North Pacific Fisheries Commission
5th Meeting of the Joint SC-TCC-COM Small Working Group on Management Strategy Evaluation for Pacific Saury (SWG MSE PS)

18-20 January 2024
Niigata, Japan (Hybrid)

REPORT

Agenda Item 1. Introductory items

1.1 Opening of the meeting

1. The 5th meeting of the joint SC-TCC-COM Small Working Group on Management Strategy Evaluation for Pacific Saury (SWG MSE PS) was held in a hybrid format, with participants attending in-person in Niigata, Japan or online via WebEx, on 18-20 January 2024. The meeting was attended by Members from Canada, China, Japan, the Republic of Korea, the Russian Federation, Chinese Taipei, the United States of America, and the Republic of Vanuatu. The Pew Charitable Trusts (Pew) attended as an observer. Dr. Larry Jacobson participated as an invited expert. The meeting was chaired by Dr. Toshihide Kitakado (Japan) and Mr. Derek Mahoney (Canada), the co-Chairs of the SWG MSE PS.

2. Mr. Mahoney opened the meeting and welcomed the participants. He thanked Japan for hosting the meeting and the Fisheries Agency of Japan for its efforts in organizing the meeting.

3. Mr. Takumi Fukuda, Fisheries Agency of Japan, welcomed the participants to Niigata and thanked them for coming. He also expressed his thanks to the co-Chairs for their dedicated preparations, and to the Secretariat for its assistance. Mr. Fukuda reminded the participants that the Commission had tasked the SWG MSE PS with testing and recommending candidate harvest control rules (HCRs) for Pacific saury and presenting the outcomes at the eighth Commission meeting (COM08) in April. He further noted that, as this is the working group's last meeting before COM08, the SWG MSE PS is expected to narrow down the candidate HCRs that it will recommend to the Commission.

4. Mr. Alex Meyer was selected as rapporteur.

1.2 Adoption of agenda

5. 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

6. The Science Manager, Dr. Aleksandr Zavolokin, outlined the meeting arrangements. He also thanked China for providing a voluntary contribution for purchasing the Secretariat's hybrid meeting equipment and the United States for providing a voluntary contribution to facilitate scientific analyses on the NPFC priority species, in particular Pacific saury and chub mackerel.

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

2.1 SWG MSE PS04

7. Dr. Kitakado (hereafter "co-Chair") presented the outcomes and recommendations from the SWG MSE PS04 meeting.

2.2 SSC PS12 and SC08

8. The co-Chair presented the outcomes and recommendations from the 12th Meeting of the Small Scientific Committee on Pacific Saury (SSC PS12).

9. The Science Manager presented the outcomes from the 8th Meeting of the Scientific Committee (SC08) that are relevant to the SWG MSE PS.

Agenda Item 3. Overview of MSE

3.1 Roles of SWG MSE PS in the NPFC process

3.2 Basic principles of MSE

3.3 Roles of harvest control rules (HCRs) and management procedures (MPs)

10. The co-Chair presented an overview of an MSE process (NPFC-2024-SWG MSE PS05-IP01), including the role of the SWG MSE PS, the basic principles of an MSE, the roles of HCRs and management procedures (MP), and the advantages of MPs (including HCRs) over non-MSE approaches.

11. Pew gave a presentation on restoring Pacific saury to a more predictable and productive fishery (NPFC-2024-SWG MSE PS05-OP01). Pew emphasized the benefits to the NPFC of adopting proactive, science-based management via an interim HCR, followed by the development of a full MP, for the Pacific saury fishery, pointing out that, where adopted elsewhere, these pre-agreed, carefully tested approaches have generated positive results.

3.4 Examples in other RFMOs

12. Pew presented examples of the application of hockey-stick HCRs and the outcomes of their

implementation in other fisheries, specifically the Australian southern and eastern scalefish and shark fishery, the British Columbia sablefish fishery, the US Atlantic herring fishery, and the Bay of Biscaye anchovy fishery.

3.5 Quick demonstration of MSE

13. The co-Chair presented a quick demonstration of HCR simulations using the Shiny application. The latest version of the Shiny application used for this analysis will be made available to Members for future HCR work.

Agenda Item 4. Review technical progress on development of an HCR as a short-term task

14. The co-Chair presented the results of the SWG MSE PS's simulation testing for HCRs in the Pacific saury fishery (NPFC-2024-SWG MSE PS05-WP01). The details are described in the relevant sections under agenda items 4.1-4.5 below.

4.1 Management objectives and reference points

15. The SWG MSE PS conducted its simulation analysis based on the following three types of management objectives agreed to at SWG MSE PS04, while putting higher priority on (a).
    (a) Recovery of the stock (primary objective):
        i. The stock status is recovered above B_{tar} within 5 years with 50% probability.
        ii. The stock status is maintained above the B_{tar} level in each of years 6-10 with 50% probability.
    (b) Avoiding unsustainable state of the stock (secondary objective):
        i. The annual probability in each of years 6-10 that the stock drops below B_{lim} should not exceed 10%.
        ii. The annual probability in each of years 6-10 that fishing mortality is above F_{lim} should not exceed 10%.
    (c) Achieving high and stable catch (tertiary objective):
        i. Average catch over years 6-10 is as high as possible.
        ii. Catch in each of years 6-10 is as stable as possible.

4.2 Conditioning of operating models (OMs)

16. The SWG MSE PS applied the OM specifications for generating future data as input for HCRs that were agreed to at SWG MSE PS04.

17. The SWG MSE PS assumed the following scenarios for environmental variability modeled as process errors in HCR simulations (Table 1). R1 and R2 are reference case scenarios used directly to provide HCR advice. S1 and S2 are sensitivity analyses to try to understand the performance of the candidate HCRs under alternate productivity regimes that were indicated

to have occurred in the early 2000s (positive or favorable) and the 2010s (negative or unfavorable) evident in results from the most recent stock assessment.

Table 1: OM specifications

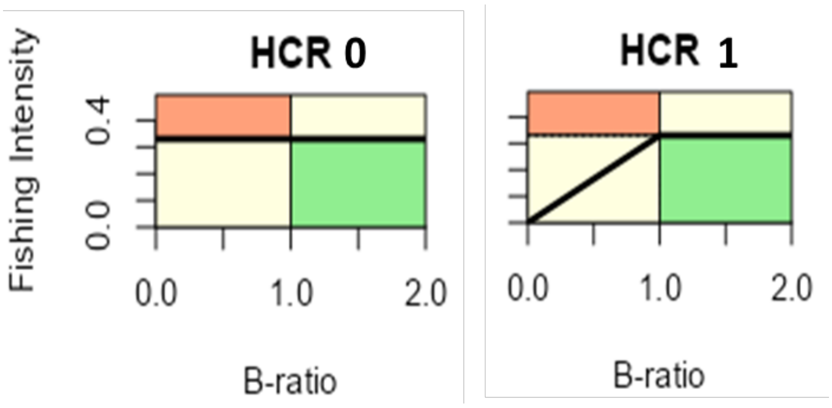
Name	Model	Scenario
R1	IID log-normal assumption	Reference scenario (1) "Random environmental effects"
R2	Auto-correlated log-normal assumption	Reference scenario (2) "Some short-term correlation in environmental effects"
S1	IID log-normal assumption with a mean adjustment	Sensitivity scenario (1) "Climate trends cause negative effects on productivity"
S2	IID log-normal assumption with a mean adjustment	Sensitivity scenario (2) "Climate trends cause positive effects on productivity"

4.3 Candidate interim HCRs and constraints therein

18. The SWG MSE PS tested two candidate interim HCRs as follows:
    - **HCR0**: $TAC_y = F_{MSY} * B_{y-1}$; and,
    - **HCR1**: $TAC_y = \alpha_{y-1} * F_{MSY} * B_{y-1}$, where $\alpha_{y-1} = \min(1, B_{y-1}/B_{MSY})$.

HCR0 is a traditional approach that sets TAC to a constant fraction of stock biomass. It has been replaced by HCR1 in many fisheries because TAC tends to be too high for stock rebuilding when biomass is low. HCR1 reduces TAC at biomass levels below B_{MSY}. However, TAC from HCR0 and HCR1 are the same once biomass increases to B_{MSY} (Figure 1).

Figure 1: Illustration of HCR0 and HCR1



19. The SWG MSE PS evaluated two types of additional adjustments to HCR0 and HCR1 by simulation as described below (Table 2). Both are intended to help protect the stock and fishery from uncertainty in true biomass. The first approach uses the average of the two most recent biomass estimates $(B_{y-2} + B_{y-1})/2$ instead of B_{y-1} to calculate TAC for year y. It has the advantage of potentially protecting the fishery and stock by reducing errors and uncertainty in the biomass

value used to calculate TAC. However, it has the disadvantage of biasing the biomass value towards the previous level and delaying any increases or decreases in TAC. The second approach is a maximum allowable change (MAC) that limits the amount of change in TAC that can occur from one year to the next. For example, managers could decide to limit changes in TAC from one year to the next to +/- 20%. This approach is also meant to protect the stock and the fishery from errors and uncertainty in biomass that might lead to wide swings in TAC. The disadvantage is a delay in decreasing or increasing TAC if stock size declines or increases.

Table 2: Additional adjustments to HCR0 and HCR1

Item	**Options**
Biomass B in HCR used to calculate TAC	1) previous single year (B_{y-1}) 2) average of previous two years [(B_{y-2}+B_{y-1})/2]
Maximum allowable change (MAC) in TAC over two consecutive years	A) 20, 30, 40% + no constraint for option 1) above B) 20, 25% and + no constraint for option 2) above

20. In initial runs prior to the meeting (NPFC-2024-SWG MSE PS05-WP01), the SWG MSE PS analyzed both types of adjustments in combination (e.g. B_{y-1} with MAC 20%). The performance of HCR0 was expected to be relatively poor, based on previous studies. To save time and simplify results, HCR0 was simulated only with single year biomass and MAC 40%. In total, there were 7 simulation scenarios with HCR1 (single year biomass with 4 MAC options plus average biomass with 3 MAC options), along with one scenario for HCR0, as shown below (Table 3).

Table 3: Candidate interim HCRs evaluated in initial simulations

Name	**HCR type**	**B input**	**MAC**
HCR0_01_40	0	Single year	40%
HCR1_01_20	1	Single year	20%
HCR1_01_30	1	Single year	30%
HCR1_01_40	1	Single year	40%
HCR1_01_No	1	Single year	None
HCR1_02_20	1	Two year average	20%
HCR1_02_25	1	Two year average	25%
HCR1_02_No	1	Two year average	None

4.4 Performance indicators

21. The SWG MSE PS used the following performance indicators agreed to at SWG MSE PS04 to measure and compare the performance of the candidate HCRs in the simulation testing:
    (a) Time series plots for Biomass, B-ratio, F-ratio, TAC, catch rate and probabilities of Kobe quadrants.

(b) Box and violin plots of Biomass (in 2029 and 2034), B-ratio (in 2029 and 2034), F-ratio (in 2028 and 2033), and average TAC (2024–2028 and 2029–2033).

(c) Trade-off plots 1: Median time trajectories of B- and F-ratios for HCR0 and HCR1 from 2024 to 2033.

(d) Trade-off plots 2: Median trajectories of the B-ratio and TAC for HCR0 and HCR1 from 2024 to 2033.

(e) Tables for $Pr(B > B_{tar})$, $Pr(B < B_{lim})$ and $Pr(F > F_{lim})$ relevant to the objectives (a) and (b) with the default reference points (B_{tar}=B_{MSY}, B_{lim}=0.35B_{MSY}, and F_{lim}=1.35F_{MSY}).

4.5 Simulation outcomes

22. The SWG MSE PS reviewed the initial simulation results in NPFC-2024-SWG MSE PS05-WP01 and noted the following:

(a) Performance in the Reference Scenarios (based screened MCMC samples)

i. HCR0 performed poorly in the single simulation test (HCR0_01_40) relative to HCR1 options. Median stock biomass was below but near B_{MSY} in 2028 and remained there until at least 2034. Median TAC levels were always less than MSY.

ii. Biomass trend results for HCR1 were generally similar for reference cases R1 (no auto-correlation in the process errors) and R2 (with auto-correlation in the process errors) at all MAC levels. Median stock biomass reached B_{MSY} in HCR1 scenarios by about 2028. Based on this result, it is expected that the stock would rebuild if any of the reference HCR1 options is adopted.

iii. Median TAC never reached MSY in HCR1_01_20 (one year biomass with 20% MAC) and did not reach MSY in HCR1_01_30 or HCR1_01_40 (30 or 40% MAC) until about 2031. In contrast, TAC reached MSY in 2029 (two years after median biomass reached B_{MSY}) in HCR1_01_No with no constraint on year-to-year variation in TAC. Results were similar in scenarios where two biomass estimates were averaged for the TAC calculation. These results show the trade-offs between TAC, rebuilding speed and MAC constraints in HCRs for Pacific saury.

iv. HCR1_01_40, employing a single-year biomass estimate and a 40% MAC and HCR1_02_25, employing a two-year average biomass estimate and a 25% MAC had similar performance. This result indicates that the two-year average biomass and MAC have similar effects on stock trajectory and involve similar trade-offs.

(b) Performance in the initial Sensitivity Scenarios (based screened MCMC samples)

i. The F_{MSY}, B_{MSY}, MSY and related quantities shown as straight lines provide useful information but are approximate in the figures from initial runs in the R1 and R2 scenarios. The incorporation of negative process error into the S1 scenario and positive process error into the S2 scenario would have shifted the reference points away from the reference case scenarios. In particular, the true B_{MSY} and MSY under climate change are likely lower in the S1 scenario with reduced productivity and higher in the S2 scenario with higher productivity.

ii. Under the S1 scenario with reduced productivity, HCR0_01_40 performs poorly and does not lead to substantial resource recovery. In contrast, simulation results indicate that the stock may recover higher and relatively stable levels under HCR1. All HCRs exhibit an immediate increase in biomass in less than 5 years under the S2 scenario with positive process errors. However, HCR1 approaches reach higher biomass and TAC levels compared to HCR0. These results indicate that HCR1 approaches perform relatively well under both positive and negative climate change effects.

23. After the SWG MSE PS reviewed the initial HCR simulation results, it reviewed HCR simulation analyses focusing on the HCR1 approach (NPFC-2024-SWG MSE PS05-WP01, Appendix 4) based on the median of the entire MCMC samples for the Reference Scenario 1. The following is a summary of the key characteristics of the settings for the updated simulation analyses:

(a) HCR0 approaches with constant F at all biomass levels were rejected from further analysis. HCR0 performance was relatively poor in preliminary runs.

(b) HCR1 is a hockey stick function for F and TAC based on biomass in the previous year.

(c) HCR1 approaches based on the average biomass during the previous two years (originally designated HCR1_02_xx) were eliminated from consideration because the median BSSPM biomass estimates from the last stock assessment and a two-year average were very similar, indicating little or no effect or benefit in averaging. Preliminary simulations confirmed that the performance of HCR1_01 and HCR1_02 approaches was similar. Finally, the HCR1_02 approach appears biologically unreasonable given that Pacific saury is very short lived (i.e., lifespan of up to 2 years), meaning that use of data from year y-2 would relate to biomass no longer available to the fishery.

(d) Updated reference simulations assumed random variability in process errors which are a proxy for environmental effects. Simulations with autocorrelated process errors were not updated because results for autocorrelated and random process errors were similar.

(e) The updated simulations utilized the median of entire MCMC runs as well as F_{MSY} and B_{MSY} reference points from the last stock assessment. The screening process was meant to focus work on the most probable assumptions. However, it changed the distributions of model parameters and reference points such as median B_{MSY} and F_{MSY} complicating interpretation of results. Median F_{MSY} and B_{MSY} in the updated runs are the same as in the last assessment and the same in all of the updated simulation analyses.

(f) Six HCR options, using year y-1 biomass estimates, were considered in updated simulations. The options are designated HCR1_01_xx% where xx% designates the MAC in TAC from one year to the next. For example, HCR1_01_40 has MAC of 40%, meaning that TAC could increase or decrease by no more than 40% each year. Options with MAC values of 10%, 20%, 30% and 40% (four options) and with no MAC constraint were all considered.

(g) The options with a MAC constraint were meant to promote varying levels of stability in TAC from year to year. These provide the additional benefit of diminishing socio-economic impacts in the short term. However, it is very important to note that interim HCRs applying MAC approaches are less responsive to biomass changes, potentially limiting catch while the stock grows and allowing catch above sustainable levels when biomass decreases.

(h) A sixth option (HCR1_01_No_HCR0), that does not constrain interannual TAC changes but applies the HCR0 approach only in 2024 to diminish the socio-economic impacts from the initial projected TAC, was also included for consideration. Without the application of HCR0 in 2024 (i.e., applying HCR1_01_No), the 2024 TAC was projected to be 74,000 mt, which would be significantly less than historically low catch levels in 2023 of approximately 100,000 mt. With the application of HCR1_01_No_HCR0, the 2024 TAC is projected to be 172,500 mt. Some Members felt that this adjustment could be more acceptable to the Commission while still meeting management objectives. In all other aspects, the HCR1_01_No and HCR1_01_No_HCR0 are identical.

24. The SWG MSE PS reviewed the updated simulation results (NPFC-2024-SWG MSE PS05-WP02) and noted the following:

(a) Updated simulation results for each of the six HCR1_01 reference options and one sensitivity case showed clear and consistent patterns.

(b) In summary, the updated results for HCR_01 options showed contrast between runs with highly constrained changes in TAC (e.g. 10% MAC), higher median biomass (> B_{MSY} in 2034), lower F (< F_{MSY} in 2034), and lower cumulative TAC on one extreme. On the other extreme are options with reduced constraints on changes in catch (e.g. MAC 40% and HCR1_01_No) with B closer to or at B_{MSY}, higher F near F_{MSY} and higher cumulative TAC levels.

(c) The management objectives agreed to at SWG MSE PS04 were generally met for all six reference cases with some tradeoffs between F and harvest goals. In particular:

i. Median simulated stock biomass reached B_{MSY} in all six reference cases by 2029 (after 5 years of application of an HCR, starting from 2024). The probability that stock biomass was maintained above B_{MSY} after 2029 was at least 50% in all cases. The probability that stock biomass declined to B_{lim} was less than 10% in all cases.

ii. F reached F_{lim} in some years of the simulation period for options with MAC 30%, 40% and no constraint. These options also provided the highest catch levels, illustrating trade-offs between the F < F_{lim} and high harvest level goals. However, the SWG MSE

PS noted this disadvantage is not a serious problem because the primary objective of rebuilding the stock was met relatively quickly (see footnote 2 under Table 5 below).

iii. Options with relatively low MAC levels resulted in biomass well above B_{MSY} but with substantially reduced TAC levels for 2024-2033.

(d) Median biomass for the sensitivity case with negative environmental effects on productivity (under S1) increased over time but did not rebuild to B_{MSY} by 2034 for all HCR options. Results from the sensitivity analyses with negative environmental effects illustrate how stock rebuilding might be affected by a poor environment in the near term and how rebuilding might be delayed.

Agenda Item 5. Selection of an HCR and implementation schedule

5.1 Selection of an Interim HCR

25. The SWG MSE PS reaffirmed that simulations are a useful tool for choosing appropriate harvest control rules for a fishery with particular characteristics under a narrow range of environmental conditions. They are not meant to and should not be interpreted as explicit predictions about the time required to rebuild the stock. Such predictions are an important topic for analysis in connection with each stock assessment when progress towards rebuilding can be evaluated and relationships between environmental data and productivity can be considered.

26. The SWG MSE PS further noted that when reviewing the results, it is important to pay attention not only to the central tendency for median results from the simulation, but also the variance therein. For example, future TAC may not follow the thick line in the middle but will fluctuate within the confidence interval.

27. When discussing the selection of an interim HCR, the SWG MSE PS agreed that it would be more appropriate to refer to the scenarios that were described as the "reference case" and the "sensitivity cases" in the simulation analyses as the "base case" and the "robustness case", respectively.

28. After extensive discussions, the SWG MSE PS recommends four interim HCR options for further consideration by the Commission. The following represents a summary of the key observations of the SWG. This is followed by a table of key outputs from the simulations for each option (Table 4) and a table summarizing the advantages and disadvantages of each option (Table 5). The simulation trajectories of biomass and TAC under the Base Case are shown in Figure 2 below. The simulation trajectories of biomass and TAC under the Robustness Case are shown in Figure 3 below.

(a) All of the options use a hockey stick shaped control function, which is a common approach used in many other fisheries, with biomass target B_{MSY}, target $F=F_{MSY}$ at biomass $\geq B_{MSY}$

and a linear decline in target F between biomass zero and B_{MSY}. MAC is the maximum allowable change in TAC from one year to the next.

(b) The differences between options are the MAC levels which range from 10% to 40% in addition to an option with no MAC constraint. The SWG MSE PS considered that the option with no MAC constraint could receive more support at the Commission if the TAC for 2024 was replaced with a higher value. One option (HCR1_No_HCR0) provides a transitional TAC for 2024 of 172,500 mt by HCR0_01 for 2024 before applying HCR1_01_No for the remainder of the simulation period.

(c) All of the options are projected to achieve the primary management objective related to stock recovery under the base case scenario.

(d) Any option with a MAC constraint will be less responsive and will not perform as well as the unconstrained option in a situation where biomass is declining and will limit the amount of catch that can be realized at higher biomass levels. Such a tendency becomes stronger as the MAC percentage becomes smaller.

(e) The set of candidate interim HCRs that has been recommended was also tested under robustness scenarios, one of which assumed negative effects on productivity caused by climate trends. Under this robustness scenario, the primary management objective related to stock recovery was not achieved for any of the options.

(f) The interim HCR is expected to be replaced by a management procedure that should consider a wider range of uncertainties in the population and fishery dynamics.

Table 4: Summary of key outputs from the simulations for each option in the set of candidate interim HCRs that has been recommended

Scenario	Year	HCR1_10%	HCR1_20%	HCR1_40%	HCR1_No_HCR0
Base case	Pr(B2029 > Btar)	0.767	0.824	0.845	0.630
	TAC 2023 (actual)	250.0	250.0	250.0	250.0
	TAC 2024 (fixed)	225.0	200.0	150.0	172.5
	TAC 2025*	202.5	160.0	139.7	139.7
	TAC 2026*	203.5	192.0	156.2	202.9
	TAC 2027*	200.5	208.8	196.5	314.5
	TAC 2028*	220.5	232.7	251.9	415.6
	Average TAC for 2024-2028*	210.4	198.7	178.8	249.0
	Average TAC for 2029-2033*	296.2	348.9	430.9	426.0
	Average TAC for 2029-2033*	253.3	273.8	304.9	337.5
Robustness case	Pr(B2029 > Btar)	0.118	0.188	0.279	0.173

*Median results from simulations for relative comparisons among options only. Units for TAC figures: thousand mt.

Table 5: Advantages and disadvantages of each option in the set of candidate interim HCRs that has been recommended[1]

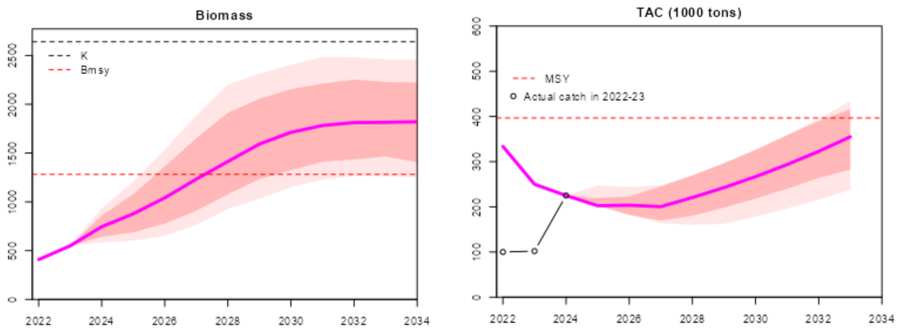
Option	Advantages	Disadvantages
HCR1_10%	• Most stable TAC during 2024-2033. • High stock biomass (> B_{MSY}) after stock rebuilds if environmental conditions are good. • $F < F_{lim}$ in the simulations.	• Lowest ability to reduce/increase quota in response to lower/higher biomass or environmental change. • Slowest rate and lowest probability of recovery if the underlying stock productivity declines or stays low (robustness case). • Lowest average TAC levels (2024-2033). • One year delay in reaching B_{MSY} relative to other options.
HCR1_20%	• Stable TAC during 2024-2033. • High stock biomass (> B_{MSY}) after stock rebuilds if environmental conditions are good. • $F < F_{lim}$ in the simulations.	• Low ability to reduce/increase quota in response to lower/higher biomass or environmental change. • Slow rate and low probability of recovery if the underlying stock productivity declines or stays low (robustness case). • Low average TAC levels (2024-2033).
HCR1_40%	• Improved ability to reduce/increase quota in response to lower/higher biomass or environmental change. • High average TAC levels (2024-2033). • Highest probability of achieving B_{tar} if the underlying stock productivity declines or stays low (robustness case).	• Less stability in TAC. • High risk of F exceeding F_{lim}.[2]
HCR1_No_HCR0	• Greatest ability for reducing/increasing quota in response to lower/higher biomass or environmental change. • Highest average TAC levels (2024-2033). • Nearest F to F_{MSY}.	• Least stability in TAC. • Lowest biomass (near B_{MSY}) after stock rebuilds. • Highest risk of F exceeding F_{lim}.[2]

[1] TAC and biomass in the table refer to median results from simulations.

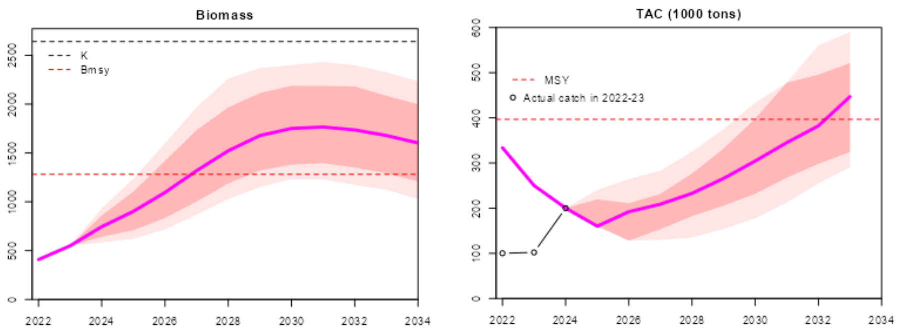
[2] The secondary management objectives include "*The annual probability in each of years 6-10 that fishing mortality is above F_{lim} should not exceed 10%*" where $F_{lim} = 1.35\ F_{MSY}$. In simulations, median F exceeds F_{lim} with a greater than 10% probability after 2028 in three years for option HCR1_40% and five years for option HCR1_No_HCR0. However, the SWG MSE PS noted this disadvantage is not a serious problem because the primary objective of rebuilding the stock was met relatively quickly. Such events are a natural consequence of random variation when managing for TAC levels near MSY by keeping biomass near B_{MSY} and F near F_{MSY}.

Figure 2. Simulation trajectories of biomass and TAC under the **Base Case**

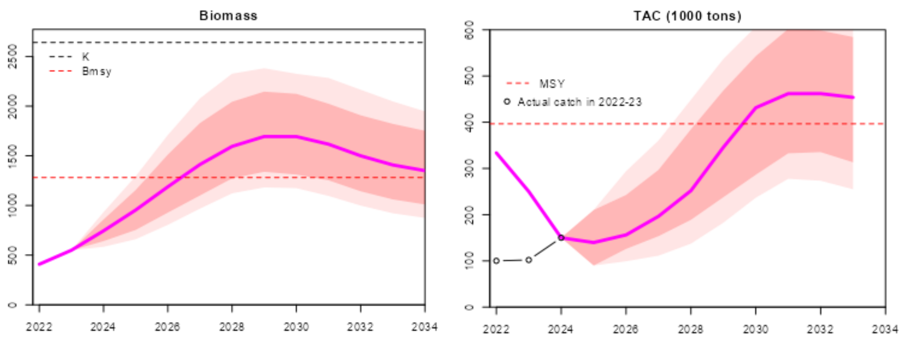
HCR1_10%



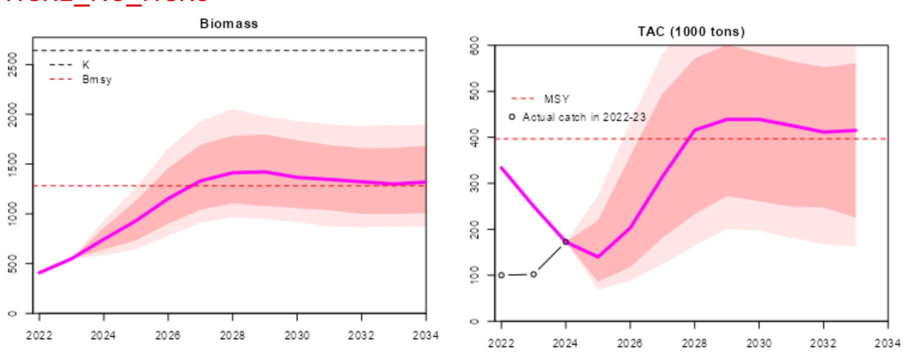
HCR1_20%



HCR1_40%



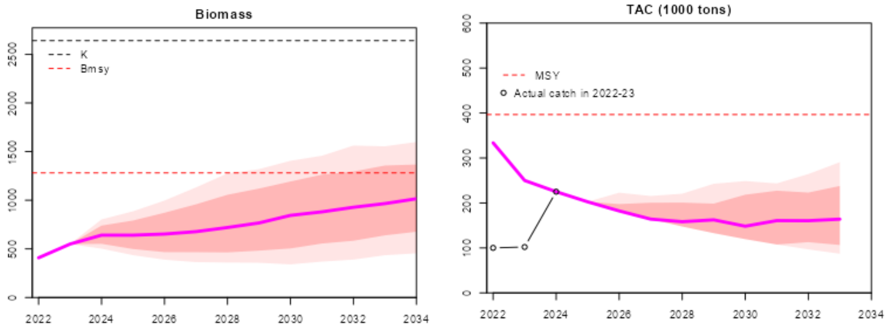
HCR1_No_HCR0



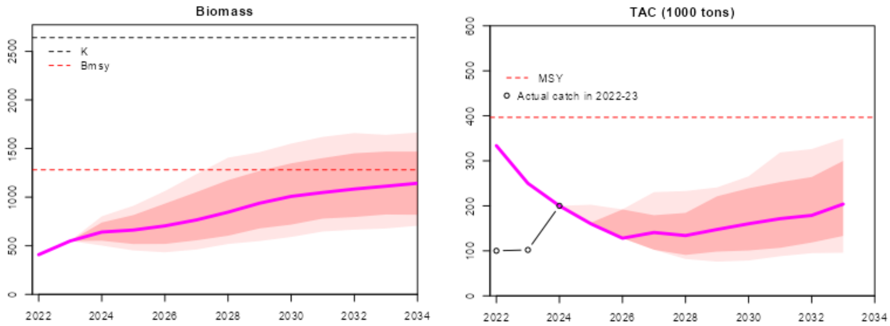
The solid pink line illustrates the median trajectory. The dark and light shaded areas correspond to the 60% and 80% intervals, respectively.

Figure 3. Simulation trajectories of biomass and TAC under the **Robustness Case**

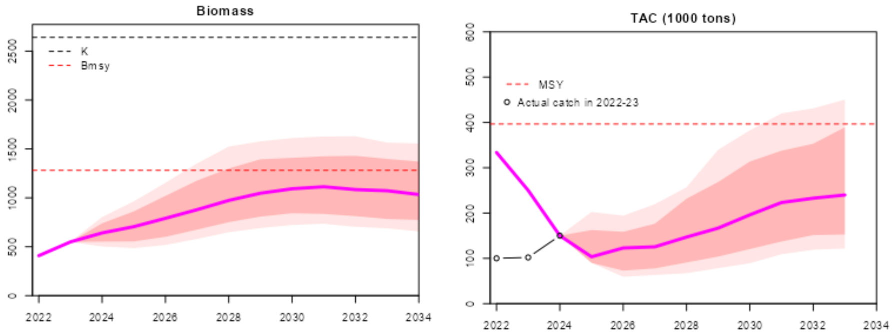
HCR1_10%



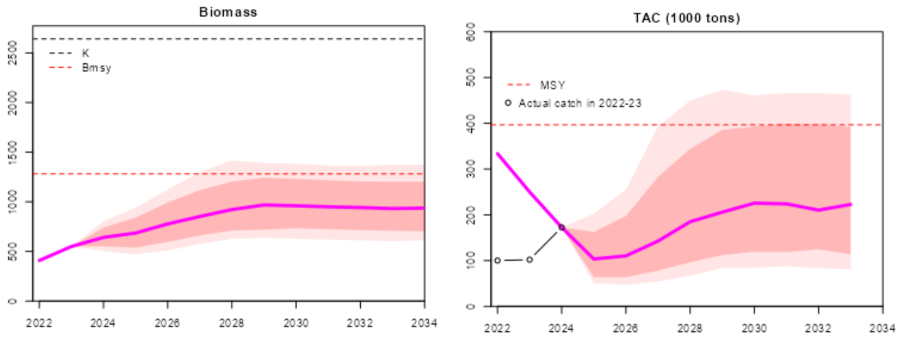
HCR1_20%



HCR1_40%



HCR1_No_HCR0



The solid pink line illustrates the median trajectory. The dark and light shaded areas correspond to the 60% and 80% intervals, respectively.

5.2 Implementation schedule

29. The SWG MSE PS anticipates the Commission will adopt an interim HCR at the eight Commission meeting and it will be implemented in 2024. It will be reviewed regularly in accordance with paragraph 37 below. The SWG MSE PS noted that the Commission has agreed to establish a management procedure under a full MSE as the next step. The interim HCR could be used until said management procedure is established.

Agenda Item 6. Discussion toward development of management procedures (MPs) as a mid-term goal

6.1 Management objectives and some constraint conditions for the regulation of fishery

6.2 Technical matters on operating models, MPs, performance indicators and simulation

30. The SWG MSE PS focused its efforts in its fifth meeting on the short-term goal, which is the development of an interim HCR. The work on its mid-term goal, which is the development of a full MSE, can be done after the Commission's discussion of the future schedule. Work on the mid-term goal will also be facilitated by the development of an age-structured model by the SSC PS.

Agenda Item 7. Other matters

31. Vanuatu proposed the inclusion of an exceptional condition in the HCR to balance sustainable resource management and its development aspirations as a small island developing State, in accordance with the principles outlined in paragraph 18 of CMM 2023-08. Specifically, Vanuatu proposed that it be allowed to be exempted from the TAC and to maintain its Pacific saury catch at its highest catch level, in 2018, of 8,231 mt. Some Members noted that Vanuatu's request related to issues of allocation outside the mandate of the SWG MSE PS and would need to be considered by the Commission. As the proposed request was not accepted for discussion at this SWG, Vanuatu recommended that the SWG further assess the impact of its proposal on the achievement of the management objectives in a future meeting and requested guidance from the Commission on the development aspirations of small island developing States.

Agenda Item 8. Timeline and future process

8.1 Timeline

8.2 Future process with assistance of SSC PS (e.g. conditioning of age-structured dynamics models)

32. The SWG MSE PS anticipates that the Commission will adopt an interim HCR, at which point the SWG can shift its focus to the mid-term goal of developing a full MSE. This work will also be facilitated by the development of an age-structured model by the SSC PS.

33. The SWG MSE PS agreed to focus on at least two topics implicitly related to improving scientific advice for harvest management. These topics are: 1) development of improved stock

assessment models, and 2) progress towards a one-year stock assessment and management cycle. Improved models would be used as operating models for MSE and HCR analysis. A one-year stock assessment and management cycle would be used to set a TAC for the current year based on assessment modeling and data from the fisheries and survey during the same year (as has been discussed as HCR3 in the previous meetings). Progress on the on-year management cycle, in particular, and assessment models will directly impact management effectiveness.

8.3 Workplan till SSC PS13 and SWG MSE PS06 meetings

34. See paragraph 36 below.

Agenda Item 9. Recommendations to the Commission

35. The SWG MSE PS recommends four candidate interim HCRs: HCR1_10%, HCR1_20%, HCR1_40%, HCR1_No_HCR0 (as explained in greater detail in paragraph 28) for further consideration by the Commission.

36. The SWG MSE PS recommends that the Commission endorse the holding of SWG MSE PS06 for one or two days between SC09 and COM09 in a virtual format for the primary purpose of conducting an operational review of events in the first fishing season following the anticipated adoption of an interim HCR.

37. The SWG MSE PS recommends that such a review be conducted annually and that the Commission consider the results of the SWG's annual review.

38. The SWG MSE PS noted that MSE procedures may include defined circumstances under which the default management procedures can be reconsidered on a short-term basis in response to unforeseen events, such as the catch exceeding the TAC or experiencing an unusually large decline. Given its interim nature, the SWG MSE PS noted that no such definitions for exceptional circumstances have been developed for Pacific saury in developing an interim HCR. However, such unforeseen circumstances may be identified through the annual review of the performance of the adopted HCR and the Commission may consider appropriate management response. The SWG MSE PS recommends that the Commission note that such a situation could arise when applying an HCR to the Pacific saury fishery and that further work in this area may be warranted.

39. The SWG MSE PS recommends that the invited expert, Dr. Larry Jacobson, be invited to the next SWG MSE PS meeting.

40. The SWG MSE PS recommends that the Commission reaffirm the importance of including

scientists, managers and stakeholders at future meetings to facilitate communication and completion of this important work.

Agenda Item 10. Adoption of report

41. The SWG MSE PS05 Report was adopted by consensus.

Agenda Item 11. Close of the meeting

42. Mr. Mahoney thanked the Secretariat and Japan for organizing the meeting and their ongoing support, the Rapporteur for his able work, the invited expert for his dedication and expertise, and Dr. Kitakado for his hard work and leadership. He also expressed his hope that the work done by the SWG MSE PS would put the Commission in a position to hold fruitful discussions.

43. The meeting closed at 16:45 on 20 January 2024, Niigata time.

Annexes:

Annex A – Agenda

Annex B – List of Documents

Annex C – List of Participants

Annex A

Agenda

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 PS04

2.2 SSC PS12 and SC08

Agenda Item 3. Overview of MSE

3.1 Roles of SWG MSE PS in the NPFC process

3.2 Basic principles of MSE

3.3 Roles of harvest control rules (HCRs) and management procedures (MPs)

3.4 Quick demonstration of MSE

Agenda Item 4. Review technical progress on development of an HCR as a short-term task

4.1 Management objectives and reference points

4.2 Conditioning of operating models (OMs)

4.3 Candidate interim HCRs and constraints therein

4.4 Performance indicators

4.5 Simulation outcomes

Agenda Item 5. Selection of an HCR and implementation schedule

5.1 Selection of an Interim HCR

5.2 Implementation schedule

Agenda Item 6. Discussion toward development of management procedures (MPs) as a mid-term goal

6.1 Management objectives and some constraint conditions for the regulation of fishery

6.2 Technical matters on operating models, MPs, performance indicators and simulation

Agenda Item 7. Other matters

Agenda Item 8. Timeline and future process

8.1 Timeline

8.2 Future process with assistance of SSC PS (e.g. conditioning of age-structured dynamics models)

8.3 Workplan till SSC PS13 and SWG MSE PS06 meetings

Agenda Item 9. Recommendations to the Commission

Agenda Item 10. Adoption of report

Agenda Item 11. Close of the meeting

Annex B

List of Documents

MEETING INFORMATION PAPERS

Document Number	Title
NPFC-2024-SWG MSE PS05-MIP01 (Rev. 2)	Meeting Information
NPFC-2024-SWG MSE PS05-MIP02	Provisional Agenda
NPFC-2024-SWG MSE PS05-MIP03 (Rev. 1)	Annotated Indicative Schedule

WORKING PAPERS

Document Number	Title
NPFC-2024-SWG MSE PS05-WP01 (Rev. 1)	Results of simulation testing for Harvest Control Rules (HCRs) in the Pacific saury fishery
NPFC-2024-SWG MSE PS05-WP02	Results of additional runs on 18 Jan 2024 (R1, Median)
NPFC-2024-SWG MSE PS05-WP03 (Rev. 1)	Results of updated simulation analysis

INFORMATION PAPERS

Document Number	Title
NPFC-2024-SWG MSE PS05-IP01	What is “Management Strategy Evaluation”?

OBSERVER PAPERS

Document Number	Title
NPFC-2024-SWG MSE PS05-OP01	Restoring Pacific Saury to a Predictable and Productive Fishery

REFERENCE DOCUMENTS

Document Number	Title
NPFC-2023-SWG MSE PS04-Final Report	SWG MSE PS04 report
NPFC-2023-SSC PS12-Draft Report	SSC PS12 Draft Report
NPFC-2023-SC08-Draft Report	SC08 Draft Report

Annex C

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