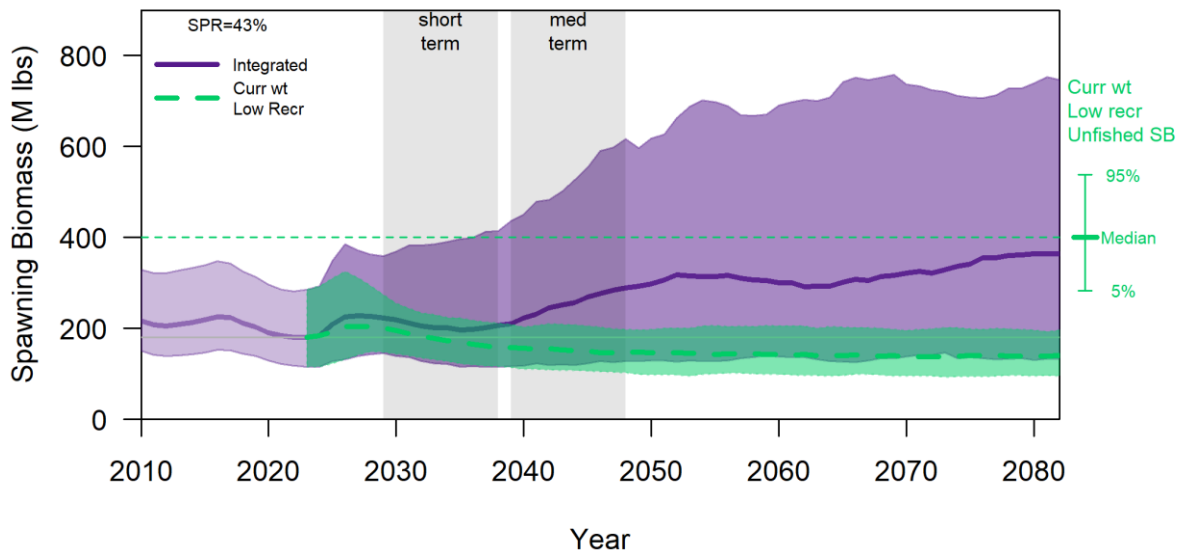


Figure 5. Simulated spawning biomass when fishing at an SPR=43% fishing intensity for productivity integrated over low and high levels (purple) and productivity assumed to remain at recent low levels (green). The 2023 median spawning biomass is shown as a horizontal grey line for reference, and the range of unfished spawning biomass for the low productivity scenario is shown on the right.

REFERENCE FISHING INTENSITY

The effect of the productivity regime on the optimal fishing intensity was investigated by conducting MSE simulations across various SPR values assuming a low productivity scenario (i.e. current weight-at-age and negative PDO) and comparing the performance metrics associated with the four priority objectives to the MSE results integrating over changes in weight-at-age and cyclical PDO. The probability that the short-term spawning biomass will be less than the spawning biomass in 2023 was also compared for both sets of simulations (Table 1). The median TCEY is less for the low productivity scenario and the AAVs slightly higher. The probability that the relative spawning biomass is less than 36% is also higher for the low productivity scenario and this performance metric is not met with an SPR of 40%. The short-term probability of being below the 2023 spawning biomass is also higher for the low productivity scenario with an approximate 1 in 2 chance for the low productivity scenario with an SPR of 43% versus an approximate 1 in 3 chance with integrated productivity.

The trade-offs between the TCEY and variability in the TCEY (AAV) are similar for the integrated productivity and low productivity scenario. There are slight differences between the AAVs at different fishing intensities with the lowest AAVs occurring between SPRs of 43% and 52%. The AAV increased at a faster rate for lower SPRs in the low productivity scenario than when integrating productivity. However, the TCEY increased by approximately 1 M lbs per every 1% reduction in SPR. Further defining what an optimal fishery is would help evaluate this trade-off.

Table 1. Performance metrics for different SPR values and simulations integrating over changes in weight-at-age and cyclical PDO and assuming a recent (i.e. low) productivity scenario (i.e. current weight-at-age and negative PDO). Green colors indicate that the performance metrics passes and red indicates that it does not.

| Integrated (low & high) Productivity | | | | | | |
|--------------------------------------|--------|--------|--------|--------|--------|--------|
| SPR (%) | 40 | 43 | 46 | 49 | 52 | 55 |
| P(RSB<20%) | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| P(RSB<36%) | 0.372 | 0.195 | 0.066 | 0.014 | 0.001 | <0.001 |
| Median TCEY | 55.0 | 52.0 | 48.9 | 45.9 | 42.5 | 39.1 |
| AAV | 28.5% | 26.3% | 25.6% | 25.5% | 26.0% | 26.7% |
| Short-term | | | | | | |
| P(SB < SB ₂₀₂₃) | 0.401 | 0.350 | 0.297 | 0.254 | 0.214 | 0.179 |

| Recent (low) Productivity | | | | | | |
|-----------------------------|--------|--------|--------|--------|--------|--------|
| SPR (%) | 40 | 43 | 46 | 49 | 52 | 55 |
| P(RSB<20%) | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| P(RSB<36%) | 0.677 | 0.462 | 0.236 | 0.081 | 0.016 | <0.001 |
| Median TCEY | 43.5 | 41.2 | 38.7 | 36.1 | 33.3 | 30.6 |
| AAV | 29.0% | 28.3% | 27.7% | 28.3% | 29.2% | 30.3% |
| Short-term | | | | | | |
| P(SB < SB ₂₀₂₃) | 0.609 | 0.543 | 0.466 | 0.390 | 0.312 | 0.241 |

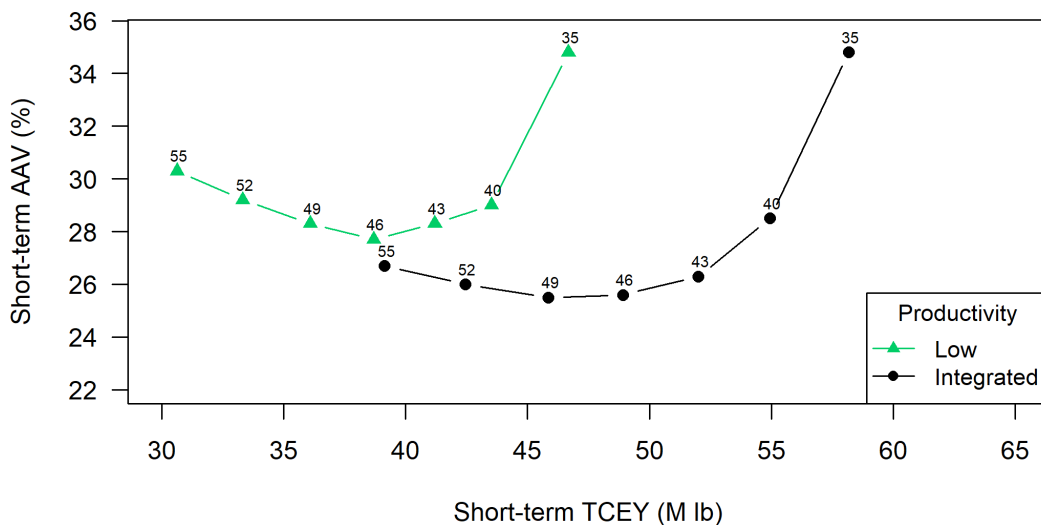


Figure 6. Trade-off between variability in the TCEY (AAV) and the TCEY for different fishing intensities (SPR labelling the points) when integrating over a range of productivity from low to high (black circles) and consistent low productivity similar to recent observations (green triangles).

RECOMMENDATION/S

That the Commission:

- 1) **NOTE** paper IPHC-2025-IM101-11a Rev_1 that provides an updated draft interim Harvest Strategy Policy and a description of how productivity regimes affect the optimal fishing intensity.
- 2) **ADOPT** the IPHC Harvest Strategy Policy (IPHC-2025-IM101-11b Rev_1), noting that updates to the reference fishing intensity and the definition of depleted may occur in 2026 following further work by the Secretariat.

SEE ALSO

IPHC-2025-IM101-11b: International Pacific Halibut Commission Interim: Harvest Strategy Policy (2025)