



Interim: IPHC Harvest Strategy Policy

PREPARED BY: IPHC SECRETARIAT (A. HICKS, I. STEWART, & D. WILSON; 29 SEPTEMBER 2024)

PURPOSE

To provide the Management Strategy Advisory Board (MSAB) with a draft of the interim Harvest Strategy Policy (HSP).

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 MSE process at IPHC and identifies areas that are incomplete. The Commission will review the HSP at the 100th Session of the Interim Meeting (IM100) and it will be updated as needed.

RECOMMENDATION/S

That the MSAB

- 1) **NOTE** paper IPHC-2024-MSAB020-07 presenting a draft interim Harvest Strategy Policy.
- 2) **RECOMMEND** edits to the draft interim Harvest Strategy Policy.

APPENDICES

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

APPENDIX A
INTERNATIONAL PACIFIC HALIBUT COMMISSION
INTERIM: HARVEST STRATEGY POLICY
(2024)

INTERNATIONAL PACIFIC



HALIBUT COMMISSION

Commissioners

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

Executive Director

David T. Wilson, Ph.D.

DISTRIBUTION:

Members of the Commission
IPHC Secretariat

BIBLIOGRAPHIC ENTRY

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

The designations employed and the presentation of material in this publication and its lists do not imply the expression of any opinion whatsoever on the part of the International Pacific Halibut Commission (IPHC) concerning the legal or development status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries.

This work is protected by copyright. Fair use of this material for scholarship, research, news reporting, criticism or commentary is permitted. Selected passages, tables or diagrams may be reproduced for such purposes provided acknowledgment of the source is included. Major extracts or the entire document may not be reproduced by any process without the written permission of the Executive Director, IPHC.

The IPHC has exercised due care and skill in the preparation and compilation of the information and data set out in this publication. Notwithstanding, the IPHC, its employees and advisers, assert all rights and immunities, and disclaim all liability, including liability for negligence, for any loss, damage, injury, expense or cost incurred by any person as a result of accessing, using or relying upon any of the information or data set out in this publication, to the maximum extent permitted by law including the International Organizations Immunities Act.

Contact details:

International Pacific Halibut Commission
2320 W. Commodore Way, Suite 300
Seattle, WA, 98199-1287, U.S.A.
Phone: +1 206 634 1838
Fax: +1 206 632 2983
Email: secretariat@iphc.int
Website: <https://www.iphc.int/>

NOTE: The following is an interim document based on an amalgamation of current IPHC practices and best practices in harvest strategy policy. 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	6
Chapter 1 Introduction	8
1.1 Scope	8
1.2 What is a Harvest Strategy Policy (HSP)?	9
1.3 What is a Harvest Strategy?.....	9
Chapter 2 Objectives and Key Principles	11
Chapter 3 Development of the Harvest Strategy	12
3.1 Accounting for fishing mortality on all sizes and from all sources	12
3.2 Variability in the environment and biological characteristics	12
3.3 Monitoring Standards	12
3.4 Establishing and applying decision rules.....	13
3.5 Balancing risk, cost and catch	13
3.6 Reference points and proxies.....	13
3.7 Technical evaluation of the harvest strategy	14
3.8 Re-evaluating the harvest strategy and management procedure.....	14
Chapter 4 Applying the harvest strategy	16
4.1 Coordinated management of domestic stocks	16
4.2 Coordinated management of international stocks.....	16
4.3 Stock assessment	16
4.4 Coastwide mortality limit	16
4.5 Rebuilding if the stock becomes overfished.....	17
4.6 Mortality limits for each IPHC Regulatory Area	18
4.7 Stakeholder and scientific input	18
4.8 Annual process	19

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;

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).

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

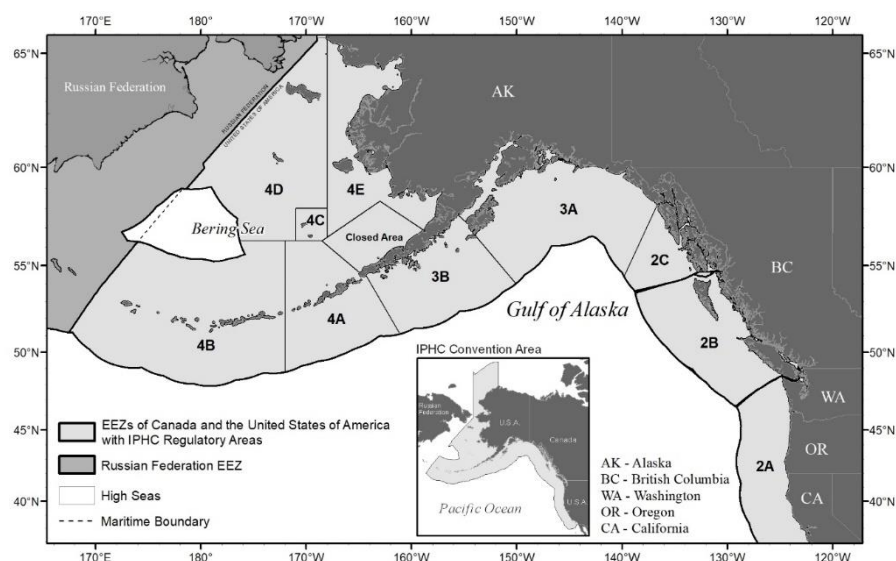


Figure 1. IPHC Regulatory Areas, where 4C, 4D, 4E, and the closed area are considered one IPHC Regulatory Area (4CDE). The IPHC Convention Area is shown in the inset.

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.

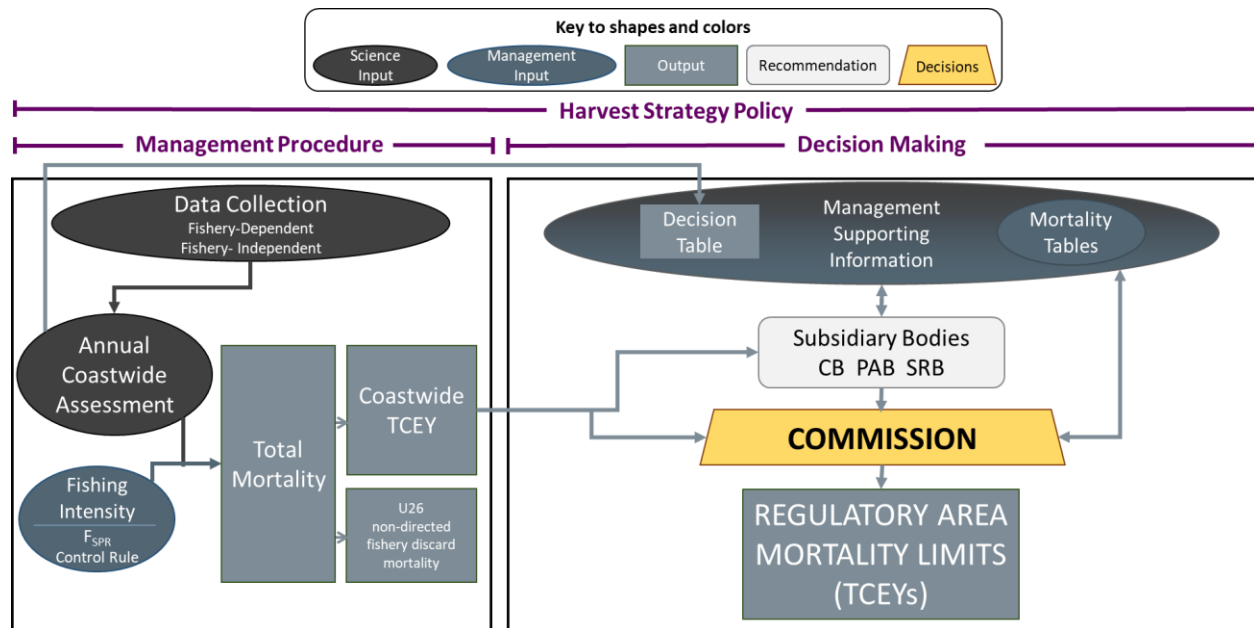


Figure 2. Illustration of the interim IPHC harvest strategy policy process to determine mortality limits showing the management procedure affecting the coastwide scale and the decision-making component, that considers inputs from many sources to distribute the coastwide TCEY to IPHC Regulatory Areas 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 in order to manage the risk. Decisions about investment in managing risk versus the economic return of the catch taken will be transparently made, clearly documented and publicly available.

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.

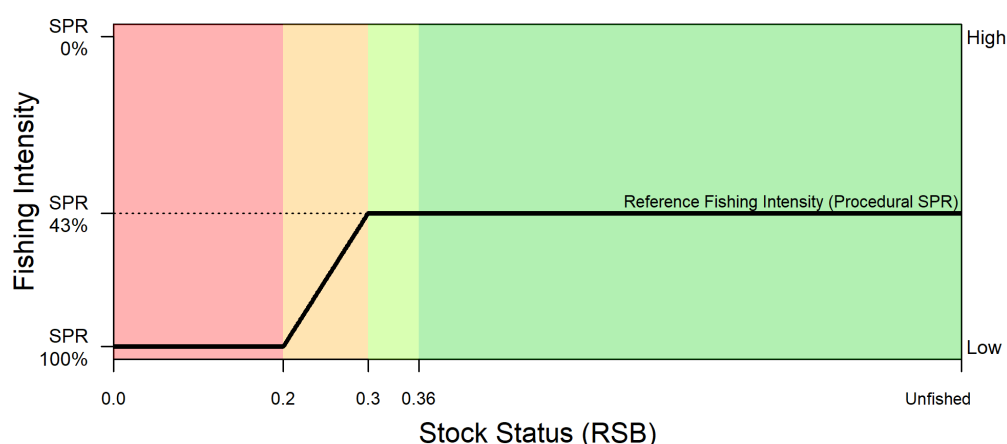


Figure 3. Harvest control rule for the fishing intensity (i.e. F_{SPR}) to determine the coastwide total mortality limit. The stock status is the dynamic relative spawning biomass (RSB) determined from the stock assessment. The reference fishing intensity is $F_{SPR=43\%}$, and is applied when stock 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 to 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.