

INTERNATIONAL PACIFIC



HALIBUT COMMISSION

# IPHC Management Strategy Evaluation and Harvest Strategy Policy: FOR DECISION

Agenda Item 7.1

IPHC-2022-IM098-13 Rev\_1



# 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

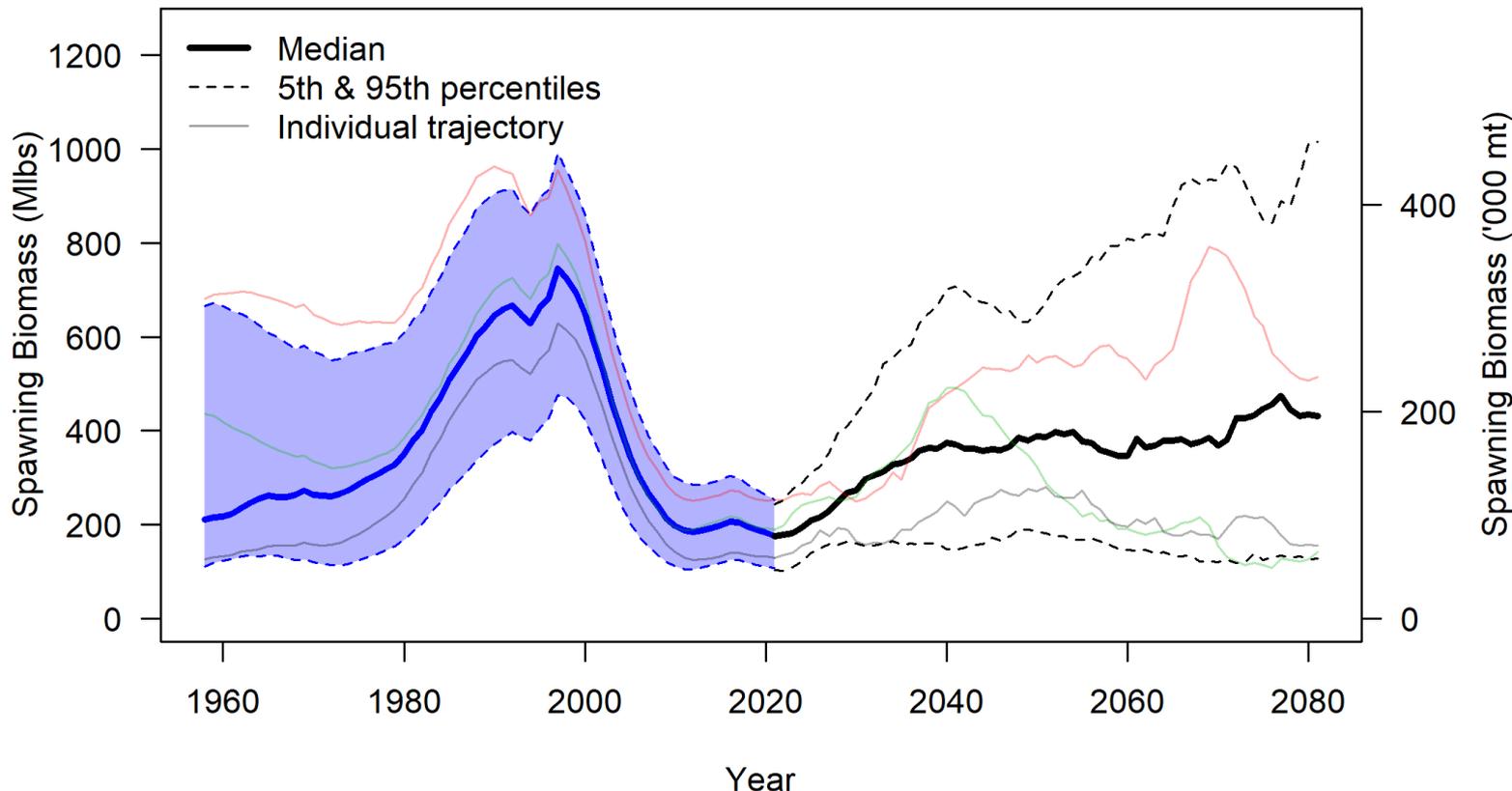
# Framework

ID	Category	Task	Deliverable
F.1	Framework	Develop migration scenarios	Develop OMs with alternative migration scenarios
F.5	Framework	Develop alternative OMs	Code alternative OMs in addition to the one already under evaluation.

- Improved OM
  - Four individual models
    - Different natural mortality (high and low)
    - Different resulting migration assumptions
  - Variability in migration rates
  - Representative of dynamics and uncertainty in the Pacific halibut population

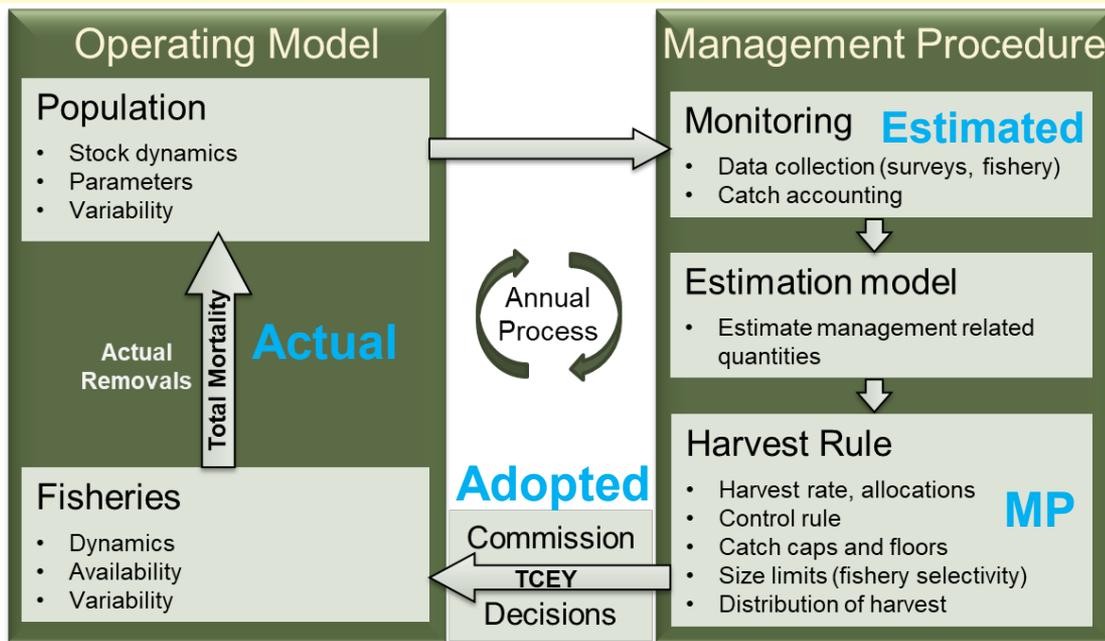


# Projections



# F.2: Implementation variability & uncertainty

ID	Category	Task	Deliverable
F.2	Framework	Implementation variability	Incorporate additional sources of implementation variability in the framework

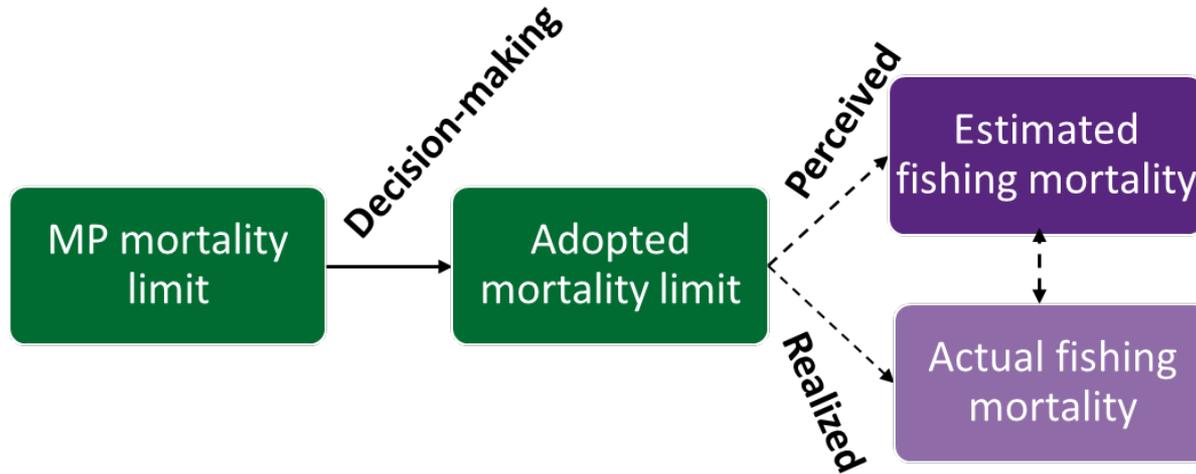


Mortality types  
in blue



# Types of implementation variability

1. **Decision-making variability:** difference between MP mortality limits and the adopted mortality limits set by the Commission.
2. **Realized variability:** difference between the adopted mortality limits set by the Commission and the actual mortality resulting from fishing.
3. **Perceived variability:** difference between the actual & estimated fishing mortality



# Runs with Decision-making variability

## Three options

0. No decision-making variability
1. Coastwide adopted TCEY is set at MP, distribution of TCEY subject to variability (*Status quo*)
2. Coastwide TCEY and distribution of TCEY subject to variability



Description

Table

Plots

Trade-offs

Regulatory Areas Trade-offs

MPs

Help

### MP Elements

#### Decision variability

None option 1 option 2

#### Estimation Error

Sim

#### MP

MP-A MP-Bb MP-Tb

#### Size Limit

0 26 32

#### SPR

43

<http://shiny.westus.cloudapp.azure.com/shiny/sample-apps/IPHC-MSE-MSAB017/>



## F.3: Estimation Error

ID	Category	Task	Deliverable
F.3	Framework	Develop more realistic simulations of estimation error	Improve the estimation model to more adequately mimic the ensemble stock assessment

- Three methods implemented
  1. No estimation error
  2. Simulated estimation error
    - TM and stock status (correlated and autocorrelated)
  3. Use stock assessment model(s)
    - Still needs work



# 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](#)
- Keep size limits and multi-year independent
- Focus on primary coastwide objectives
- Examine IPHC Regulatory Areas in a general way
- Integrate five distribution procedures
- MSAB AGREED to not consider additional objectives



# 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

- Consistent phrase “above a biomass target”
  - Would be consistent with other fisheries agencies
  - Could still achieve a MSC score of 100





# 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



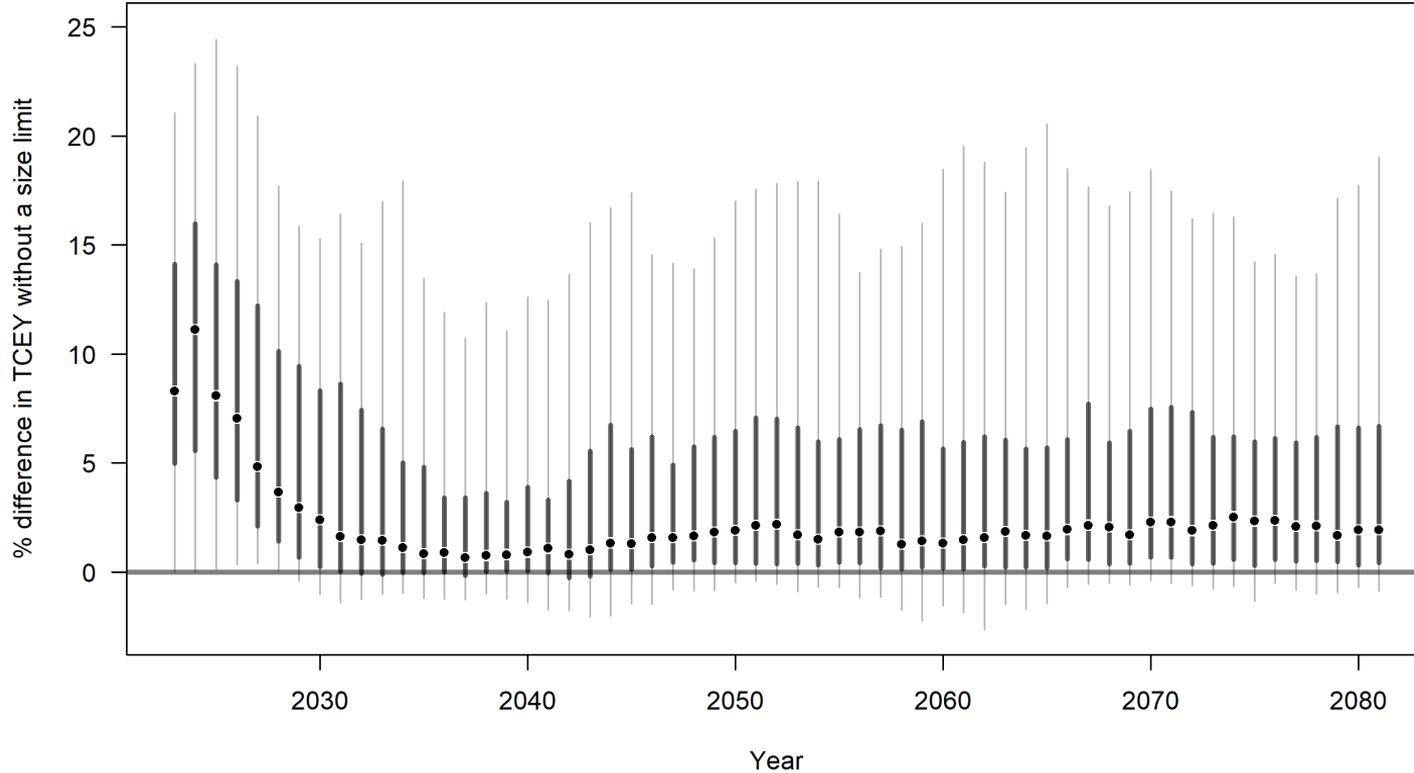
# Size Limits: Coastwide objectives

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

- Meets Bio Sustainability
- Slightly lower biomass with 32-inch size limit
- Slightly less variability with no 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

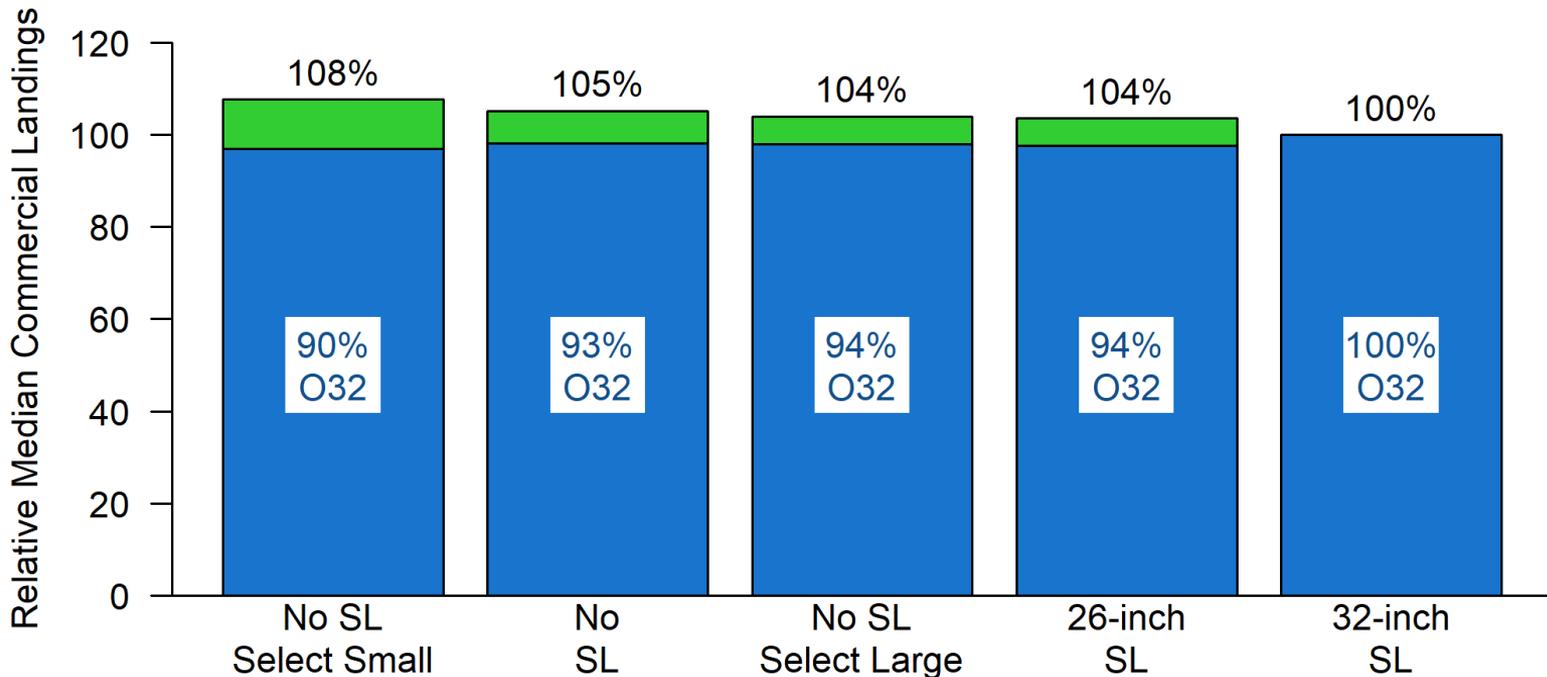


# Size Limits: Other Outcomes

- 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

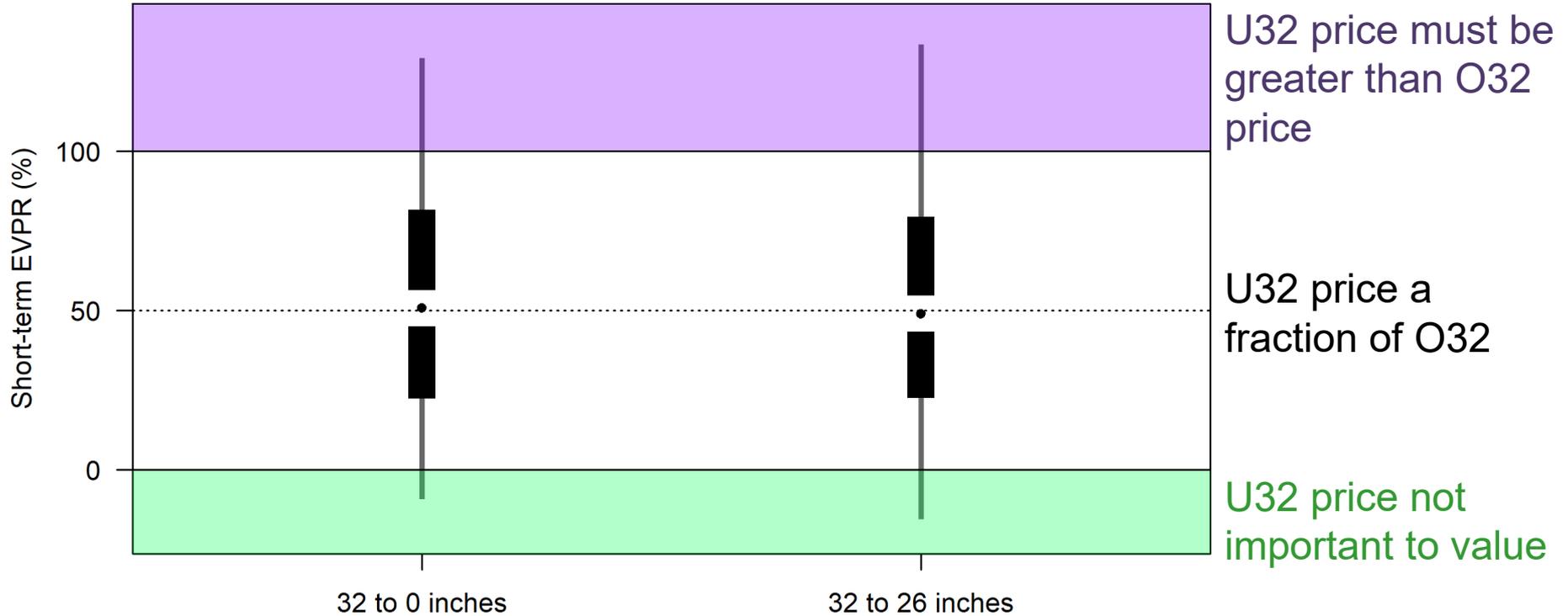


# Size Limits: Equal Value Price Ratio

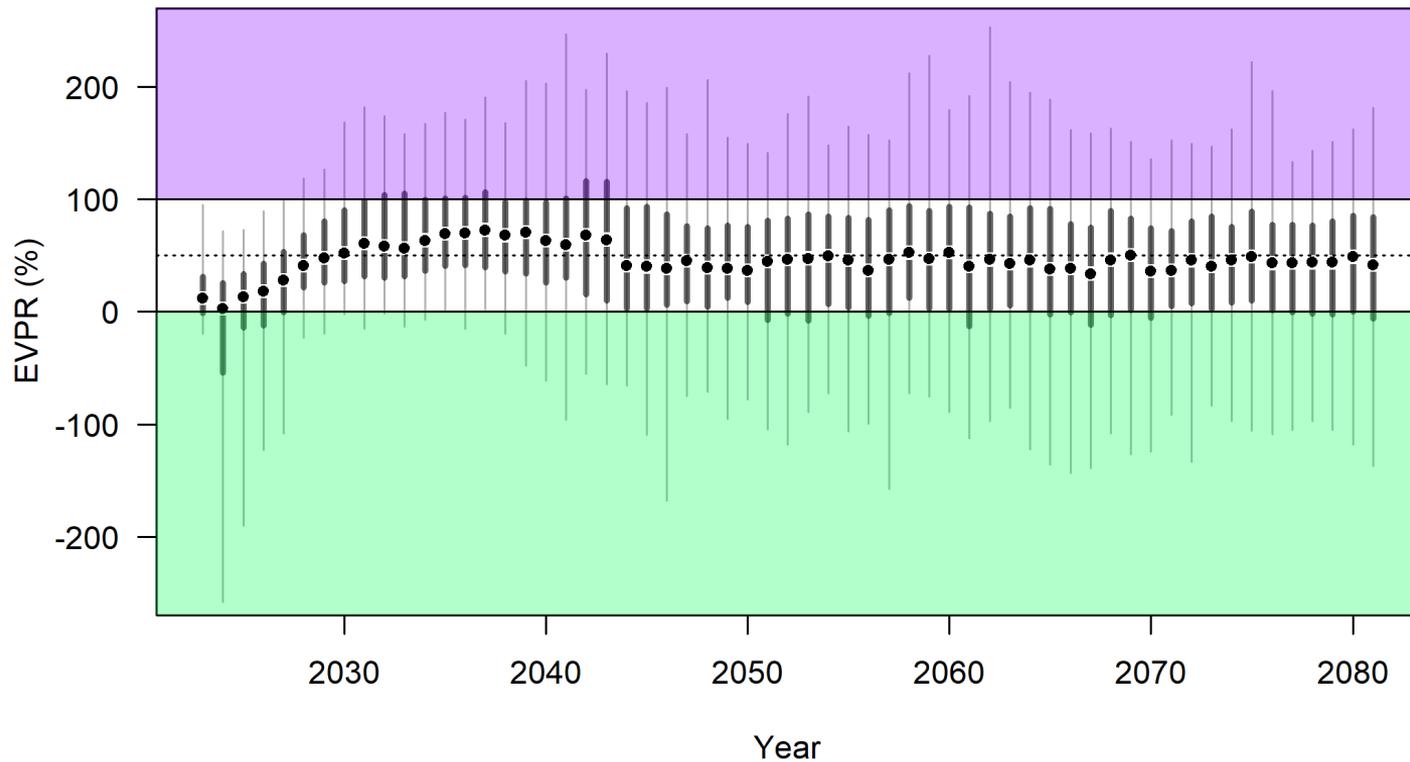
- U32 may be a lower price/lb than O32
  - An increase in U32 landings could result in a decrease in value of the fishery
- Price ratio is the  $\text{Price}_{\text{U32}}/\text{Price}_{\text{O32}}$ 
  - U32 price was 88% of O32 price in 2022 FISS sales
  - Above 80% in last 4 years
- Equal Value Price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



# Size Limits: EVPR



# Size Limit: Long-term EVPR



Equal Value  
Price Ratio  
depends on  
stock  
conditions



# 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
Decision-making variability	option 1				
Estimation Error	Simulated				
Assessment Frequency	Annual	Biennial			Triennial
Size Limit	32 inches				
SPR	0.43				

- a) Multi-year stock assessment with constant TCEY for IPHC Regulatory Areas
- b) Multi-year stock assessment with coastwide TCEY updated proportionally to coastwide FISS index and distribution of TCEY updated via distribution procedure
- 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 <sub>y</sub> <20%)				
P(any RSB <sub>y</sub> <20%)	PASS	PASS	PASS	PASS	PASS
Fishery Sustainability	P(all RSB<36%)				
P(all RSB<36%)	PASS	PASS	PASS	PASS	PASS
Median AAV TCEY	17.8%	13.2%	17.0%	13.2%	14.1%
Median average TCEY	58.3	57.8	58.5	57.7	58.3

Constant TCEY less on average (a & c)

- Smallest variability

TCEY based on FISS similar

- Slight decrease in variability with biennial,
- Smallest 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 SB closer to 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
- 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

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



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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



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Slide 25

# 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%)	PASS	PASS	PASS	PASS	PASS
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



# Recommendations

- 1) **NOTE** paper IPHC-2022-IM098-13 Rev\_1 describing the MSE framework, an updated operating model, size limit and multi-year assessment management procedures, and simulation results.
- 2) **ADOPT** the IPHC's MSE Operating Model, noting that further adjustments may be made, at the request of the Commission, to align with the recent stock assessment.
- 3) **AGREE** to the following MSE priority coastwide objectives:
  - 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 above a biomass target reference point ( $B_{36\%}$ ) at least 50% of the time.
  - c) Limit annual changes in the coastwide TCEY.
  - d) Optimise average coastwide TCEY.



# Recommendations

- 4) **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 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.
  - d) **Median TCEY**: The median of the short-term average TCEY over a ten-year period, reported only if the spawning biomass objectives are passed.



# Recommendations

- 5) **ENDORSE** the following reduced set of MPs to move forward with as part of further testing and for presentation to the Commission 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

6) That the Commission **NOTE** that:

- a) spawning biomass objectives for all MPs passed and SB was more often above the target for SPR values ranging between 40% and 46%;
- b) removal of a size limit results in a 3.7% increase in short-term TCEY;
- c) without a size limit for the directed commercial fishery, landings of O32 fish would likely decline while U32 landings would likely increase;
- d) without a size limit for the directed commercial fishery, short-term coastwide discard mortality would potentially decline by 78%;
- e) for the directed commercial fishery without a size limit to maintain equal value to the fishery with a 32-inch size limit, the price of U32 fish would have to be near one-half the price of O32 fish, on average;



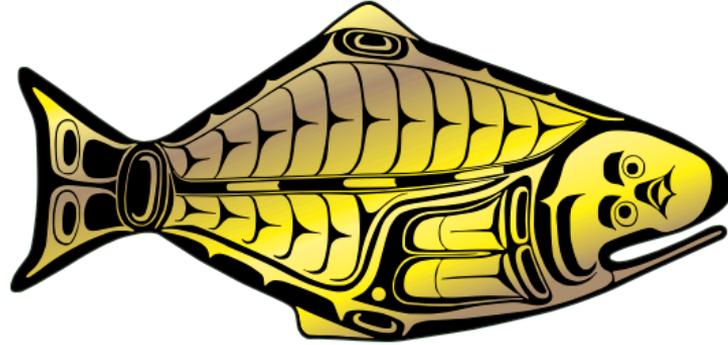
# Recommendations

6) That the Commission **NOTE** that:

- f) a biennial assessment frequency with an empirical rule using FISS observations in non-assessment years shows similar results to an annual assessment;
- g) a triennial assessment frequency with an empirical rule using FISS observations in non-assessment years shows a similar short-term median TCEY along with a significant reduction in inter-annual variability of the TCEY;
- h) costs and benefits associated with multi-year assessments.



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