INTERNATIONAL PACIFIC HALIBUT COMMISSION

MSE Framework

Agenda Item 4.1

IPHC-2022-MSAB017-07

A. Hicks & I. Stewart

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

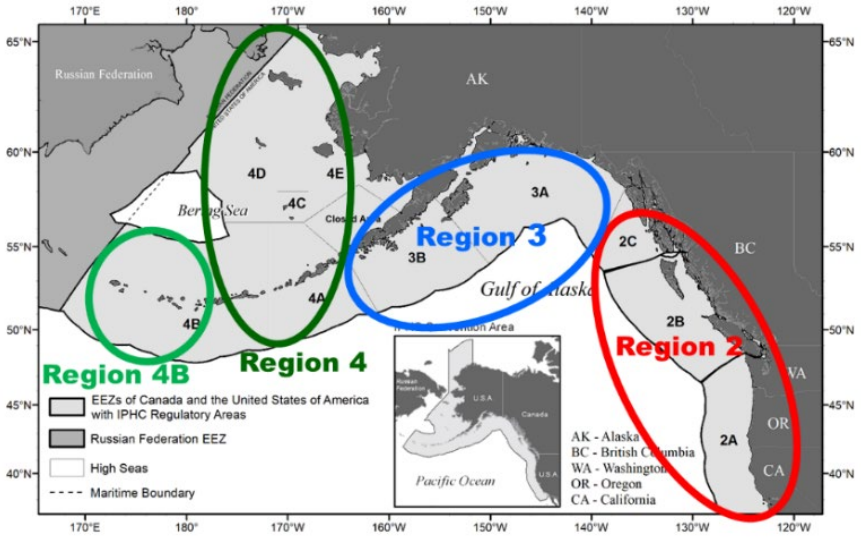
Framework

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
  - Incorporates representative uncertainty about the Pacific halibut population

Population Dynamics

- Occur at the scale of Biological Regions
- Movement between each Region
- Multiple fisheries operate within a Region

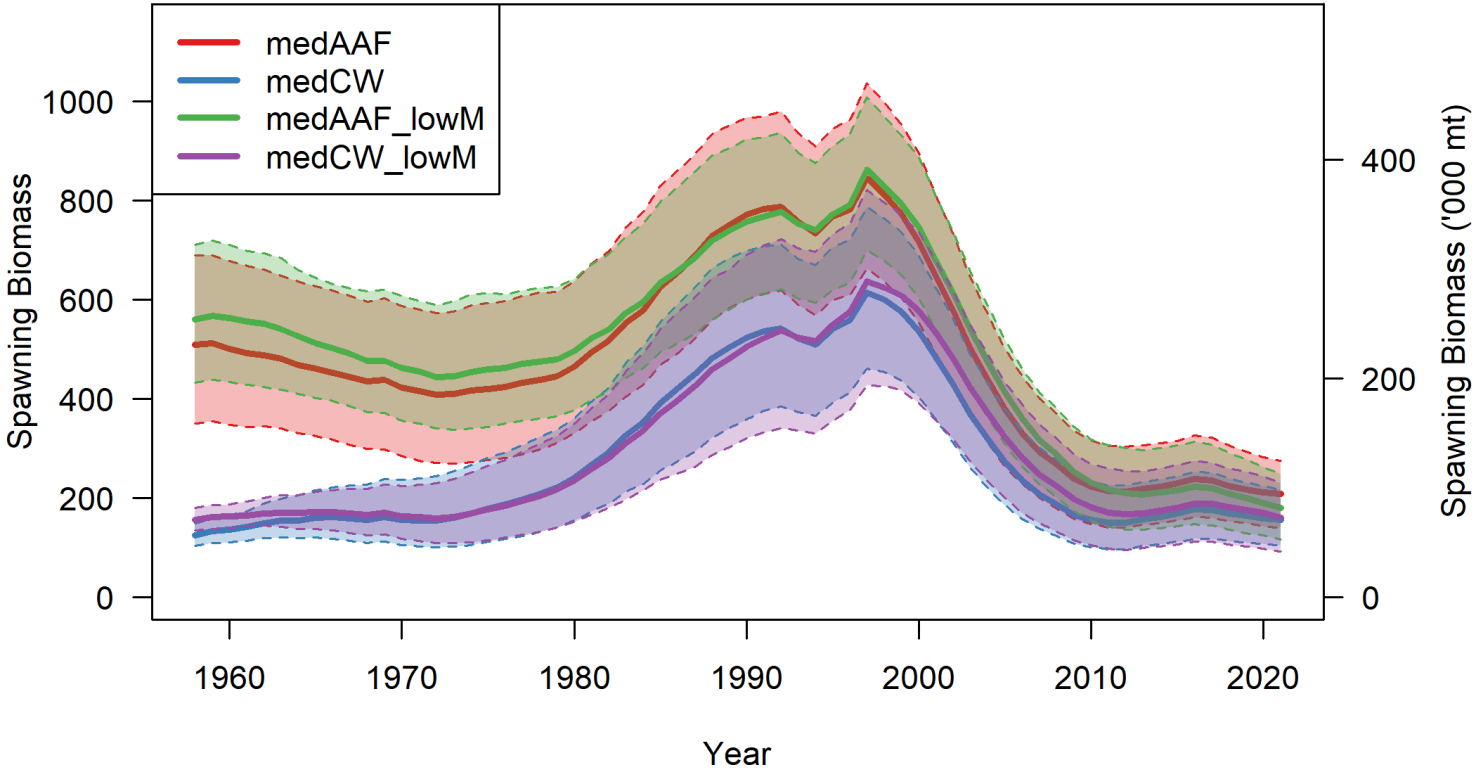


Fishing Sectors

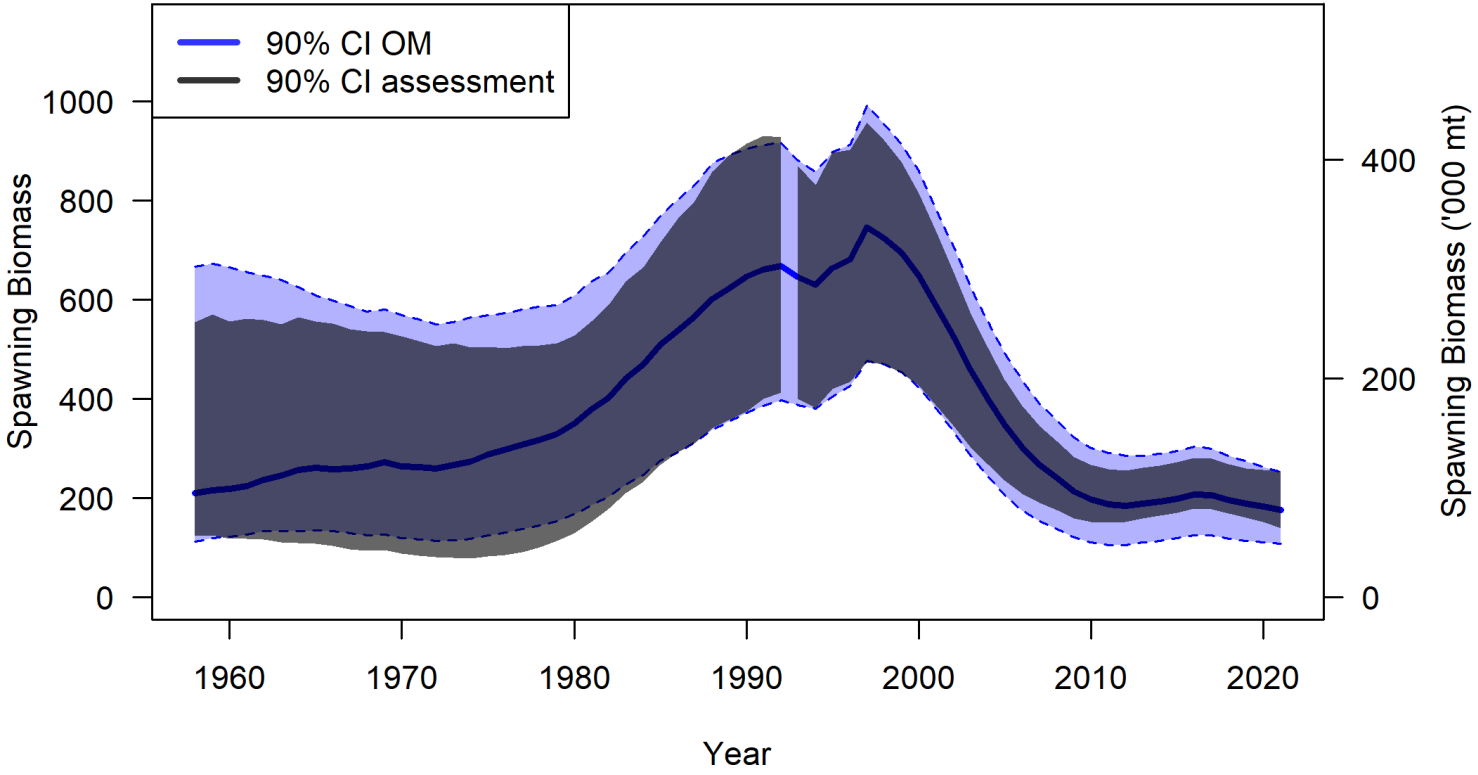
- **Directed commercial** representing the mortality from the directed commercial fisheries including landings, O32 discard mortality (from lost gear or regulatory compliance), and U32 discard mortality comprised of Pacific halibut discarded due to the minimum size limit
- **Non-directed commercial discard** representing the mortality from incidentally caught Pacific halibut in non-directed commercial fisheries;
- **Recreational** representing recreational landings (including landings from commercial leasing) and recreational discard mortality; and
- **Subsistence** representing non-commercial, customary, and traditional use of Pacific halibut for direct personal, family, or community consumption or sharing as food, or customary trade.

- These sectors are divided into fisheries within each IPHC Regulatory Area
  - Some Recreational and Subsistence fisheries are combined together and across IPHC Regulatory Areas 4A, 4B, and 4CDE

Operating Model

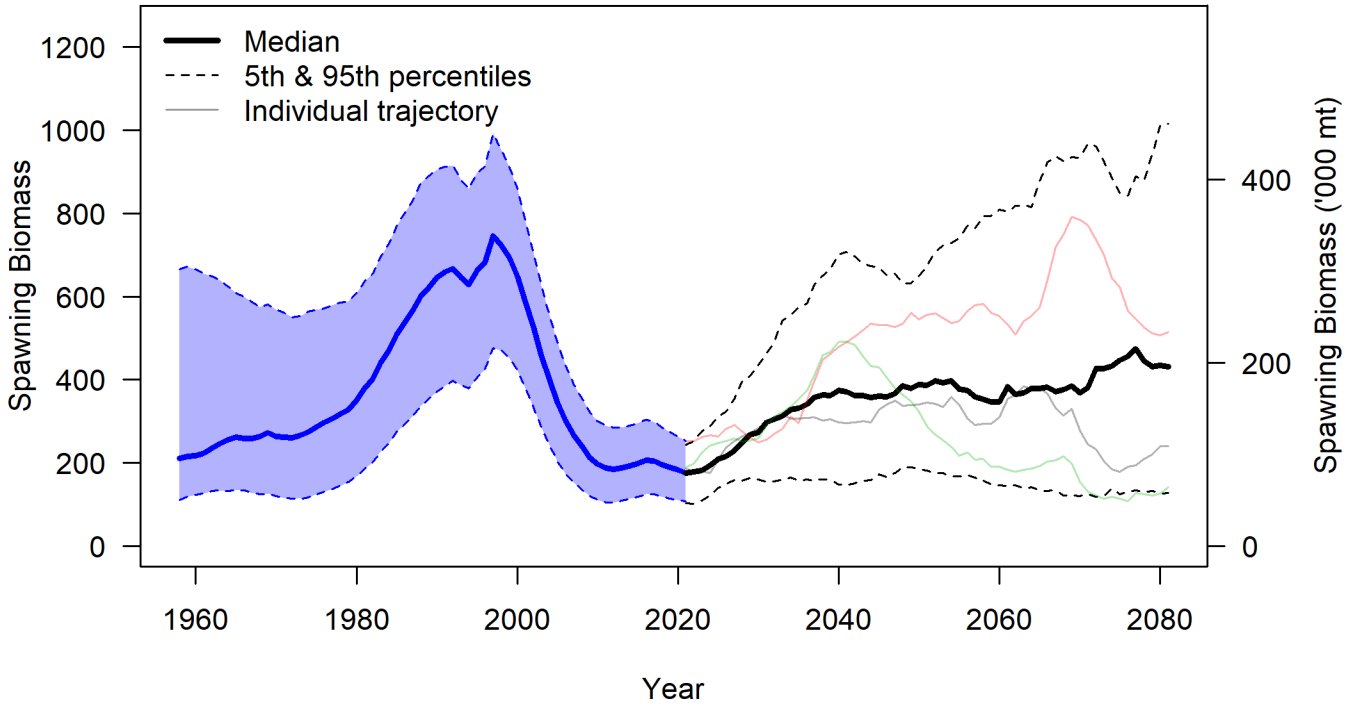


Operating Model vs Ensemble Assessment



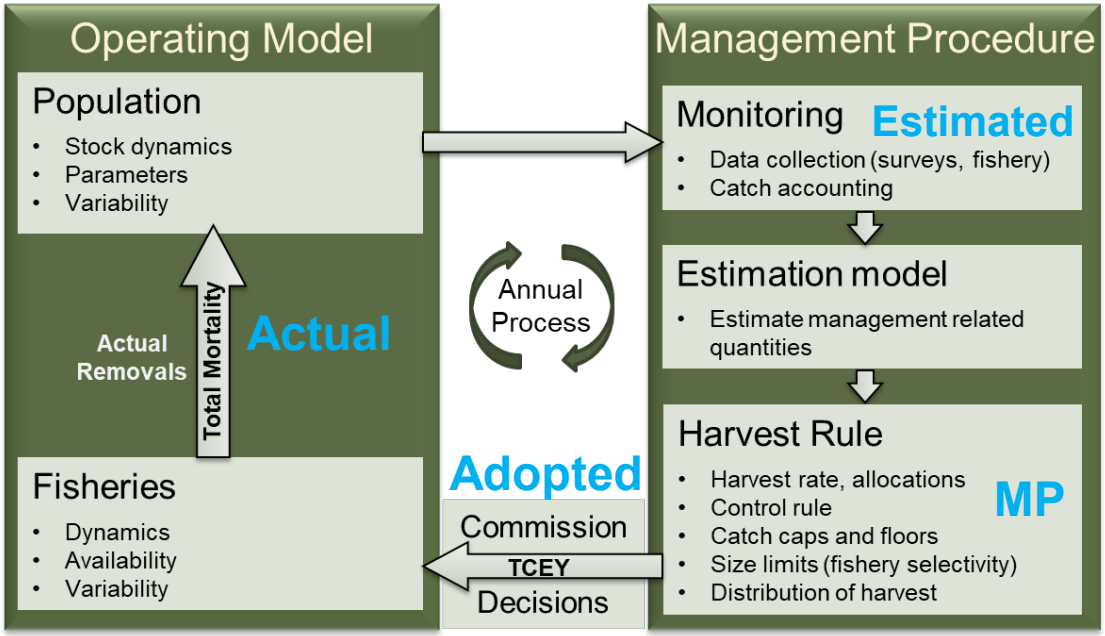
Projected spawning biomass

- SPR=43%



F.2: Implementation variability & uncertainty

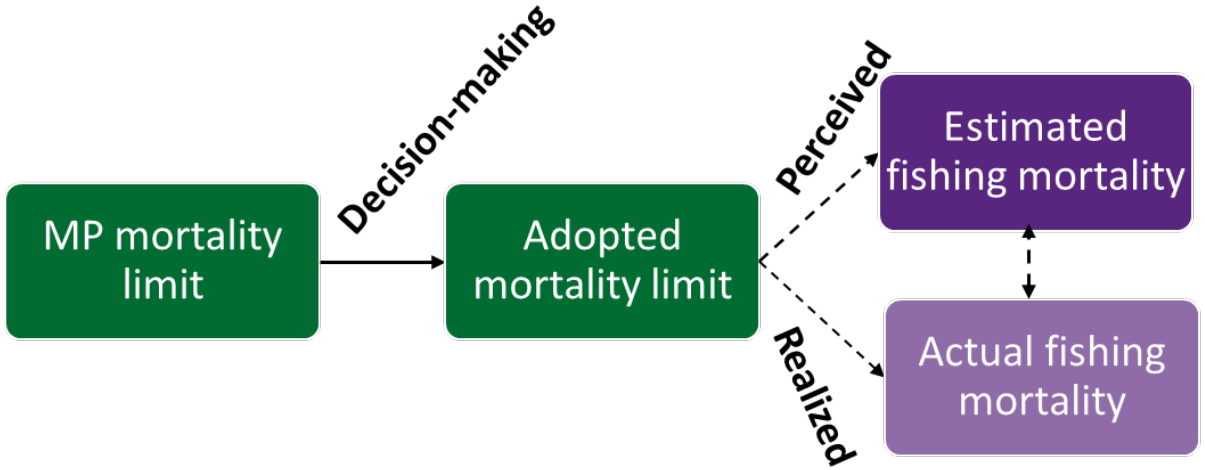
ID	Category	Task	Deliverable
F.2	Framework	Implementation variability	Incorporate additional sources of implementation variability in the framework



Mortality types in blue

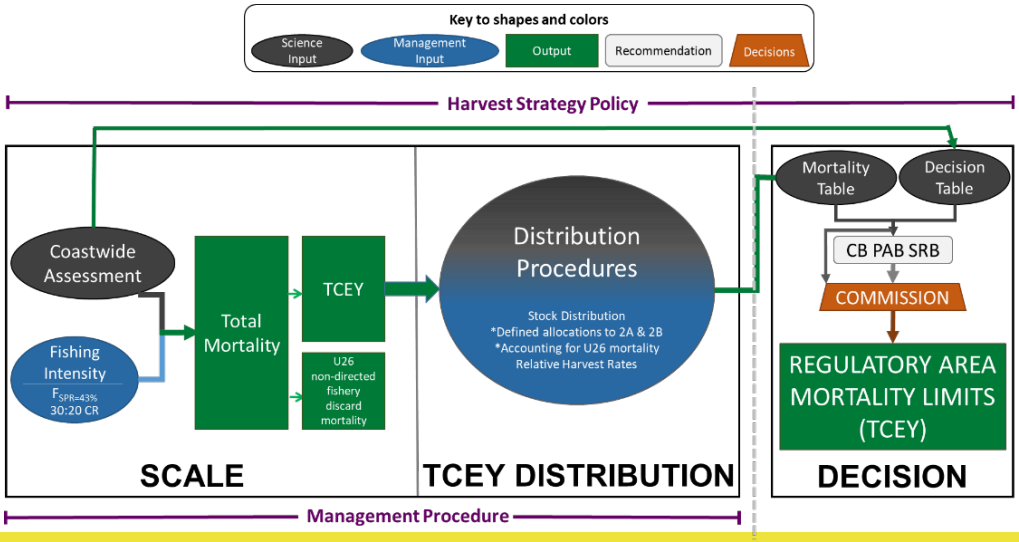
Types of implementation variability

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



Modelling decision-making variability

- Coastwide scale and TCEY distribution components modelled separately
- Deviation from the coastwide scale
- Deviations from O32 stock distribution

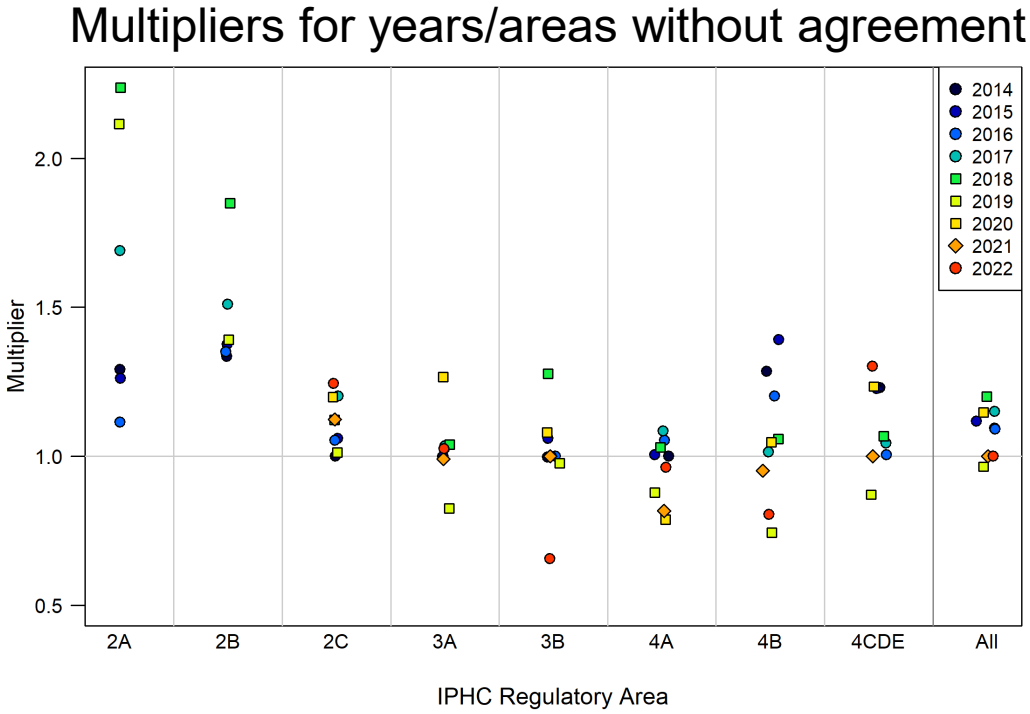


Decision-making variability

- Historically, the adopted TCEY has differed from the MP TCEY
- Can model this as a multiplier to the MP mortality limit

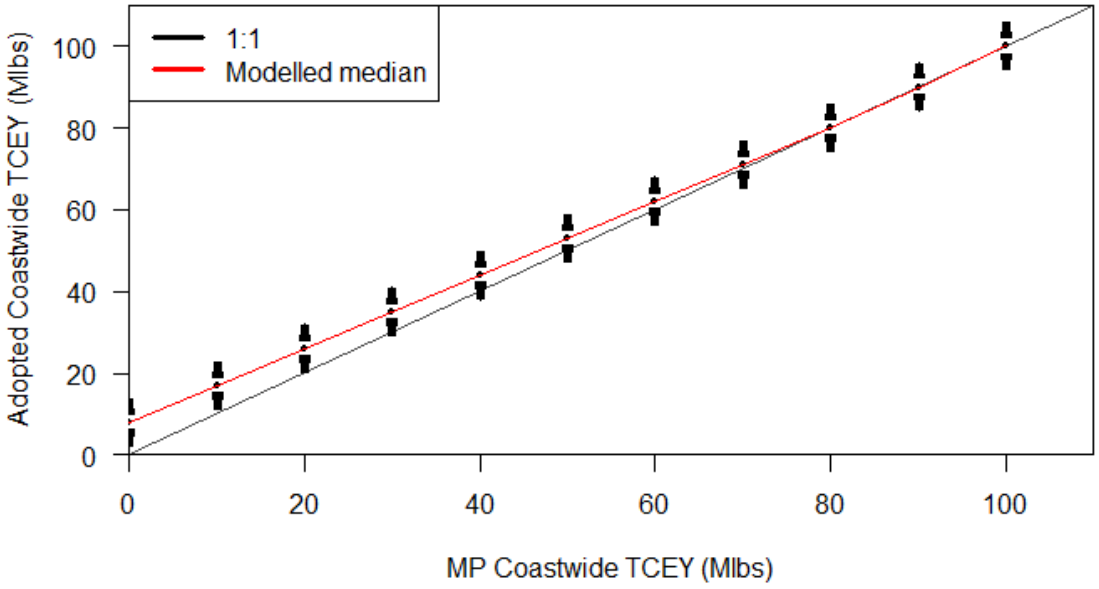
$$\widetilde{TCEY}_t = TCEY_t \times \varepsilon_I$$

Adopted MP Multiplier



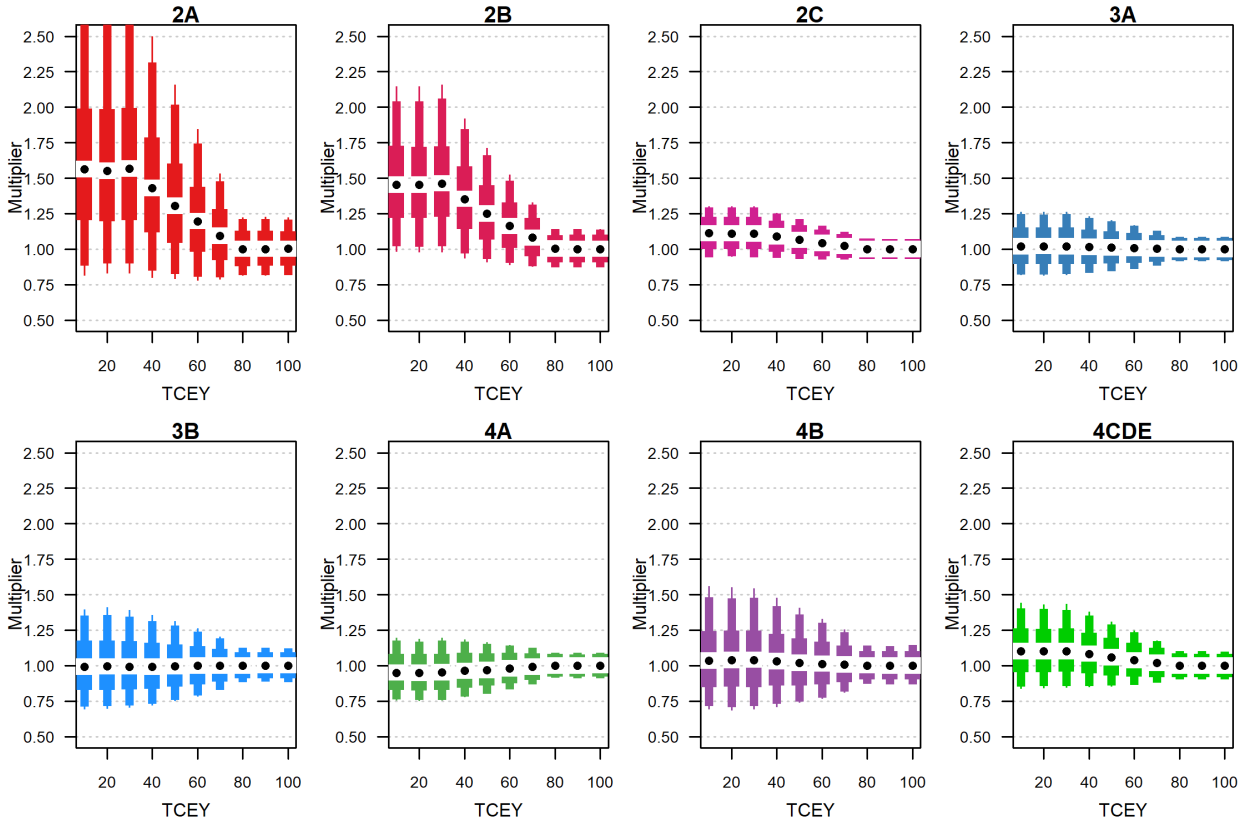
Coastwide scale

- Variability and bias determined from past outcomes
- Positive bias lessens as TCEY approaches 80 Mlbs



Decision-making variability: No agreements

- 2 out of 5 distribution procedures
- Use 2014-2019 observations in 2A and 2B, and 2014-2022 for other areas to parameterize
- Higher adopted TCEYs result in multiplier at 1 and reduced variability



Decision-making variability: With agreements

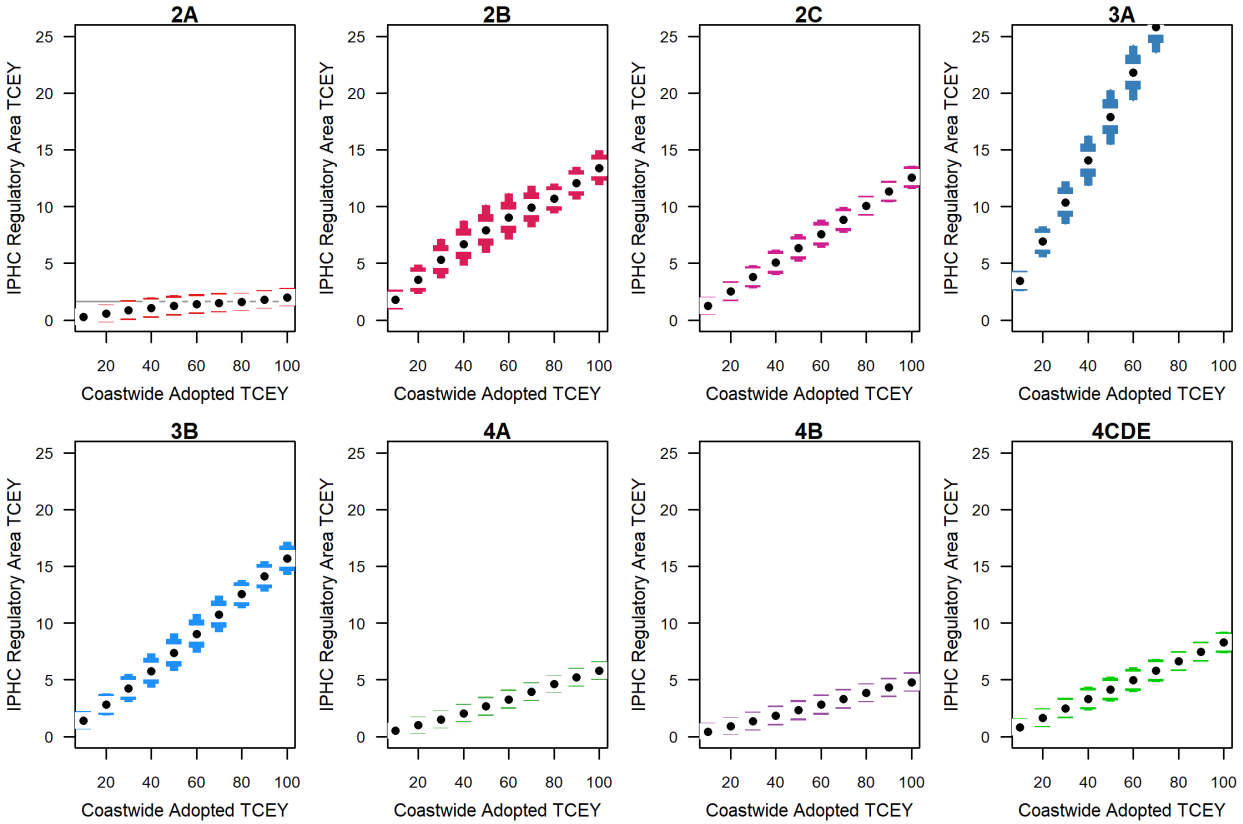
- 2A and 2B
- 3 out of 5 distribution procedures
- 2C-4B as before
- 2A and 2B have multiplier at 1 and no variability

Decision-making variability: TCEYs

Distribution Only

Using 2022 baseline stock distribution

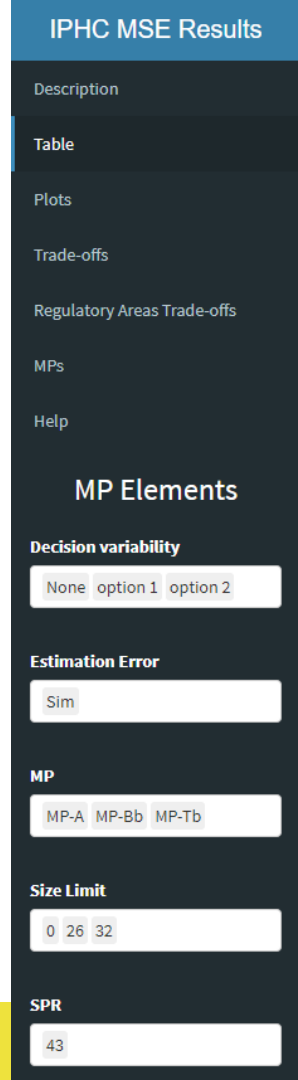
Without agreements



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



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

SRB017-R, **para. 57**. *The SRB … RECOMMENDED continuing work to incorporate actual estimation models, as in the third option, because that method would best mimic the current assessment process.*

SRB020-R, **para. 20**. *The SRB REQUESTED that the MSE not attempt to implement a Stock Synthesis estimation procedure as part of the management procedure and, instead, to integrate a simpler assessment modelling approach into the management procedure via tuning.*

F.3: Estimation Error

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

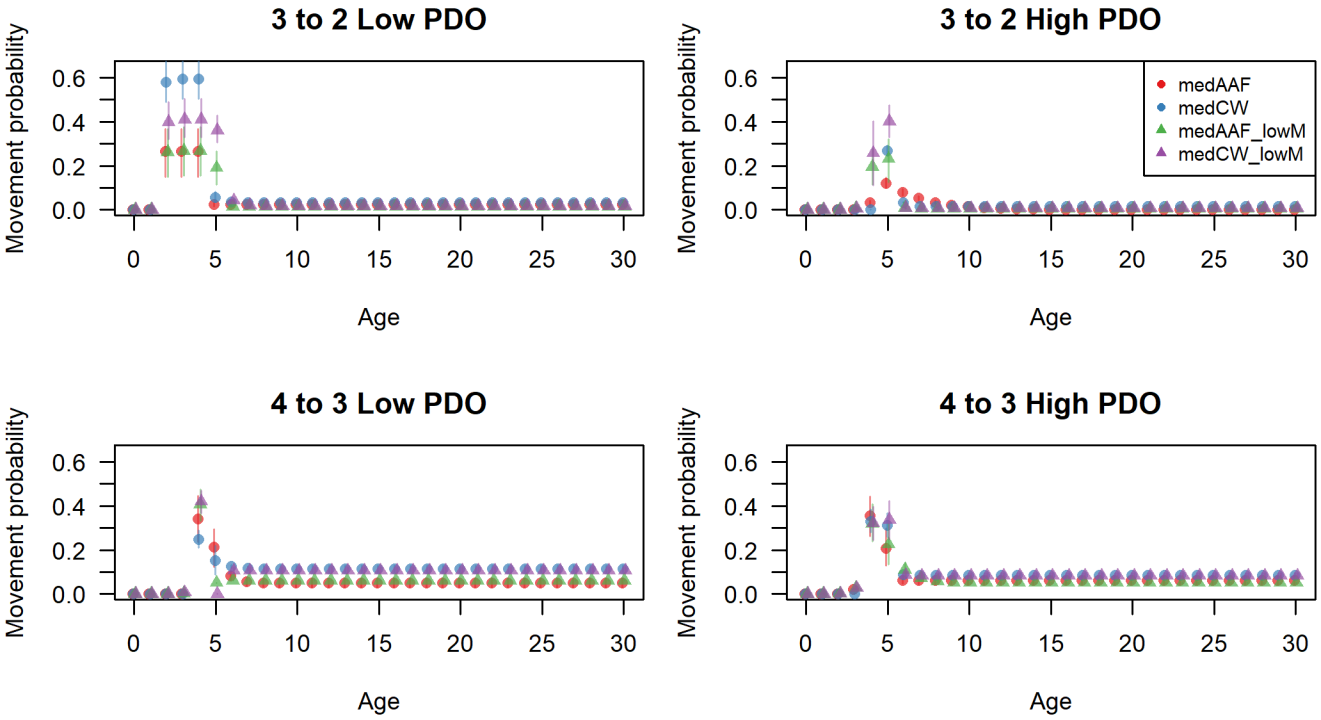
Potential OM Scenarios

- Targeting small Pacific halibut
- Avoiding small Pacific halibut
- Low or high weight-at-age
- Low or high recruitment

> IPHC-2022-SRB020-R, **para 18.** *The SRB NOTED the Secretariat's plan to further explore migration scenarios in the MSE and therefore REQUESTED that the set of migrations scenarios remain within bounds of plausible values identified via the OM development/fitting and previous tagging studies.*

- No migration-specific scenarios

Migration Variability



Recommendations

- **NOTE** paper IPHC-2022-MSAB017-07
- **RECOMMEND** additional improvements or additions to the MSE framework to be done in 2023
- **RECOMMEND** additional scenarios for consideration in the future
- **NOTE** that future agreements of the Commission related to harvest policy can be tested using the MSE framework and used to focus further evaluations

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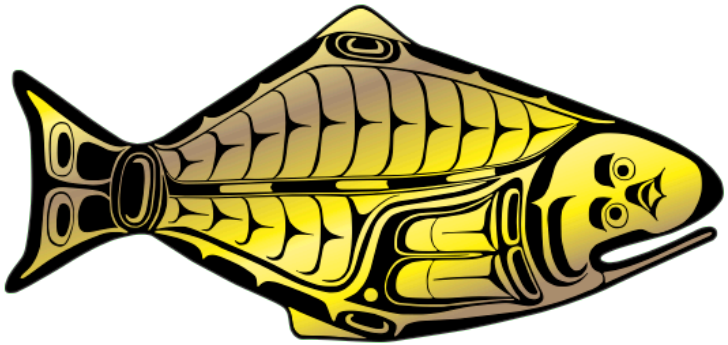

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