



Welcome to the SWG MSE PS08

Co-chairs: Derek Mahoney (Canada) and Toshihide Kitakado (Japan)

Schedule (version 2, 2026-2028)

Meeting	Date	Task	Note
COM10	Apr 14-17, 2026	- Recommend 2026 catch level based on the adopted HCR - Review outcomes and recommendations from SWG MSE PS 07 (including timeline of full MSE)	Hybrid
SWG NSAM	Jun / July, 2026	- Review progress of age-structured modelling (finalize specification) - Review issues arisen for the BSSPM	Hybrid
SWG MSE PS 08	Oct, 2026	Re-start discussion on objectives, conditioning of OMs (based on age-structured models with consideration of uncertainty of parameters and climate impacts) and possible types of MPs	Virtual
SSC-PS-17	Dec 15-17, 2026	- Prepare data for 2026 assessment (BSSPM, SS3) Review results of conditioning of OMs	
SSC-PS-18	Jan 19-22, 2026	- Review results of BSSPM and application of the adopted HCR - Review results of age-structured models (completed) Review progress of MSE	Hybrid
SWG MSE PS 09	Feb , 2027	Finalize management objectives Review conditioning of OMs Develop a list of candidate MPs (model-based, empirical)	Virtual
COM11	April 12-15, 2027	Review progress of MSE	Hybrid
SWG MSE PS 10	Summer, 2027	Finalize conditioning of OMs (based on age-structured models with consideration of uncertainty of parameters and climate impacts, base and robustness cases) Data-guillotine Finalize a list of candidate MPs (model-based, empirical) Finalize performance indicators Discuss definitions of exceptional circumstances	Hybrid
		Running MSE and prepare results of performance of MPs (SSC will review in its meeting)	
SWG MSE PS 11	Jan / Feb, 2028	Finalize evaluation of performance of candidate MPs Recommendations of a few MPs (including EC definitions) to COM12	Hybrid
COM12	April, 2028	Adoption of CMM on MP?	Hybrid

Re-start discussion on objectives, conditioning of OMs (based on age-structured models with consideration of uncertainty of parameters and climate impacts) and possible types of MPs

Agenda Item 3. Discussion toward development of management procedures (MPs) as a mid-term goal

3.1 Operating models

3.1.1 Progress in age-structured modelling

3.1.2 Climate issues

3.1.3 Range of operating models

3.1.4 Other relevant matters

3.2 Management procedures

3.2.1 Model-based and data-based management procedures

3.2.2 Additional elements in light of short-lived species for seasonal fisheries

3.3 Performance indicators

3.4 Definition of exceptional circumstances and meta-rules

Agenda Item 1. Introductory items

- 1.1 Opening of the meeting
- 1.2 Adoption of agenda
- 1.3 Meeting logistics

Agenda Item 2. Overview of the outcomes of previous NPFC meetings

- 2.1 SWG MSE PS07
- 2.2 COM10

Agenda Item 3. Discussion toward development of management procedures (MPs) as a mid-term goal

- 3.1 Operating models
 - 3.1.1 Progress in age-structured modelling
 - 3.1.2 Climate issues
 - 3.1.3 Range of operating models
 - 3.1.4 Other relevant matters
- 3.2 Management procedures
 - 3.2.1 Model-based and data-based management procedures
 - 3.2.2 Additional elements in light of short-lived species for seasonal fisheries
- 3.3 Performance indicators
- 3.4 Definition of exceptional circumstances and meta-rules

Agenda Item 4. Other matters

Agenda Item 5. Timeline and future process

- 5.1 Timeline
- 5.2 Future process with assistance of SSC PS
- 5.3 Workplan till SSC PS17&18 and SWG MSE PS10 meetings

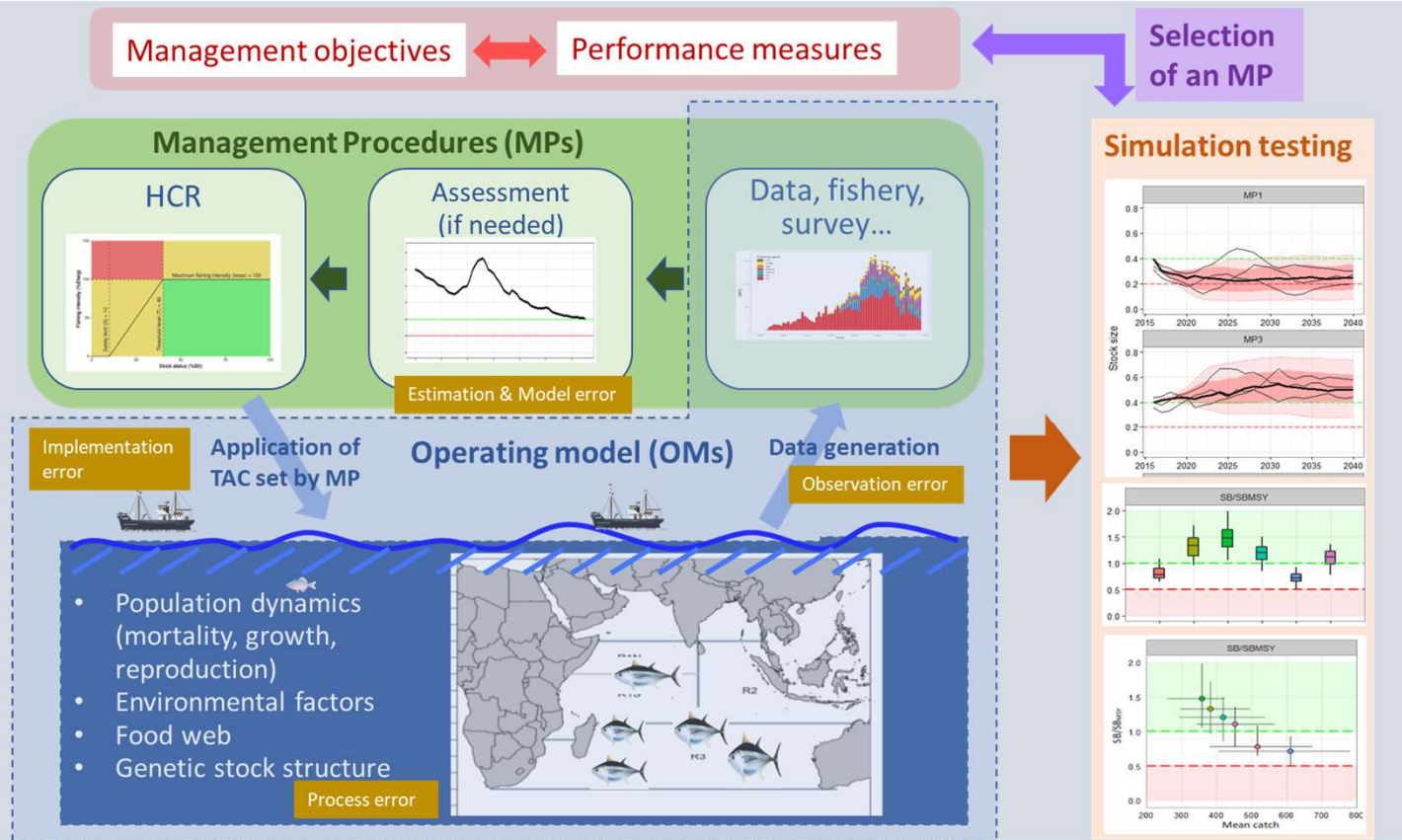
Agenda Item 6. Recommendations to the Commission

Agenda Item 7. Adoption of report

Agenda Item 8. Close of the meeting

MSE Process

1. Identification of **Management objectives** and **performance measures**
2. Development of **Management Procedures (MPs)**
3. Development of **Operating Models (OMs)**
4. **Simulation testing** of MPs with the OMs
5. **Selection of an MP** based on simulation performance
6. **Implementation of the MP**



MSE Process

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6. **Implementation of the MP**

- Several different objectives
- Use of performance measures to see if management objectives are met or not

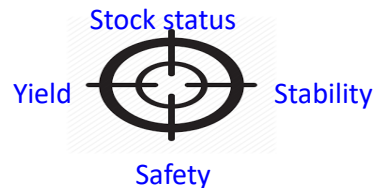
Management objectives



Performance indicators



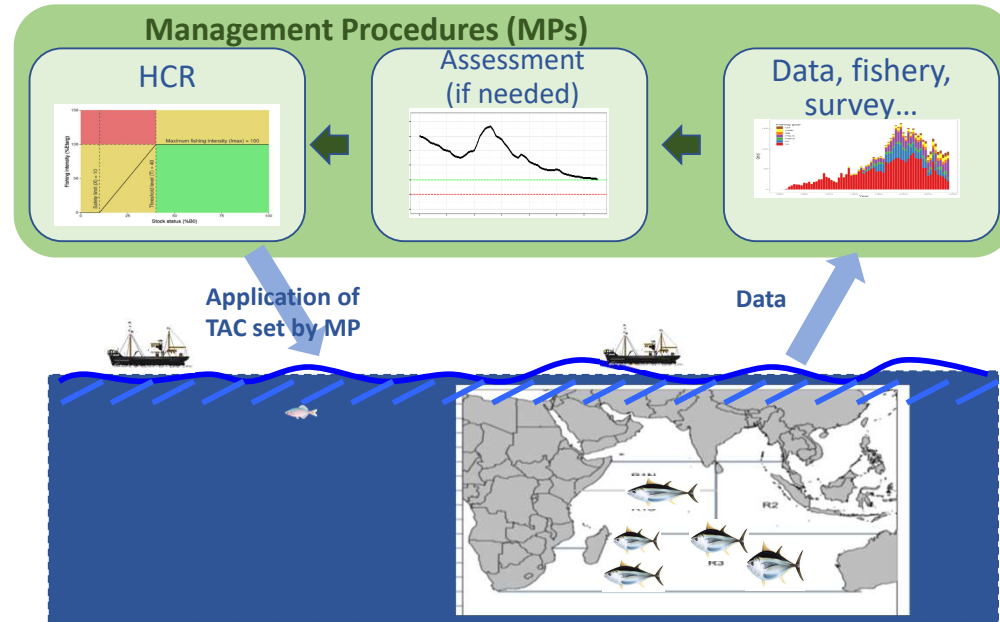
Stock status	↔	Probability that stock is being above a target level
Safety	↔	Probability that stock is breaching the biomass limit
Yield	↔	Maximize average catch over management period
Stability	↔	Minimize the yearly variation



MSE Process

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“Management Procedure (MP)”: a predetermined rule to set a TAC

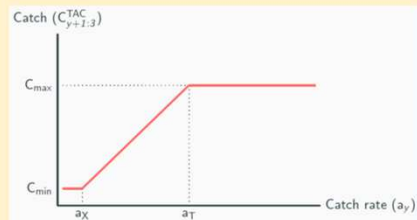
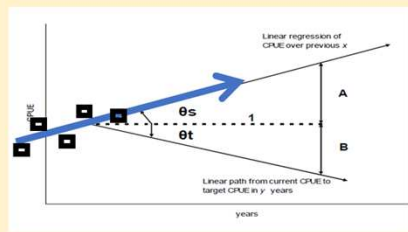


MSE Process

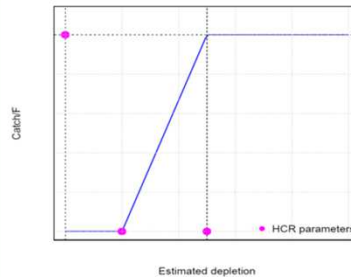
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“Management Procedure (MP)”: a predetermined rule to set a TAC

**Empirical
(model-free, CPUE-based)**



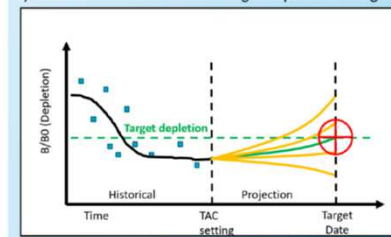
**Model-based with
simple stock assessment**



**Model-based MP with
internal projection**

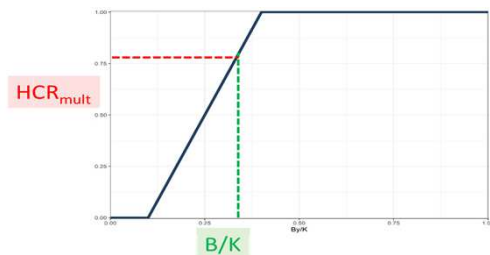
PTRE-based MP with internal projection

- 1) Fit PETR Model
- 2) Find constant TAC that hits target depletion at target date

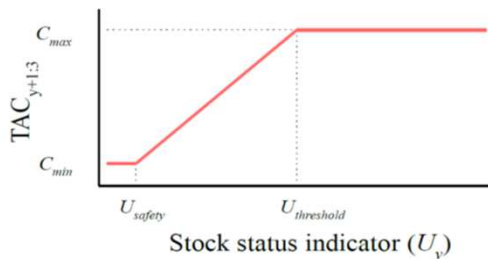


	Bigeye	Skipjack	Swordfish
Stock status	2022	2023	2023
CMM/Prop	22/03 (MP), 23/04 (Catch limits)	24/07 (MP)	24/08 (MP)
Tuning criterion	Prob(Kobe G) = 50%, 60%, 70%	Prob(B>B40% & E<E40%) = 50%, 60%, 70%	Prob(Kobe Green) = 50%, 60%, 70%
MP type	• ~~Data-based~~ • Model-based (MP1-Harvest MP2-Target)	• Data-based (stable) • Data-based (target) • ~~Model-based~~	• Data-based (fast) • Data-based (slow) • Model-based
Constraints etc.	15% maximum change	• Symmetric 15% max change • Asymmetric 15%(up)-10% (down)	Asymmetric 15% (up) - 10% (down)

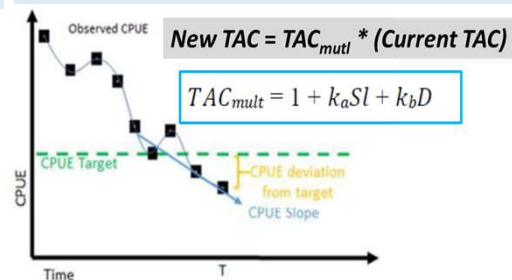
Fishing intensity is controlled to set a TAC depending on stock status based on an internal simple assessment



TAC is directly controlled depending on stock status indicator (CPUE)

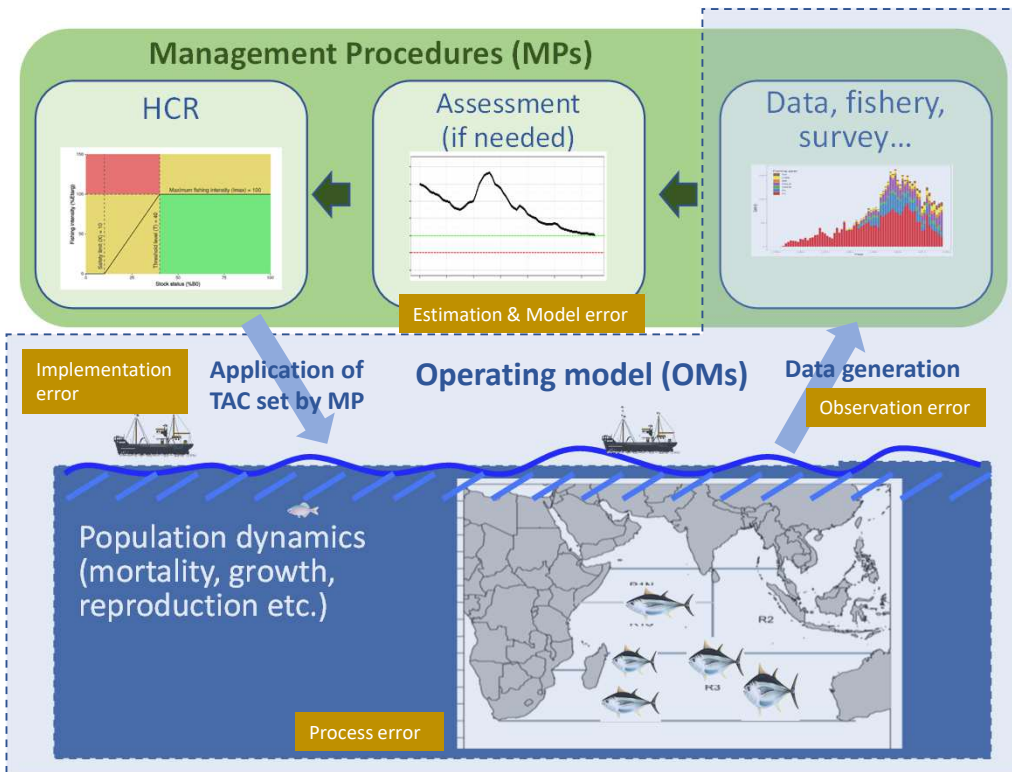


TAC is updated by CPUE trend and its difference against target



For testing MPs, we need “**virtual population**” and “**virtual fishery following an MP**”

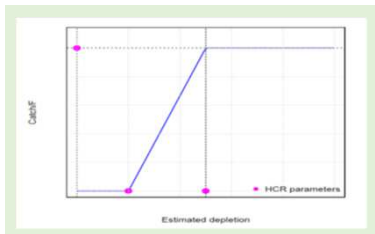
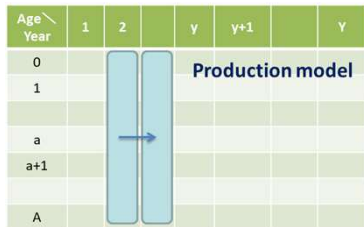
⇒ **Operating models (OMs)**



- OMs **generate data** used in MPs
- OMs can account for the impact of catch on the stock
- OMs are primarily based on the stock assessment, but **should not be completely equal to the assessment models**
- Consider several key uncertainties in parameters, and other kinds of uncertainties to evaluate the **robustness** of candidate Management Procedures

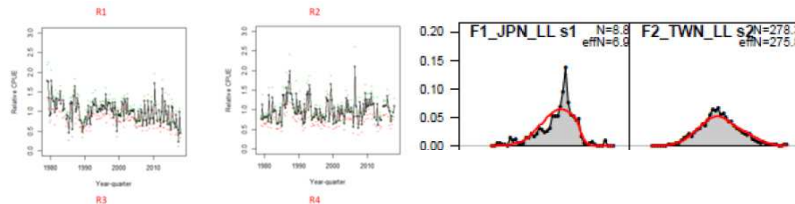
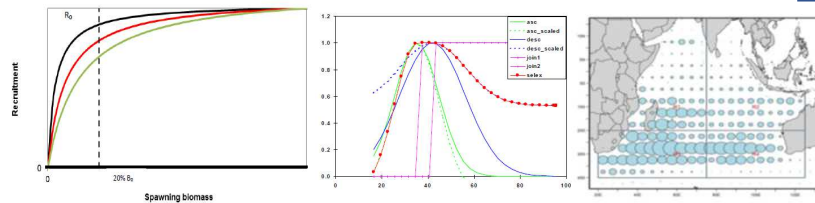
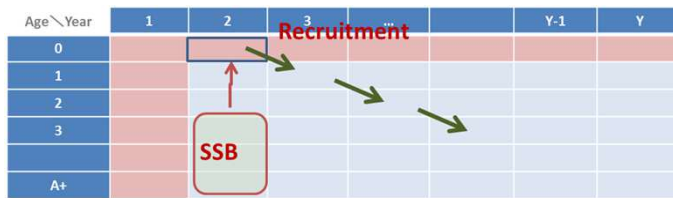
Models for assessment within MPs

Simpler assessment models
to give **robust input on
stock status** to HCR



Models for stock assessment

Stock status, benchmark, detailed mechanism and life
history (by age/life stage and by gear/space/time)



Operating Models (OMs) in MSE

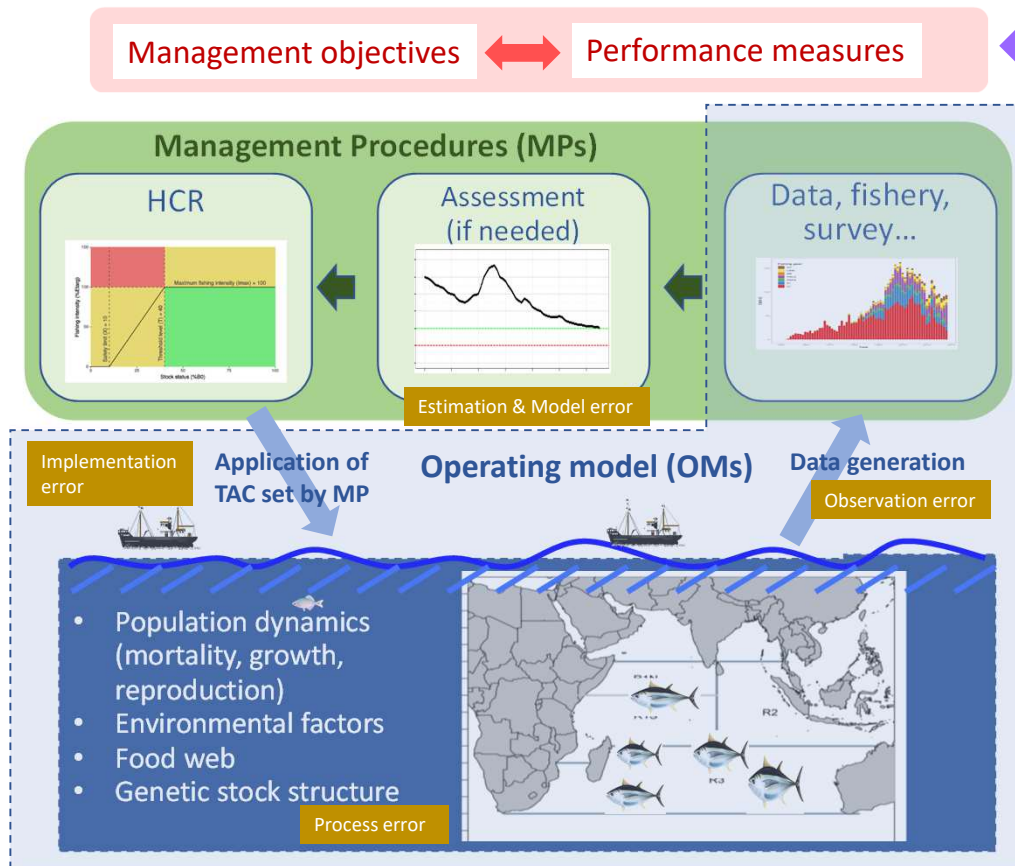
To play roles of **“virtual
population dynamics”**
and **“virtual fishery”** in
the simulation

Primarily based on the
stock assessment, but
several and broader ranges
of uncertainties in key
parameters are considered

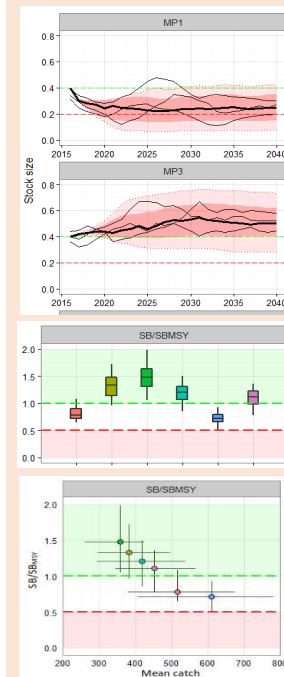
MSE in Nutshell (4) Simulation Testing

MSE Process

1. Identification of **Management objectives** and **performance measures**
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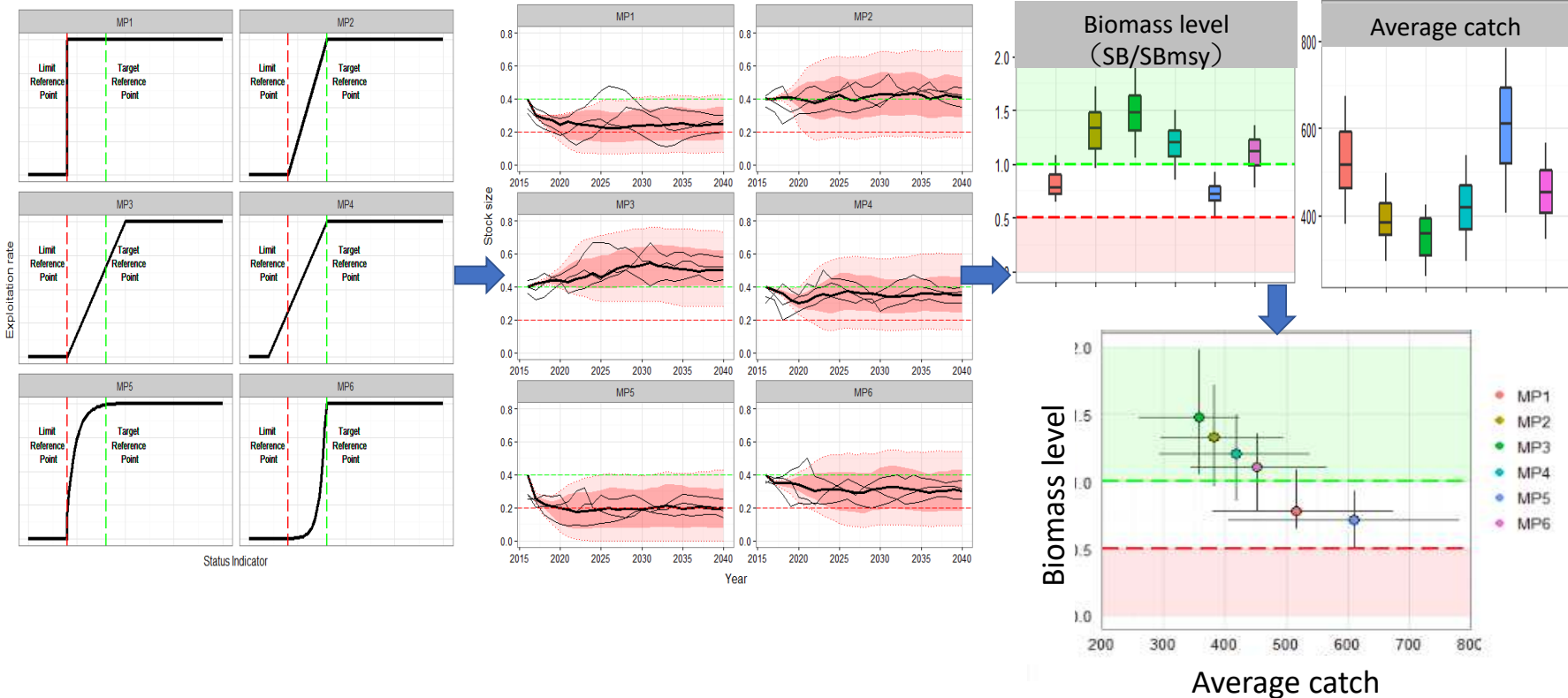


Simulation testing



MSE in Nutshell (4) Simulation Testing

Conduct **comprehensive simulation** to evaluate the performance of MPs using OMs



Items	Development of interim HCR	Development of full MP
Management objectives	- Primary (recovery) - Secondary (avoid risk) - Tertiary (catch)	The three main objectives will be used as previously agreed. Members may also consider additional objectives relating to the following. - Categories: Stock Status (e.g. B, PGK, Abundance), Safety (Avoiding Blim), Yield (catch) stability, socio-economic (incl. consideration of aspirations of SIDS) and ecological/ecosystem - Achieve robustness under climate changes.
Operating models	BSSMP - Age: aggregated over life - Space: combined over EEZ & CA - Time: annual	Age-structured models (SS3, other state-space models) - Age: 0/1 - Space: so far combined - Time: so far annual (seasonal/monthly) - Include key uncertainties (M, S-R, selectivity...) May consider some spatial elements (i.e. distribution shift) for investigating spatial management (depending on progress on new modelling)

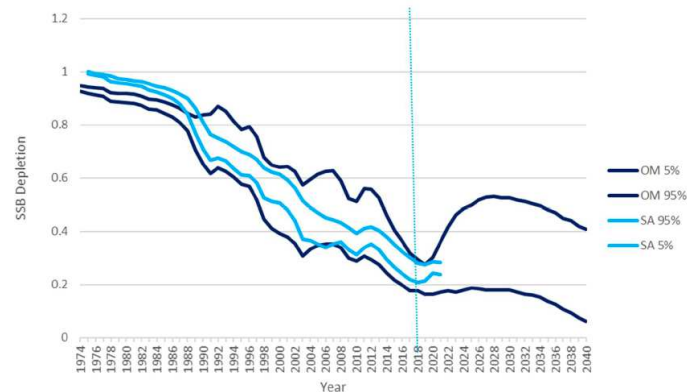
Items	Development of interim HCR	Development of full MP
HCRs and MPs	- Set an annual TAC - Just HCR assuming availability of unbiased estimates	- Set an annual TAC - Model-based (incl. assessment) or empirical MPs or combined - May need to consider spatial allocation particularly for juvenile protection - Evaluate advantages and disadvantages of constraints such as existing MAC and a minimum TAC (particularly in light of scale and climate uncertainties)
Main input (incl. assessment)	Estimates of key reference points from BSSPM analyses	- Estimates of key reference points from BSSPM or others - Address uncertainty in estimates

Items	Development of interim HCR	Development of full MP
Time lag btw data & implementation	1-yr (survey) 2-yrs (fisheries CPUE)	- Use the most recent CPUE and survey information from the current fishing year? - Consider the use of an in-season adjustment if possible
Climate impacts	Considered as robustness case	- Routinely use as part of reference models or robustness testing - Explicitly link climate effects and biological parameters that affect stock size & productivities
Meta rules and others	No definition of exceptional circumstances	Develop definition of exceptional circumstances

Key points on Exceptional Circumstances

- **Exceptional Circumstances (EC)** are a **safety mechanism** for management procedures (MPs).
- ECs are intended to address situations that **fall outside the conditions considered in the MSE** or that may undermine the performance of the adopted MP.
- **BUT, not every unusual event constitutes an EC**
 - The key question is whether the event could **affect the performance or reliability of the MP**.
- Potential ECs include:
 - biological or fishery conditions outside the MSE range
 - major changes in stock dynamics or productivity
 - substantial changes in fishing practices or selectivity
 - missing, unreliable, or substantially changed input data
 - new scientific information that challenges key assumptions
- **EC protocols should be established in advance**, rather than developed after an unexpected event occurs.

- Need “regular monitoring” for MP implementation
- Need “regular review” of MSE
- Need safeguard for “Exceptional Circumstances”
 - New information: out of range of previous knowledge
 - Input data for MP: missing (no longer available), historically changed etc.
 - Inconsistency between TAC recommended and actual catch
 - Rare events, when the fishery system falls outside of the scope of the simulation testing, e.g. recruitment failures



Key points on Exceptional Circumstances

- **Identification of an EC does not automatically imply that the MP should be abandoned or the TAC changed.**
- Possible responses include:
 - continued monitoring
 - additional analysis or data collection
 - enhanced monitoring
 - earlier review of the MP
 - adjustment of management advice or TAC, if warranted
 - revision of the MP in more serious cases
- The **thresholds and decision rules should be transparent and predefined** as far as possible.
- EC provisions should avoid **ad hoc modification of the MP** while allowing flexibility when conditions genuinely fall outside the MSE framework.
- Recent RFMO practice shows a trend toward **stock-specific EC protocols and explicit monitoring strategies.**
- A key principle is:
- **EC identified $\neq$ MP cannot be applied $\neq$ TAC must be changed**

- **Stock productivity substantially outside the MSE range**
 - e.g., prolonged periods of exceptionally low recruitment or natural mortality
- **Major changes in spatial distribution**
 - e.g., persistent shifts in the distribution of Pacific saury that affect the survey or fishery indices
- **Changes in fleet distribution or fishing selectivity**
 - e.g., substantial changes in the fishing grounds or size composition of the catch
- **Major changes in data availability or quality**
 - e.g., loss of a key survey series or substantial changes in survey design

Again, it should be noted;

- **A large change in the stock size alone should not necessarily trigger an EC** if the change is within the range covered by the MSE.



Management procedures & exceptional circumstances

Preparing fisheries for the unexpected

INTRODUCTION

MANAGEMENT PROCEDURES (MPs), ALSO KNOWN AS HARVEST STRATEGIES, provide pre-agreed frameworks for fisheries management decisions under uncertain conditions. MPs are developed and tested using management strategy evaluation (MSE), a simulation-based framework to assess candidate MPs across a wide range of plausible scenarios that capture uncertainty in stock dynamics, fishery behavior, and other factors such as environmental variability, data availability, and management measure implementation. By testing candidate MPs for performance under different scenarios, managers and scientists can select the MP that best achieves the agreed management objectives, even when the current state of the fishery or stock is uncertain and without knowing which conditions are most likely to occur in the future.



Food and Agriculture
Organization of the
United Nations



COMMON
OCEANS
PROGRAM
Tuna project



THE OCEAN
FOUNDATION



Heather Lueder-Thies

Exceptional Circumstances: Preparing for the Unexpected

July 23, 2026
90 minutes starting at 14:00 EDT/18:00 GMT/20:00 CEST

 @HrvstStrategies
 HarvestStrategies
 HarvestStrategies.org

 www.HarvestStrategies.org

<https://www.youtube.com/watch?v=jNjVHg9ZeqY>

MSE IN NUTSHELL (CONCEPTUALLY)

What is **Management Strategy Evaluation (MSE)** ?

“a simulation framework incorporating uncertainty to evaluate the performance of candidate Management Procedures (MPs) against pre-determined management objectives”

Management Procedures (MPs)

- a pre-defined operational rule used to set a Catch Limit (or level of fishing effort)
 - ✓ Data acquisition (catch series, CPUE series etc.)
 - ✓ Understanding the stock condition (via an internal assessment or index trend etc.)
 - ✓ Harvest Control Rule for implementation
- “Model-based” (with a stock assessment model) and “Empirical-based” (data-driven)
- Designed to be robust under uncertainty

MSE IN NUTSHELL (CONCEPTUALLY)

What is **Management Strategy Evaluation (MSE)** ?

“a simulation framework incorporating uncertainty to evaluate the performance of candidate Management Procedures (MPs) against pre-determined management objectives”

Simulation framework incorporating uncertainty

- Create a virtual population and virtual fisheries in computer for future operation (operating models, with several elements of uncertainty)
- Catch is determined according to an MP
- Population reacts to impact of catch (e.g. population decreases if catch limit is too high)
- Continue until management period ends, repeats many times to account for stochastic uncertainty

MSE IN NUTSHELL (CONCEPTUALLY)

What is **Management Strategy Evaluation (MSE)** ?

“a simulation framework incorporating uncertainty to evaluate the performance of candidate Management Procedures (MPs) against pre-determined management objectives”

Management objectives and performance indicators

Objectives

- ✓ *Biological safety : Sustainability of populations, recovery to target levels*
- ✓ *Catch : High yields, stability across years*
- ✓ *Risk-averse : Precautionary approach, minimizing probability of stock depletion*

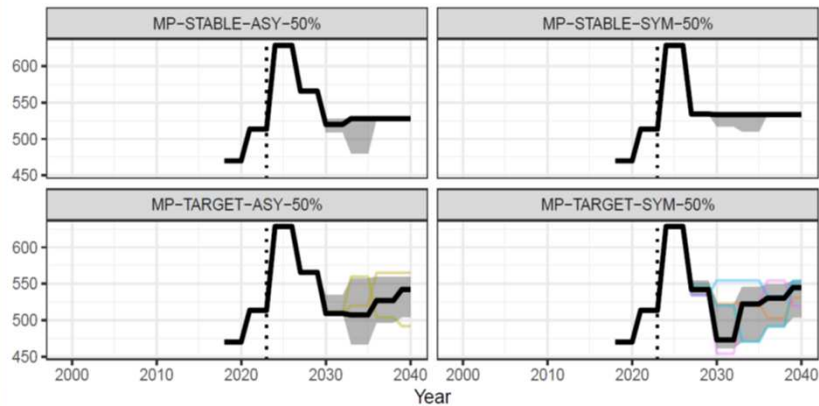
Performance indicators

- *To quantify the expectations and probabilities of the achievements and risks*

MERITS OF MSE

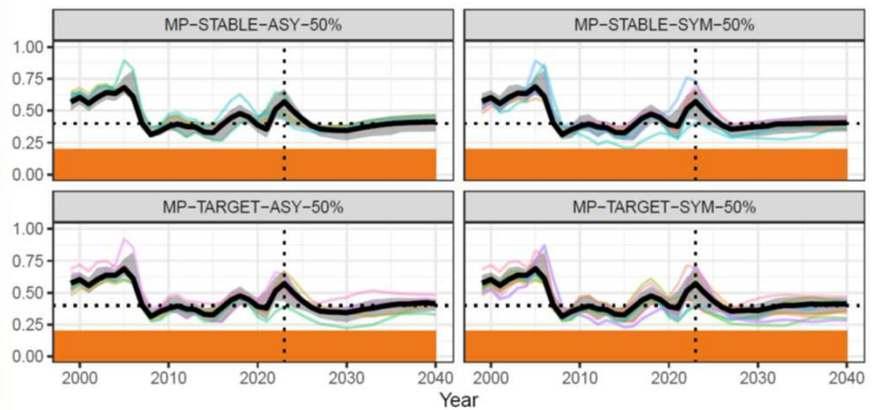
- **Comprehensiveness, Transparency and Dialogue**
- Consider in advance **uncertainty** in data, model, estimation, projection, implementation etc.
- Ensure a certain level of **robustness** of management performance to uncertainty
- Information is available in advance for some **likely trajectories** and their ranges for biomass, catch, etc. after implementing an MP

Absolute TAC



(a) MP's tuned to 50% probability of being in the target quadrant.

Relative SSB



(a) MP's tuned to 50% probability of being in the target quadrant.

MSE PURPOSES & MERITS

Purposes

- to understand the **expected behavior of “MPs”** if implementing them in an actual fishery
- to find the best way by developing MPs to **robustly meet the pre-determined management objectives** (acceptable trade-off and levels of risk)
- to **select an MP** for implementation in actual fisheries

Merits of MSE

- **Comprehensiveness, Transparency and Dialogue**
- Consider in advance **uncertainty** in data, model, estimation, projection, implementation etc.
- Ensure a certain level of **robustness** of management performance to uncertainty
- Information is available in advance for some **likely trajectories** and their ranges for biomass, catch, etc. after implementing an MP