



**North Pacific Fisheries Commission**

NPFC-2022-SWG MSE PS01-Final Report

**1st Meeting of the Joint SC-TCC-COM Small Working Group on  
Management Strategy Evaluation for Pacific Saury (SWG MSE PS)  
REPORT**

21-22 February 2022

March 2022

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**1st Meeting of the Joint SC-TCC-COM Small Working Group on**  
**Management Strategy Evaluation for Pacific Saury (SWG MSE PS)**

**21-22 February 2022**

**WebEx**

**REPORT**

Agenda Item 1. Introductory items

*1.1 Opening of the meeting*

1. The 1st meeting of the joint SC-TCC-COM Small Working Group on Management Strategy Evaluation for Pacific Saury (SWG MSE PS) took place in the format of video conferencing via WebEx, and was attended by Members from Canada, China, Japan, the Republic of Korea, the Russian Federation, Chinese Taipei, the United States of America and Vanuatu. The Pew Charitable Trusts (Pew) attended as an observer. Dr. Penelope Ridings and Dr. Andrew Wright attended as Secretariat Guests in their role as Panelists for the first NPFC Performance Review. The meeting was opened by Dr. Toshihide Kitakado (Japan) and Mr. Justin Turple (Canada), who served as Co-Chairs.

*1.2 Adoption of agenda*

2. The agenda was adopted without revision (Annex A). The List of Documents and List of Participants are attached (Annexes B, C).

*1.3 Meeting logistics*

3. The Science Manager, Dr. Aleksandr Zavolokin, outlined the meeting arrangements.
4. Mr. Alex Meyer was selected as rapporteur.

Agenda Item 2. Role of the joint SWG MSE PS and review of the Terms of Reference

*2.1 Commission's request and CMM 2021-08*

5. The Science Manager explained the Commission's request to establish the SWG MSE PS, as described in paragraph 15 of Conservation and Management Measure 2021-08 for Pacific Saury.

## *2.2 Confirmation of NPFC priority on management*

6. The Science Manager explained the NPFC priority on management, highlighting the following:
  - (a) Adopting measures, based on the best scientific information available, to ensure that fisheries resources are maintained at or restored to levels capable of producing maximum sustainable yield (Article 3(b) of the Convention);
  - (b) Adopt, where necessary, management strategies for any fisheries resources (Article 7(1)(d) of the Convention);
  - (c) Provide analysis to the Commission of alternative conservation and management measures (Article 10(4)(j) of the Convention).

## *2.3 Review of the Terms of Reference*

7. The SWG MSE PS reviewed the Terms of Reference (TOR) and determined that no revisions are currently necessary.

## Agenda Item 3. General overview of an MSE process

### *3.1 Basic and general concept of MSE*

8. Dr. Kitakado outlined the basic and general concept of MSE, highlighting the following necessary steps (not necessarily in sequence):
  - (a) Identification of management objectives and performance measures;
  - (b) Development of operating models (OMs);
  - (c) Development of management procedures (MPs);
  - (d) Simulation testing of MPs with the OMs;
  - (e) Selection of an MP based on simulation performance;
  - (f) Implementation of the MP.
9. Dr. Kitakado explained the difference between projection based on stock assessment and projection in MSE, the difference between an MP and a harvest control rule (HCR), and what an OM is and how it differs from an assessment model (see NPFC-2022-SWG MSE PS01-IP01 for details).
10. In response to a request for further clarification of the difference between OMs and assessment models and how each accounts for uncertainty, Dr. Kitakado explained that both assessment models and OMs consider a certain level of uncertainty but that OMs can also consider an additional level of uncertainty compared to assessment models. Dr. Kitakado suggested that reference case scenarios could be developed for the OM with a similar level of uncertainty to the current assessment model and that these would provide the main outcomes when testing the MPs. In addition, additional scenarios with a greater level of uncertainty could be developed to

test the robustness of the MPs.

11. In response to a request for further elaboration on performance measures/metrics, Dr. Kitakado explained that performance measures/metrics measure the extent to which a management objective is being met. These include measures/metrics for both conservation and fisheries performance.

### *3.2 Reference points, stock status and risks*

12. Dr. Kitakado provided an overview of reference points and explained that limit reference points indicate a biological limit beyond which the state of stock/fishing mortality is undesirable and that target reference points indicate a desired level of biomass/harvest.
13. Dr. Kitakado provided an overview of Kobe plots, Majuro plots, and combined plots as means of representing stock status.

### *3.3 Potential issues regarding MSE for Pacific saury (and small pelagic fish in general)*

14. Dr. Kitakado explained some potential issues regarding MSE for Pacific saury that were raised at the NPFC Biological Reference Point/Harvest Control Rule/Management Strategy Evaluation Workshop held in 2019, namely:
  - (a) Pristine biomass ( $B_0$ ) is not always well estimated for short-lived and highly variable stocks, such as small pelagic species, and  $B_0$ -based reference points should not be used for such species;
  - (b) The importance of tailoring reference points to life history characteristics such as growth and maturity and also to variability in recruitment, understanding the weaknesses and uncertainties inherent in reference points, and testing the robustness of reference points for fishing mortality and spawning stock biomass;
  - (c) Age-structured stock assessment models would be more appropriate than age-aggregated models and age-structured operating models are preferable to length-based operating models.

Agenda Item 4. Initial discussion toward development of an interim harvest control rule (HCR) for the short-term goal

#### *4.1 Management objectives and some constraint conditions for the regulation of fishery*

#### *4.2 Technical matters on operating models, HCRs, performance measures and simulation*

15. Dr. Kitakado summarized the outcomes of the 8<sup>th</sup> meeting of the Small Scientific Committee on Pacific Saury (SSC PS08), focusing on the following recommendations:
  - (a) The current annual TAC for 2021-2022 specified in CMM 2021-08 for Pacific saury

(333,750 tons) is much larger than the TAC would be based on the  $F_{MSY}$  catch approach ( $B_{2021} * F_{MSY} = 192,804$  tons) and the current biomass is much lower than  $B_{MSY}$ . Reducing  $F$  in the short term may increase the probability of achieving long-term sustainable use of Pacific saury (i.e. higher long-term catch closer to MSY of around 419,000 tons);

- (b) A harvest control rule that reduces the target harvest rate and TAC when biomass falls below its target level may be appropriate for Pacific saury. This type of HCR is used in managing many fisheries around the world.

16. Dr. Kitakado presented a strawman proposal for technical developments toward setting an interim HCR for the short-term (NPFC-2022-SWG MSE PS01-WP01), using a Shiny application, to facilitate the discussions of the SWG MSE PS.
17. The SWG MSE PS considered potential reference points. Noting that, according to Article 3(b) of the Convention, fisheries resources are to be maintained at or restored to levels capable of producing maximum sustainable yield, the SWG MSE PS agreed that first priority should be given to MSY-based reference points. In the case of target and limit reference points for the stock, these could be  $B_{tar} = c * B_{MSY}$  or  $c * K$  and  $B_{lim} = c * B_{MSY}$  or  $c * K$ . In the case of target and limit reference points for the fishing intensity, these could be  $F_{tar} = c * F_{MSY}$  and  $F_{lim} = c * F_{MSY}$ . In addition, the SWG MSE PS suggested that reference points based on a certain percentage of fish stock level, such as  $F_{tar} = F(100c\% \text{ of } K \text{ or } B_0)$  and  $F_{lim} = F(100c\% \text{ of } K \text{ or } B_0\%)$ , could also be considered.
18. The SWG MSE PS discussed three types of management objective: recovery of the stock, avoiding unsustainable state of the stock, and achieving high and stable catch.
19. Regarding recovery of the stock, the SWG MSE PS agreed that this should be given the highest priority in light of the current status of the stock. Furthermore, noting the short-lived nature of the species, the SWG MSE PS agreed that a shorter timeframe for achieving recovery would be appropriate. The SWG MSE PS also noted that, with a depleted stock, it is common practice at other regional fisheries management organizations (RFMOs) to set a high probability of achieving recovery. The SWG MSE PS agreed to give further consideration to the following objectives: 1. The stock status is recovered above  $B_{tar}$  within “xx” years with “pp” probability (for example, xx could be 2-5 and pp could be >80%); and 2. The stock status is maintained above the  $B_{tar}$  level over “yy-yy” years with “qq” probability.
20. Regarding avoiding unsustainable state of the stock, the SWG MSE PS agreed to give further consideration to the following two objectives: 1. The annual probability that the stock drops

below  $B_{lim}$  should not exceed “pp” probability; or 2. The annual probability that the fishing mortality exceeds  $F_{lim}$  should not exceed “pp” probability. The SWG MSE PS noted that if the objective for recovery is to be established based on B, setting the objective for sustainability based on F should be avoided because these two objectives may cause confusion.

21. Regarding achieving high and stable catch, the SWG MSE PS agreed to give further consideration to the following two objectives: 1. Catch is high and stable as much as possible; and 2. Maximum interannual variation of TAC over yy period should be less than xx%.
22. Regarding OMs, the SWG MSE PS considered Option A and Option B as described in NPFC-2022-SWG MSE PS01-WP01. The SWG MSE PS weighed the pros and cons of the two options and agreed to prioritize Option A (the use of the current interim stock assessment model, BSSPM, as a basis with consideration of uncertainties in estimated parameters and process errors) given the short timeframe available for achieving the short-term objectives of the SWG MSE PS TOR to develop an HCR. At the same time, the SWG MSE PS agreed that Option B (development of an age-structured model) is more scientifically comprehensive and could be considered as a potential additional model, if it is possible to develop such a model in time. The SWG MSE PS also noted that the BSSPM model in Option A has limited capability of predicting future biomass, and there is a need for improvement for evaluating interim HCRs.
23. The SWG MSE PS agreed to give further consideration to an empirical or model-based HCR. In the case of a model-based HCR, the following points need to be considered:
  - (a) Selection of an input of “B” for HCR (single recent year or 2- or 3-years average?);
  - (b) Maximum change in TAC over two consecutive years (within “xx” %);
  - (c) Parameters can be tuned to meet a priority objective over the reference scenarios;
  - (d) Frequency of application of HCR (every year considering the short-lived nature of the species and environmental concern?);
  - (e) Safeguards for exceptional circumstances.
24. The SWG MSE PS recognized the usefulness of the Shiny application and recommended the Commission allocate funds for the development of a simulation platform for the evaluation of HCR.

Agenda Item 5. Initial discussion toward development of management procedures (MPs) for the mid-term goal

*5.1 Management objectives and some constraint conditions for the regulation of fishery*

*5.2 Technical matters on operating models, MPs, performance measures and simulation*

25. The SWG MSE PS noted that, before it can hold detailed discussions about work towards its mid-term goal, there needs to be more progress on the development of a new age-structured stock assessment model that is better able to predict future biomass trends. The SWG MSE PS agreed to focus on its short-term goal until such progress is made and to defer discussions on its mid-term goal.
26. Pew suggested that the NPFC should work towards establishing an MSE process based on an ecosystem framework that takes into account environmental factors.

#### Agenda Item 6. Functioning within NPFC

##### *6.1 Roles and scientific contributions from the SC and SSC PS*

27. The SWG MSE PS reviewed the roles and expected scientific contributions from the SC and the SSC PS.

##### *6.2 Roles and contributions from the TCC*

28. The SWG MSE PS reviewed the roles and expected contributions from the TCC.

##### *6.3 Others*

29. The SWG MSE PS agreed to conduct intersessional technical work on developing a concrete proposal for reference points and management objectives and developing and evaluating HCRs as a short-term task (conditioning of OMs and listing up of possible/candidate HCRs).

#### Agenda Item 7. Other matters

##### *7.1 Selection of an external expert*

30. Dr. Kitakado suggested the selection of Dr. Larry Jacobson as the external expert for the development of the interim HCR, noting Dr. Jacobson's contributions to the work of the SSC PS.
31. The SWG MSE PS recommends the hiring of Dr. Larry Jacobson as the external expert for the development of the interim HCR.

##### *7.2 Capacity building (glossary and demonstration)*

32. The SWG MSE PS reviewed a glossary of terms for harvest strategies, management procedures and management strategy evaluation developed by the joint tuna RFMO (NPFC-2022-SWG MSE PS01-IP01) and requested that the Secretariat use this as a basis for developing the SWG MSE PS's own MSE glossary in cooperation with co-Chairs and Members.

33. Pew provided an overview of [harveststrategies.org](http://harveststrategies.org), an online resource with harvest-strategy-related material for fisheries scientists, managers, and other stakeholders (NPFC-2022-SWG MSE PS01-OP01).

### *7.3 Others*

34. No other matters were discussed.

## Agenda Item 8. Timeline and future process

### *8.1 Timeline*

### *8.2 Future meetings*

35. The SWG MSE PS discussed and drafted a timeframe for 2022 and early 2023 with proposed meetings and tasks (Annex D).

## Agenda Item 9. Recommendations to the Commission

36. The SWG MSE PS01 recommends that the Commission:
- (a) Allocate funds for the development of a simulation platform for the evaluation of HCR.
  - (b) Hire Dr. Larry Jacobson as an external expert to support the development of an interim HCR.
  - (c) Endorse the timeframe for 2022 and early 2023 including the proposed meetings and tasks (Annex D).

## Agenda Item 10. Adoption of report

37. The SWG MSE PS01 Report was adopted by consensus.

## Agenda Item 11. Close of the Meeting

38. The meeting closed at 12:40 on 22 February 2022, Tokyo time.

## Annex A – Agenda

## Annex B – List of documents

## Annex C – List of participants

## Annex D – Proposed timeframe for 2022 and early 2023



## **Agenda**

### Agenda Item 1. Introductory items

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

### Agenda Item 2. Role of the joint SWG MSE PS and review of the Terms of Reference

- 2.1 Commission's request and CMM 2021-08
- 2.2 Confirmation of NPFC priority on management
- 2.3 Review of the Terms of Reference

### Agenda Item 3. General overview of an MSE process

- 3.1 Basic and general concept of MSE
- 3.2 Reference points, stock status and risks
- 3.3 Potential issues regarding MSE for Pacific saury (and small pelagic fish in general)

### Agenda Item 4. Initial discussion toward development of an interim harvest control rule (HCR) for the short-term goal

- 4.1 Management objectives and some constraint conditions for the regulation of fishery
- 4.2 Technical matters on operating models, HCRs, performance measures and simulation

### Agenda Item 5. Initial discussion toward development of management procedures (MPs) for the mid-term goal

- 5.1 Management objectives and some constraint conditions for the regulation of fishery
- 5.2 Technical matters on operating models, MPs, performance measures and simulation

### Agenda Item 6. Functioning within NPFC

- 6.1 Roles and scientific contributions from the SC and SSC-PS
- 6.2 Roles and contributions from the TCC
- 6.3 Others

### Agenda Item 7. Other matters

- 7.1 Selection of an external expert
- 7.2 Capacity building (glossary and demonstration)

### 7.3 Others

#### Agenda Item 8. Timeline and future process

##### 8.1 Timeline

##### 8.2 Future meetings

#### Agenda Item 9. Recommendations to the Commission

#### Agenda Item 10. Adoption of report

#### Agenda Item 11. Close of the meeting

## List of Documents

**MEETING INFORMATION PAPERS**

Symbol	Title
NPFC-2022-SWG MSE PS01-MIP01	Meeting Information
NPFC-2022-SWG MSE PS01-MIP02	Provisional Agenda
NPFC-2022-SWG MSE PS01-MIP03 (Rev. 1)	Annotated Indicative Schedule

**REFERENCE DOCUMENTS**

Symbol	Title
NPFC-2019-WS BRP_HCR_MSE01-WP01 (Rev. 1)	Review of Target and Limit Reference Points
NPFC-2019-WS BRP_HCR_MSE01-Final Report	Biological Reference Point/Harvest Control Rule/Management Strategy Evaluation Workshop Report
	Conservation and Management Measure 2021-08 for Pacific Saury
	TOR for a joint SC-TCC-COM SWG MSE PS

**WORKING PAPERS**

Symbol	Title
NPFC-2022-SWG MSE PS01-WP01	Development of HCR for Pacific saury for meeting the short-term objective set in the Terms of Reference of the SWG MSE PS

**INFORMATION PAPERS**

Symbol	Title
NPFC-2022-SWG MSE PS01-IP01	Glossary of terms for harvest strategies, management procedures and management strategy evaluation
NPFC-2022-SWG MSE PS01-IP02	Proposed timeframe for 2022 and early 2023

**OBSERVER PAPERS**

Symbol	Title
NPFC-2022-SWG MSE PS01-OP01	Harvest Strategies

## List of Participants

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## Proposed timeframe for 2022 and early 2023

Meeting	Date	Task
SWG MSE PS01 (virtual)	Feb 21-22, 2022	<ul style="list-style-type: none"> <li>Objectives, timeline and workplan</li> <li>Plans for intersessional technical work</li> </ul>
COM07 (virtual)	Mar 28-30, 2022	<ul style="list-style-type: none"> <li>Review of management advice from SC</li> <li>Review and endorsement of SWG MSE PS01 report</li> </ul>
Intersessional technical work		<ul style="list-style-type: none"> <li>Develop a concrete proposal of reference points and management objectives</li> <li>Start technical work for developing and evaluating HCRs as a short-term task (conditioning of OMs and list up possible/candidate HCRs)</li> </ul>
SSC PS09	Aug 30-Sep 2, 2022	<ul style="list-style-type: none"> <li>Review standardized CPUE up to 2021</li> <li>Review Japanese survey estimates including 2022</li> <li>Review progress on new assessment models and finalize a set of models and specification</li> <li>Start discussion on development and evaluation of HCR as a short-term task</li> </ul>
SWG MSE PS02	Sep 12-13, 2022	<ul style="list-style-type: none"> <li>Feedback on outcomes of intersessional work</li> <li>Capacity building</li> </ul>
Intersessional technical work		<ul style="list-style-type: none"> <li>Continue discussions on reference points and management objectives and technical work for developing and evaluating HCRs as a short-term task</li> </ul>
SSC PS10	Dec 12-15, 2022	<ul style="list-style-type: none"> <li>Update BSSPM analyses and provide recommendations to the SC/COM</li> <li>Review progress on new assessment models and finalize a set of models and specification (relevant to the mid-term MSE work as conditioning of operating models)</li> <li>Continue discussion on development and evaluation of HCR as a short-term task</li> </ul>
SWG MSE PS03	Around one month prior to COM08	<ul style="list-style-type: none"> <li>Objectives, reference points, timeline and workplan</li> <li>Recommendations to the Commission</li> </ul>
COM08	2023	<ul style="list-style-type: none"> <li>Review of management advice from SC</li> <li>Review and endorsement of SWG MSE PS 02 and 03 reports</li> </ul>
To be determined	2023	

Note: Meetings highlighted in yellow are those that have already been scheduled.