INTERNATIONAL PACIFIC

HALIBUT COMMISSION

IPHC Management Strategy Evaluation and Harvest Strategy Policy: FOR DECISION

Agenda Item 7.1

IPHC-2023-AM099-13

(A. Hicks)

MSE Program of Work 2021-2023

IPHC-2021-MSE-02

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

MSE Program of Work 2021-2023

IPHC-2021-MSE-02

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F.1	Framework	Develop migration scenarios	Develop OMs with alternative migration scenarios
F.2	Framework	Implementation variability	Incorporate additional sources of implementation variability in the framework
F.3	Framework	Develop more realistic simulations of estimation error	Improve the estimation model to more adequately mimic the ensemble stock assessment
F.5	Framework	Develop alternative OMs	Code alternative OMs in addition to the one already under evaluation.

- OM has been reviewed by SRB
- Decision-making variability included in these results
- May be updated to align with newest stock assessment results

Evaluation

ID	Category	Task	Deliverable
E.3	Evaluation	Presentation of results	Develop methods and outputs that are useful for presenting outcomes to stakeholders and Commissioners

- MSE-Explorer
- Independently evaluate size limits and multi-year MPs
- Focus on priority coastwide objectives in this presentation

Priority Coastwide Objectives (order of importance)

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 a female spawning stock biomass above a biomass limit reference point at least 95% of the time	SB < Spawning Biomass Limit (SB_{Lim}) SB_{Lim}=20% unfished spawning biomass	Long-term	0.05	$P(SB < SB_{Lim})$ PASS/FAIL
2.1 Maintain spawning biomass around a level that optimizes fishing activities	Maintain the coastwide female spawning biomass above a biomass target reference point at least 50% of the time	SB<Spawning Biomass Target (SB_{Targ}) SB_{Targ}=36% unfished spawning biomass	Long-term	0.50	$P(SB < SB_{Targ})$
2.3. Provide Directed Fishing Yield	Optimize average coastwide TCEY	Median coastwide TCEY	Short-term		Median $\overline{TCEY}$
2.2. Limit Variability in Mortality Limits	Limit annual changes in the coastwide TCEY	Median coastwide Average Annual Variability (AAV)	Short-term		Median AAV

Objective 2.1

General Objective	Measurable Objective	Measurable Outcome	Time-frame	Tolerance
2.1 Maintain spawning biomass around a level that optimizes fishing activities	Maintain the coastwide female spawning biomass above a biomass target reference point at least 50% of the time	SB<Spawning Biomass Target (SB_{Targ}) SB_{Targ}=$SB_{36\%}$ unfished spawning biomass	Long-term	0.50

- Suggest "at or above a biomass target"
  - ***Canadian Fisheries Act § 6.1 (1)***: *[…] maintain major fish stocks at or above the level necessary to promote the sustainability of the stock […]*
  - ***U.S. Magnusson-Stevens Act § 600.310 (e)(3)(i):*** *[…] long term average biomass is near or above Bmsy […]*

Suggestion for Objective 2.1

General Objective	Measurable Objective	Measurable Outcome	Time-frame	Tolerance
2.1 Maintain spawning biomass at or above a level that optimizes fishing activities	Maintain the coastwide female spawning biomass at or above a biomass target reference point ~~at least~~ 50% or more of the time	SB<Spawning Biomass Target (SB_{Targ}) SB_{Targ}=$SB_{36\%}$ unfished spawning biomass	Long-term	0.50

Size limits

ID	Category	Task	Deliverable
M.1	MPs	Size limits	Identification, evaluation of size limits

IPHC-2022-AM098-R, para 61: *The Commission RECALLED SS011-Rec.01 and REQUESTED that the current size limit (32 inches), a 26 inch size limit, and no size limit be investigated to understand the long-term effects of a change in the size limit*

- Investigate various size limits
  - **32 inch (current) size limit (81.3 cm)**
  - **26 inch size limit (66.0 cm)**
  - **No size limit**

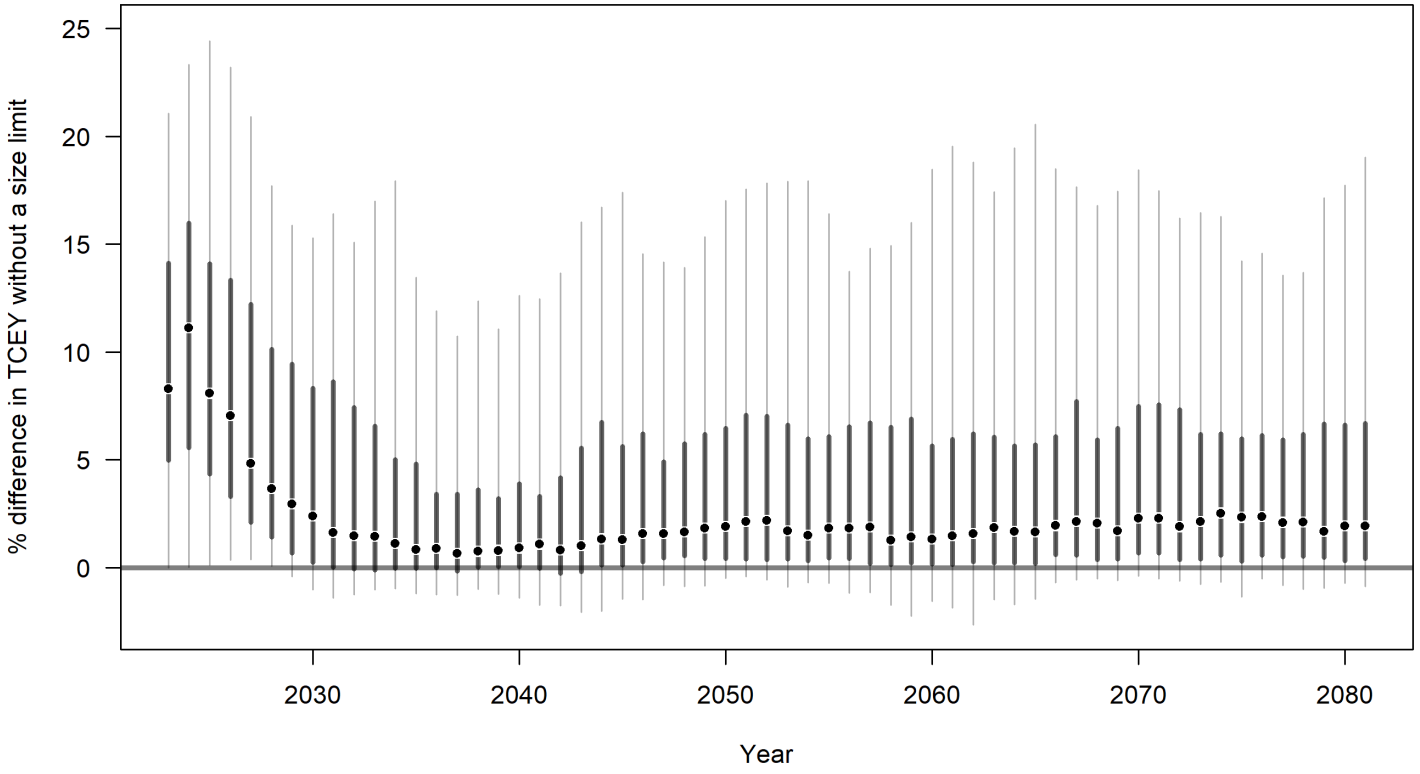
MSE framework updated to accommodate any size limit and produce meaningful outputs of directed commercial discard mortality

Size Limits: Coastwide objectives

MP name	MP-A0	MP-A26	MP-A32
Assessment Frequency	Annual	Annual	Annual
Size Limit	**0**	**26**	**32**
SPR	0.43	0.43	0.43
Biological Sustainability			
P(any RSB_y<20%)	PASS	PASS	PASS
Fishery Sustainability			
P(all RSB<36%)	0.174	0.174	0.180
Median average TCEY	60.5	59.9	58.3
Median AAV TCEY	17.2%	17.5%	17.8%

- Meets Biological Sustainability
- Slightly lower biomass with 32-inch size limit
- Slightly less variability without a size limit
- 3.7% increase in TCEY without a size limit
  - 2.7% increase with a 26-inch

Size Limit: Long-term yield



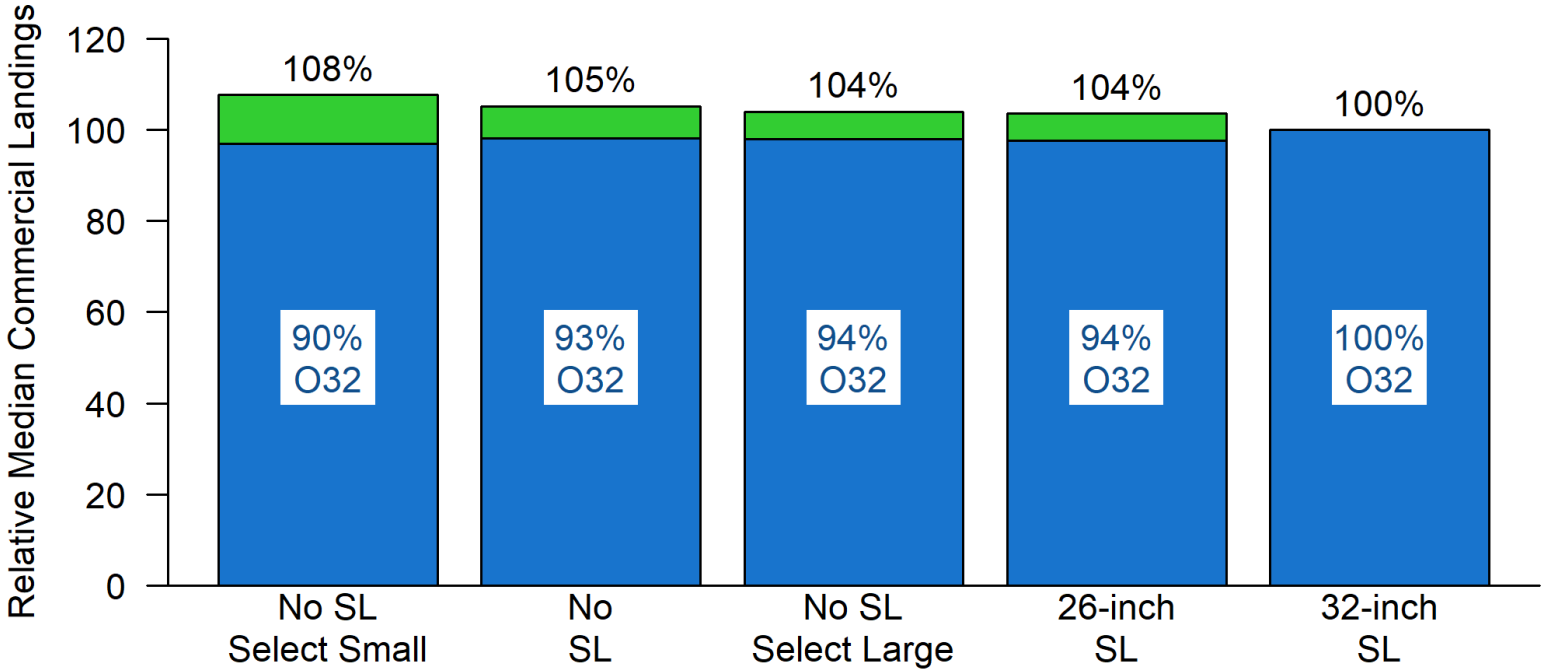
Gains are dependent on stock conditions

95th percentile
75th percentile
50th percentile (median)
25th percentile
5th percentile

Size Limits: Other Outcomes

- Similar results across IPHC Regulatory Areas
  - Percent increase in TCEY range from 4.0-5.9% (except 2A)
- Higher fishing intensity
  - Larger percent increase when removing the size limit
- Targeting smaller or larger fish and no size limit
  - Reduced gains as target larger fish, but still gains
- Coastwide 78% decrease in directed commercial discard mortality
  - 0.76 Mlbs to 0.16 Mlbs

Size Limits: Proportion of U32 in landings

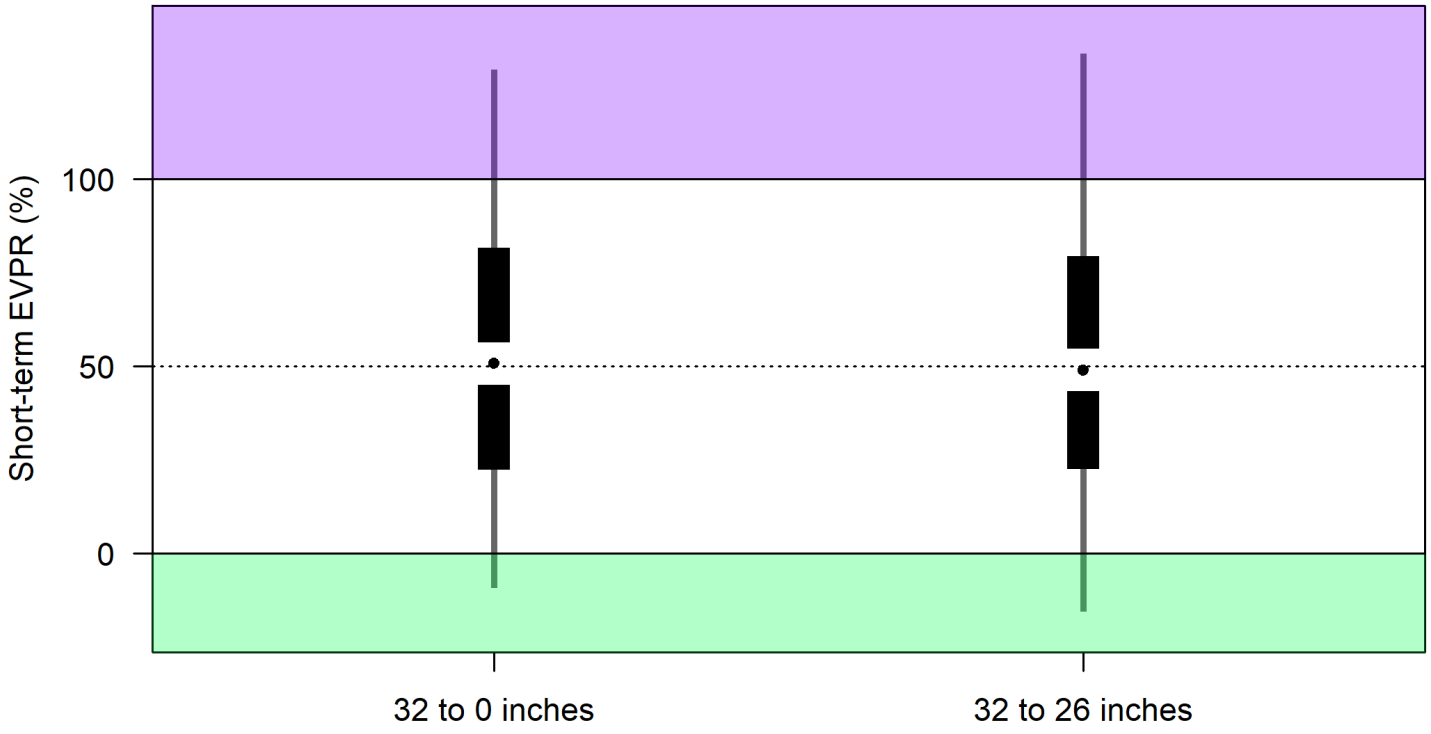


- Percent increase in U32 commercial mortality limit is greater than total increase in mortality limit

Size Limits: Equal Value Price Ratio

- U32 may be a lower price/lb than O32
  - An increase in U32 landings could result in a decrease in value of the fishery
- Price ratio is the PriceU32/PriceO32
  - U32 price was 88% of O32 price in 2022 FISS sales
  - Above 80% in last 4 years
- Equal Value Price Ratio (EVPR)
  - The price ratio that would result in an equal value of the fishery

Size Limits: EVPR



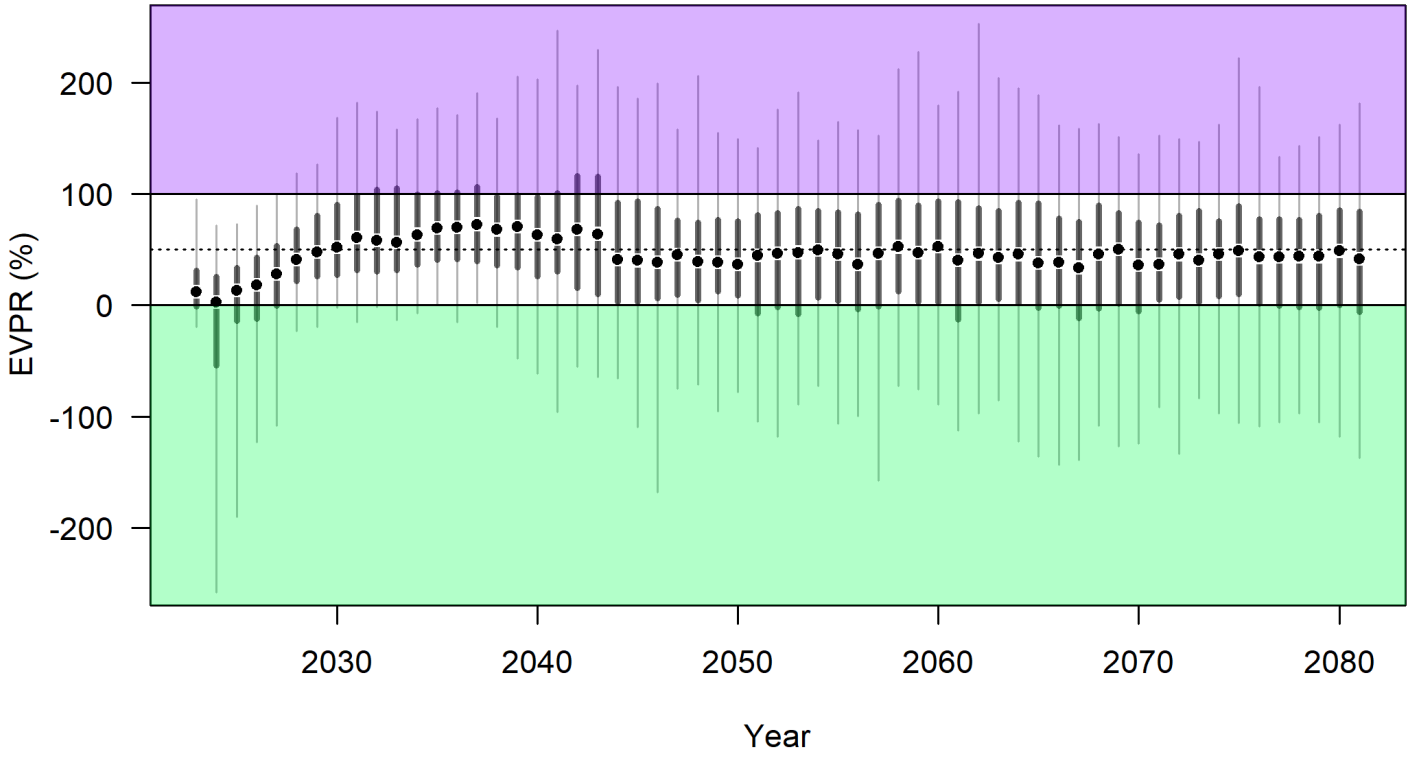
U32 price must be greater than O32 price

U32 price a fraction of O32

U32 price not important to value

95th percentile
75th percentile
50th percentile (median)
25th percentile
5th percentile

Size Limit: Long-term EVPR



Equal Value Price Ratio depends on stock conditions

95th percentile
75th percentile
50th percentile (median)
25th percentile
5th percentile

Multi-year stock assessment

ID	Category	Task	Deliverable
M.3	MPs	Multi-year assessments	Evaluation of multi-year assessments

IPHC-2022-AM098-R, para 64: *The Commission REQUESTED that multi-year management procedures include the following concepts:*

a) The stock assessment occurs biennially (and possibly triennial if time in 2022 allows) and no changes would occur to the FISS (i.e. remains annual);

b) The TCEY within IPHC Regulatory Areas for non-assessment years:

i. remains the same as defined in the previous assessment year, or

ii. changes within IPHC Regulatory Areas using simple empirical rules, to be developed by the IPHC Secretariat, that incorporate FISS data

FISS remains an annual survey

MPs: Multi-year stock assessment

MP name	MP-A32	MP-Ba32	MP-Bb32	MP-Bc32	MP-Tb32
Assessment Frequency	Annual	Biennial			Triennial
Size Limit	32 inches				
Empirical Rule	--	a	b	c	b
SPR	0.43				

Recommended empirical rule for non-assessment years

b) Multi-year stock assessment with coastwide TCEY updated proportionally to coastwide FISS index and distribution of TCEY updated via distribution procedure

Other alternatives

a) Multi-year stock assessment with constant TCEY for IPHC Regulatory Areas

c) Multi-year stock assessment with coastwide TCEY constant and distribution of TCEY updated via distribution procedure

Multi-year: Coastwide objectives

MP name	MP-A32	MP-Ba32	MP-Bb32	MP-Bc32	MP-Tb32
Assessment Frequency	**Annual**	**Biennial**			**Triennial**
Size Limit	**32 inches**				
Empirical Rule	**--**	**a**	**b**	**c**	**b**
SPR	**0.43**				
Biological Sustainability					
P(any RSB_y<20%)	PASS	PASS	PASS	PASS	PASS
Fishery Sustainability					
P(all RSB<36%)	0.180	0.164	0.164	0.168	0.197
Median average TCEY	58.3	57.8	58.5	57.7	58.3
Median AAV TCEY	17.8%	13.2%	17.0%	13.2%	14.1%

Constant TCEY less on average (a & c)

- Smallest variability

TCEY based on FISS is similar (b)

- Slight decrease in variability with biennial,
- Lowest variability with triennial

Multi-year: other outcomes

- Similar outcomes across Regulatory Areas
  - Significant decrease in variability with Triennial frequency
- Similar outcomes with increased fishing intensity
  - SPR=40% results in RSB closer to 36% target

Multi-year: Costs

a) Detailed management information is not available every year
   - e.g. stock status

b) A slightly higher chance of a smaller stock size
   - Only being below 36% target

c) The TCEY in non-assessment years may not follow stock trends
   - for options with a constant TCEY across non-assessment years; (a) and (c)

d) Potentially a small loss in yield
   - for options with a constant TCEY across non-assessment years; (a) and (c)

e) Potentially may not meet distribution agreements, if any
   - only for option ‘a’

Multi-year: Benefits

a) Reduced inter-annual variability in the TCEY

b) Multi-year stability and short-term predictability of the TCEY

c) Use of annual FISS index in a transparent process to determine the TCEY in non-assessment years

d) More focused assessment research

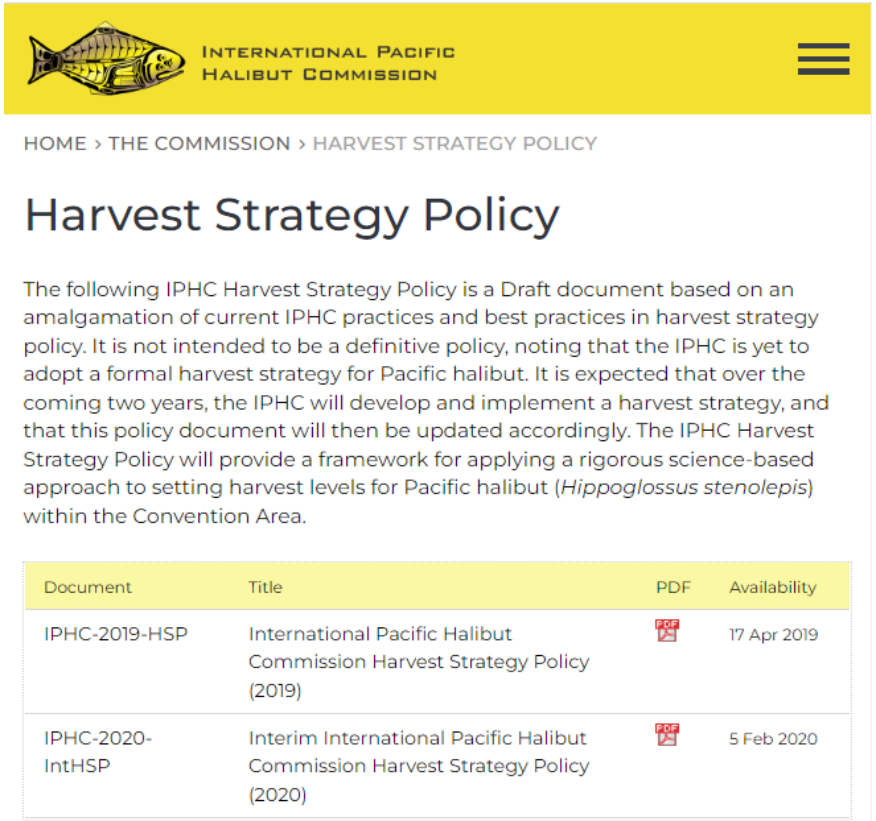
e) Potential for additional time to collaborate within the Secretariat

f) A triennial assessment frequency would be consistent with the current assessment cycle of update and full assessments

g) The multi-year approach has precedent at other fisheries commissions

Next Steps

- Update the Harvest Strategy Policy with items that are complete and identify areas to complete
- Tune coastwide specifications to optimize a selected distribution procedure



INTERNATIONAL PACIFIC HALIBUT COMMISSION

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Harvest Strategy Policy

The following IPHC Harvest Strategy Policy is a Draft document based on an amalgamation of current IPHC practices and best practices in harvest strategy policy. It is not intended to be a definitive policy, noting that the IPHC is yet to adopt a formal harvest strategy for Pacific halibut. It is expected that over the coming two years, the IPHC will develop and implement a harvest strategy, and that this policy document will then be updated accordingly. The IPHC Harvest Strategy Policy will provide a framework for applying a rigorous science-based approach to setting harvest levels for Pacific halibut (*Hippoglossus stenolepis*) within the Convention Area.

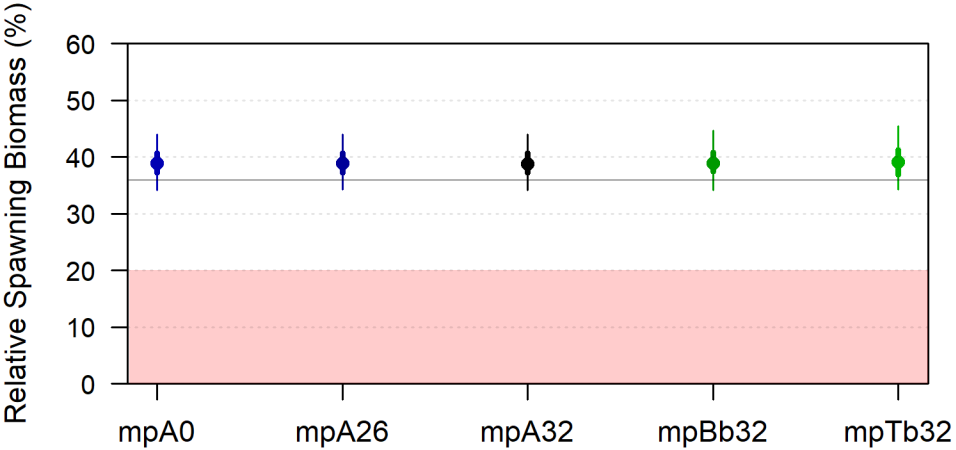
Document	Title	PDF	Availability
IPHC-2019-HSP	International Pacific Halibut Commission Harvest Strategy Policy (2019)		17 Apr 2019
IPHC-2020-IntHSP	Interim International Pacific Halibut Commission Harvest Strategy Policy (2020)		5 Feb 2020

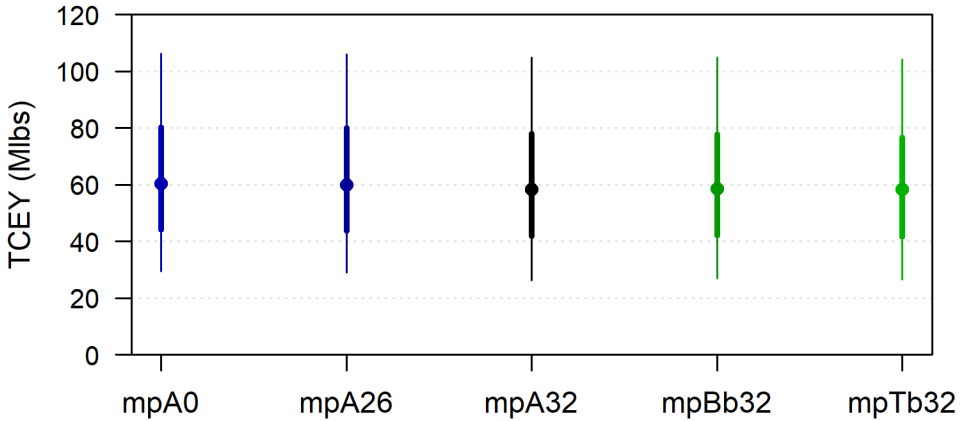
https://www.iphc.int/the-commission/harvest-strategy-policy

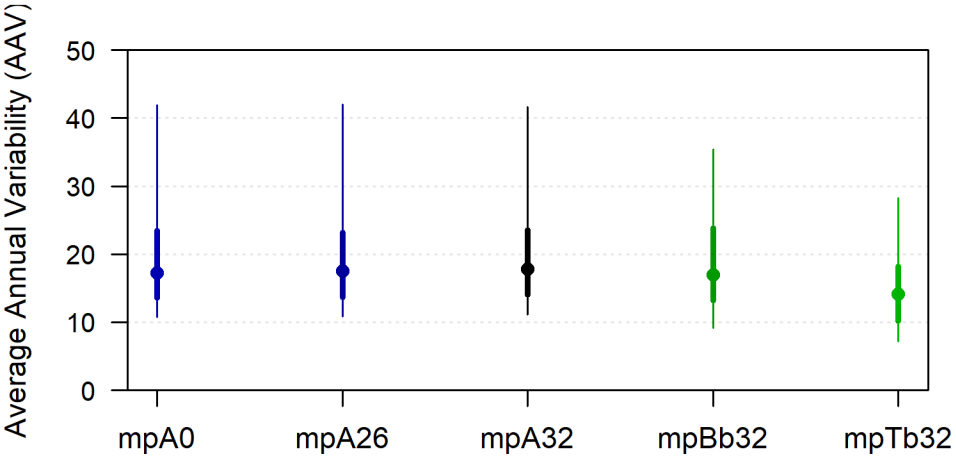
Summary

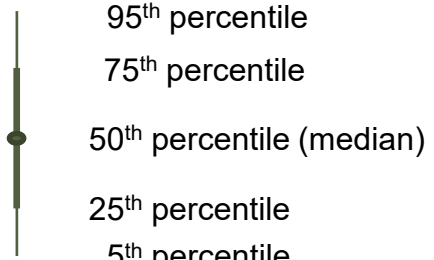
MP name	MP-A0	MP-A26	MP-A32	MP-Bb32	MP-Tb32
Assessment Frequency	Annual	Annual	Annual	Biennial	Triennial
Size Limit	0	26	32	32	32
Empirical Rule	–	–	–	b	b
P(RSB<20%)	PASS	PASS	PASS	PASS	PASS
P(RSB<36%)	0.174	0.174	0.180	0.164	0.197
Median AAV TCEY	17.2%	17.5%	17.8%	17.0%	14.1%
Median TCEY	60.5	59.9	58.3	58.5	58.3

Summary Plots









Recommendations

1) **NOTE** paper IPHC-2023-AM099-13 describing the MSE framework, an updated operating model, size limit and multi-year assessment management procedures, and simulation results.
2) **AGREE** to the following MSE priority coastwide objectives (in order of importance):
   a) Maintain the long-term coastwide female spawning stock biomass above a biomass limit reference point ($B_{20\%}$) at least 95% of the time.
   b) Maintain the long-term coastwide female spawning stock biomass at or above a biomass target reference point ($B_{36\%}$) 50% or more of the time.
   c) Optimise average coastwide TCEY.
   d) Limit annual changes in the coastwide TCEY.

Recommendations

3) **ENDORSE** the following Performance Metrics, associated with the priority coastwide objectives:

   a) **P(RSB<20%)**: Probability that the long-term Spawning Biomass is less than the Spawning Biomass Limit, failing if the value is greater than 0.05.

   b) **P(RSB<36%)**: Probability that the Spawning Biomass is less than the Spawning Biomass Target, 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, reported only if the spawning biomass objectives are passed.

   d) **Median AAV TCEY**: Average annual variability of the short-term TCEY determined as the average difference in the TCEY over a ten-year period, reported only if the spawning biomass objectives are passed.

Recommendations

4) **NOTE** the following reduced set of MPs presented for decision at AM099:

   a) **MP-A32:** Annual assessment frequency and a 32-inch size limit for the directed commercial fishery.

   b) **MP-A26:** Annual assessment frequency and a 26-inch size limit for the directed commercial fishery.

   c) **MP-A0:** Annual assessment frequency and no size limit (full retention) for the directed commercial fishery.

   d) **MP-Bb32:** Biennial assessment frequency and a 32-inch size limit for the directed commercial fishery. The coastwide TCEY in non-assessment years is determined from the change in the FISS index. The distribution of TCEY in all years is calculated using the FISS observations within a defined distribution procedure.

   e) **MP-Tb32:** Triennial assessment frequency and a 32-inch size limit for the directed commercial fishery. The coastwide TCEY in non-assessment years is determined from the change in the FISS index. The distribution of TCEY in all years is calculated using the FISS observations within a defined distribution procedure.

Recommendations

5) **NOTING** the evaluation of size limits for the directed commercial fishery,

   a) **RECOMMEND** starting the process of changing regulation and updating the harvest strategy policy to specify no size limit for the directed commercial fishery

   b) **REQUEST** considering no size limit in future evaluations of management procedures

   c) **REQUEST** using additional objectives and performance metrics when evaluating future management procedures (including alternative size limits). This may include objectives related to discard mortality, fishery efficiency, and opportunities for specific fisheries.

Recommendations

6) **ENDORSE** a triennial assessment frequency with an empirical rule in non-assessment years that adjusts the coastwide TCEY proportionally to the change in the FISS index. The distribution of the TCEY in every year is calculated using a defined distribution procedure, which may include FISS observations.

7) **REQUEST** updating the harvest strategy policy document and identifying areas that are missing or could use further specification.

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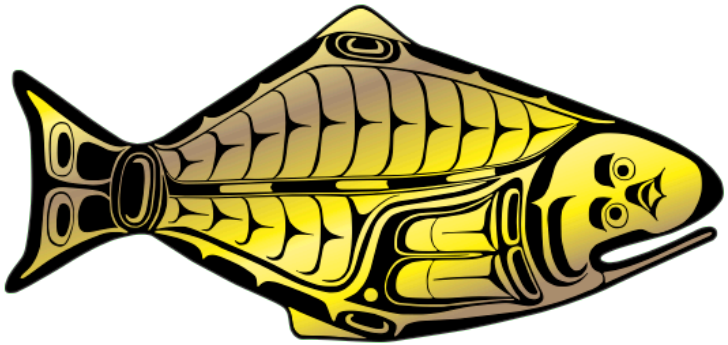

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