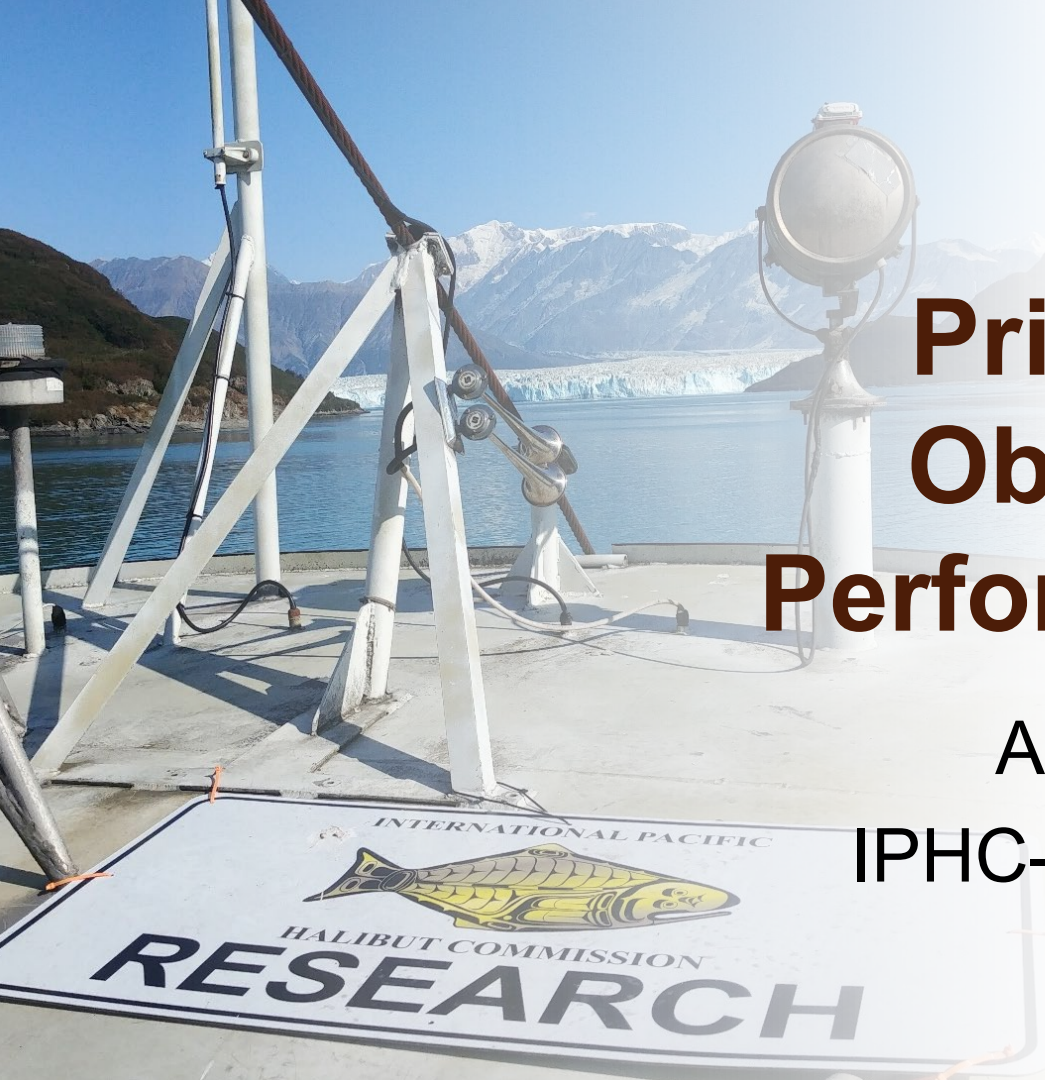


INTERNATIONAL PACIFIC HALIBUT COMMISSION

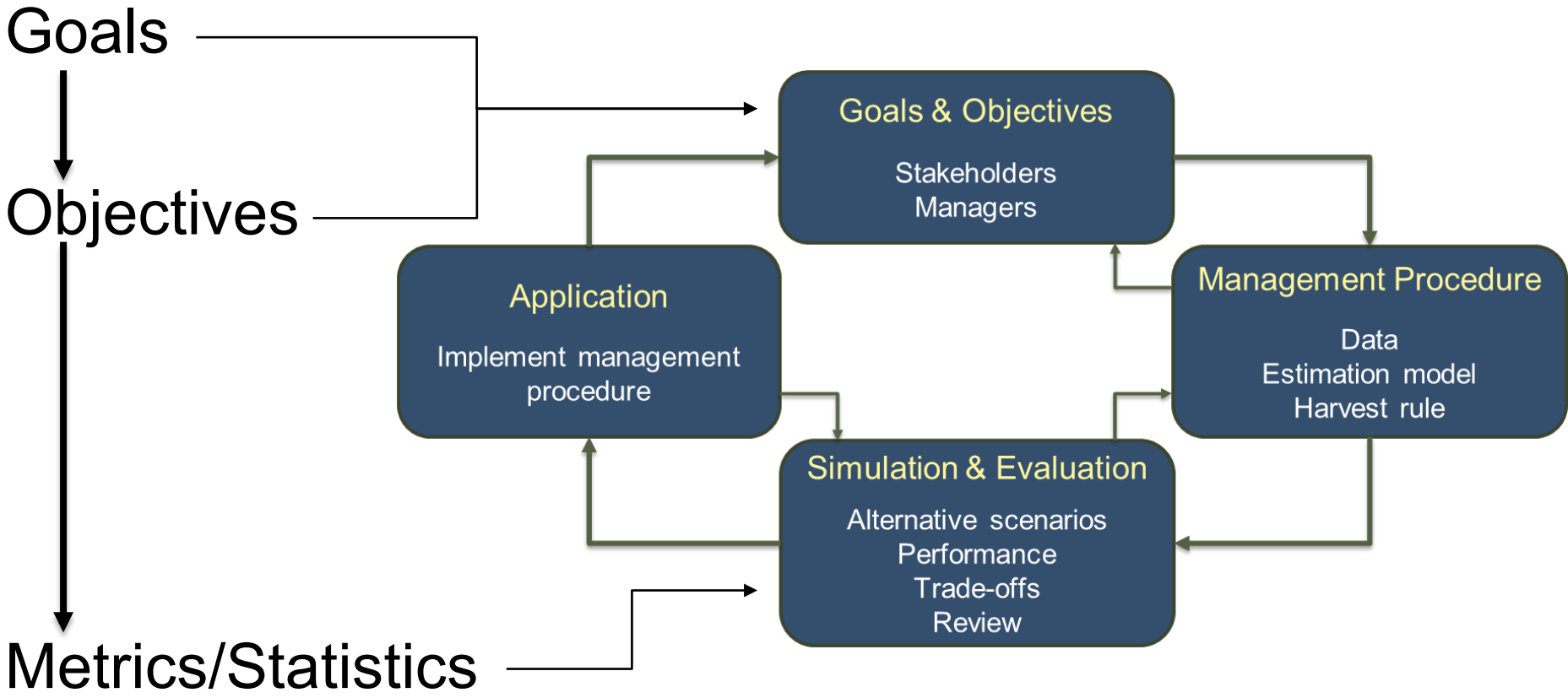
Primary Goals, Objectives and Performance Metrics

Agenda Item 4.2

IPHC-2022-MSAB017-08

A. Hicks

Management Strategy Evaluation



Primary Goals and Objectives

1. Biological Sustainability (or conservation goal)
   - Keep biomass above a limit to avoid critical stock sizes
2. Optimise directed fishing opportunities
   - Maintain spawning biomass around a level (i.e. a target biomass reference point) that optimises fishing activities
   - Limit variability in mortality limits
   - Provide directed fishing yield

Metrics/Statistics in MSE

- Metric and statistic are often used interchangeably in MSE
- Metric/statistic is a general term for any calculated quantity from the simulated results
- **Performance Metric** (at IPHC) is a calculated probability with a defined tolerance
  - P(SB<20%) must be greater than 5%
- **Statistic of interest** is used at IPHC to define a calculated metric without a defined tolerance, which may be a value or a probability
  - Median average TCEY or AAV or P(SB>20%), for example

See IPHC-2019-MSAB014-INF01

Metrics/Statistics suggested terminology

Metric or statistic: a general term for any calculated quantity

Statistic of interest: a calculated metric associated with an objective

- May be a value or a probability
- Median average TCEY or AAV or P(SB>20%), for example

Performance Metric: a statistic of interest with a defined tolerance

- P(SB<20%) or P(SB<36%)
- Must be a probability to have a tolerance

Performance Standard: The yes or no outcome of a performance metric

- P(SB<20%) is not greater than 5%
- P(SB<36%) is not greater than 50%

1.1. Primary biological objectives

Measurable Objective	Metric	Time-frame	Tolerance
Maintain a female spawning stock biomass above a biomass limit reference point at least 95% of the time	$P(SB < 20\%\ B0)$	Long-term	0.05
Maintain a defined minimum proportion of female spawning biomass in each Biological Region	$P(p_{SB,2} < 5\%)$ $P(p_{SB,3} < 33\%)$ $P(p_{SB,4} < 10\%)$ $P(p_{SB,4\mathrm{B}} < 2\%)$	Long-term	0.05

The minimum proportions in each Biological Region were defined from stock distribution observations back to 1998 and may not represent potential ranges

2.1. Primary fishery objective (target SB)

Measurable Objective	Metric	Time-frame	Tolerance
Maintain the coastwide female spawning biomass above a biomass target reference point at least 50% of the time	$P(SB < 36\%\, B0)$	Long-term	0.50

The biomass target reference point (36%) was determined from an analysis of MSY and determined as a reasonable proxy to achieve Maximum Yield (economic and sustainable) given uncertainties about Pacific halibut population dynamics

2.2. Primary fishery objectives (stability)

Measurable Objective	Metric	Time-frame	Tolerance
Limit annual changes in the coastwide TCEY	$P(AC > 15\% \text{ in any 3 years of 10})$	Short-term	
	Coastwide Average Annual Variability (AAV)	Short-term	
Limit annual changes in the Regulatory Area TCEY	$P(AC_A > 15\% \text{ in any 3 years of 10})$	Short-term	
	AAV by Regulatory Area (AAV_A)	Short-term	

AC: Annual Change in TCEY from one year to next
AAV: The average percent variability over a 10-year period

Note that Tolerance is not defined, thus the statistic of interest will be compared across MPs

2.3. Primary fishery objectives (yield)

Measurable Objective	Metric	Time-frame	Tolerance
Optimize average coastwide TCEY	Average coastwide TCEY	Short-term	
Optimize TCEY among Regulatory Areas	Average TCEY in each IPHC Regulatory Area	Short-term	
Optimize the percentage of the coastwide TCEY among Regulatory Areas	Average %TCEY in each IPHC Regulatory Area	Short-term	
Maintain a minimum TCEY for each Regulatory Area	Minimum TCEY in each IPHC Regulatory Area	Short-term	
Maintain a percentage of the coastwide TCEY for each Regulatory Area	Minimum %TCEY in each IPHC Regulatory Area	Short-term	

Note that Tolerance is not defined, thus the statistic of interest will be compared across MPs

Additional Goals and Objectives

3. Minimise discard mortality in the *directed commercial* fishery
   - Minimize directed *commercial* fishery discard mortality
   - Maintain the directed *commercial* fishery discard mortality at less than 10% of the annual mortality limit

- Discards are now modelled in a way that these metrics would be meaningful

Italics indicate a change from the original goal defined earlier by the MSAB

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

Evaluation

- MSE-Explorer
- Keep size limits and multi-year assessments as independent evaluations
- Distribution integrated

Evaluation of size limits

- Primary biological sustainability and yield metrics
- Other metrics and tradeoffs
  - Size distribution of landings
    - Proportion or amount of U32 landings
  - Discard mortality
  - Economic metrics
    - For example, value of fishery given price ratio of U32:O32
      - See IPHC-2021-AM097-09

Evaluation of multi-year assessments

- Primary biological sustainability and yield metrics
- Other metrics and tradeoffs
  - Different measures of TCEY variability
    - Change in assessment years only, for example
  - Economic metrics
    - Effect of variability on investment in fishery
      - e.g. lost investment or missed opportunity due to variability in mortality limits
    - Example from Hutniczak et al 2019 (summer flounder)
      - Transformed biomass-based metrics to net economic benefits for commercial and recreational fisheries
      - An economic analysis can be complex to create, but once "economic models have been parameterized, the capacity to examine a wide range of scenarios is greatly enhanced"

Evaluation

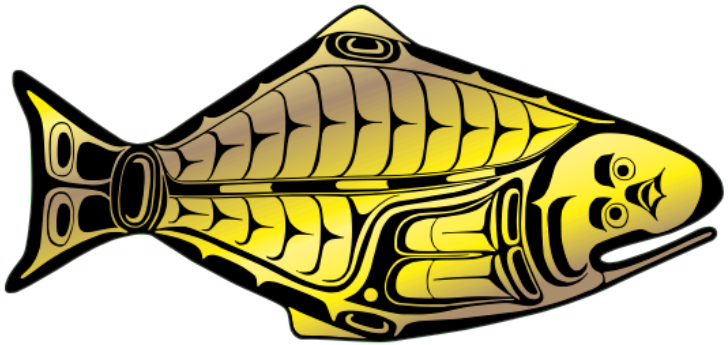
SRB020-R, para. 21. The SRB REQUESTED evaluating whether the relative ranking of MPs – defined only by multi-year assessment cycle and size limits - remains similar across the set of proposed distribution scenarios using objectives identified as priorities by the Commission.

- Can have a closer look at specific MPs
  - 100 simulations per distribution procedure
- Examine quantiles of metrics
  - E.g. 2A without agreement

Recommendations

- **NOTE** paper IPHC-2022-MSAB017-08 describing IPHC goals, objectives, and metrics, as well as evaluation considerations.
- **RECOMMEND** additional goals, objectives, and metrics to assist with the evaluation of size limits and multi-year assessments
- **RECOMMEND** additional methods of evaluation which may include tables, plots, and trade-offs.

INTERNATIONAL PACIFIC



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