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WCPFC Skipjack tuna monitoring strategy report

WCPFC-SC21-2025/MI-WP-03
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OFP, SPC

1. EXECUTIVE SUMMARY

The monitoring strategy routinely evaluates the performance of the management procedure (MP) to check that it is working as expected. The monitoring strategy should consider all aspects of the harvest strategy. In addition, it may identify changes in the dynamics of the fishery resulting from environmental, economic or social factors that may require a reconsideration for the management objectives and the testing of alternative MPs.

WCPFC21 formally adopted the skipjack monitoring strategy. This paper summarises the work conducted to address issues identified in that version of the skipjack monitoring strategy, including:

1. The development of climate change scenarios for inclusion in the operating model (OM) grid (SC19).
2. Analyses to test the representativeness and appropriateness of candidate CPUEs used in the MP (SC20).
3. Evaluation of the impact of changes to the FAD closure duration on the performance of the MP (SC20).
4. The provision of additional catch and effort data to enable testing for compliance with the MP (TCC20).
5. The incorporation of SEAPODYM and/or other model projections into the skipjack management strategy evaluation operating model grid (SMD02).

We note that, at the time of writing, the skipjack stock assessment is not yet finalised, and will need to be reviewed by SC21 before it can be formally considered within the monitoring strategy.

WCPFC-SC21-2025/MI-WP-10 outlines proposed changes to the harvest strategy workplan to better align the implementation of management procedures with updates to the implementing measures and the stock assessment schedule. Those proposed changes have potential consequences for the MP implementation and monitoring schedule outlined in Table 2.

We invite SC21 to:

- Consider the work presented in MI-WP-01 and MI-WP-02 and amend table 1, parts 1b and 3a as appropriate.
- Note that additional data to address issues in Table 1 part 1a will be provided to TCC21.
- Update any other parts of Table 1, as appropriate.
- Note that the monitoring strategy report will be further updated and presented to WCPFC22 following consideration by SC21 and TCC21.

2. INTRODUCTION

The interim management procedure (MP) for WCPO skipjack was formally adopted at WCPFC19 (CMM2022-01) and was implemented for the first time at WCPFC20 (through CMM2023-01). The overall objectives of the MP are to maintain the stock around the target reference point (TRP) and to minimise the extent of changes in catch and effort between management periods. Now that the skipjack MP has been adopted and implemented, it should be routinely monitored to check that it is performing as expected and is achieving the desired outcomes.

In addition to monitoring the performance of the adopted MP, the monitoring strategy should consider all aspects of the harvest strategy, including the underlying management objectives (TRP); procedures for designing and evaluating candidate MPs; and the scenarios against which they are tested (the OM grid). The purpose of the monitoring strategy is not to conduct these analyses but, rather, to identify instances where conditions may have changed from those assumed when testing and evaluating the MP, and to highlight areas where modifications to the existing MP may be necessary or where further work may be required. The monitoring report is intended to be routinely considered and updated by the relevant bodies of the Commission (specifically SC and TCC), allowing incremental development as new information becomes available.

The skipjack monitoring strategy has been developed with input from SC, TCC and the SMD meetings. It was formally adopted in 2024 by WCPFC21, noting further review of the skipjack monitoring report will take place in 2025 and may be informed by the outcomes of the skipjack stock assessment and associated recommendations from SC21. WCPFC21 further encouraged ongoing work to consider climate change impacts within the skipjack operating model grid.

A number of areas for further work have been identified during the development of the monitoring strategy. These include:

1. The development of climate change scenarios for inclusion in the OM grid (SC19).
2. SC20: Analyses to test the representativeness and appropriateness of candidate CPUEs used in the MP.
3. SC20: Evaluation of the impact of changes to the FAD closure duration on the performance of the MP.
4. TCC20: The provision of additional catch and effort data to enable testing for compliance with the MP.
5. SMD02: The incorporation of SEAPODYM and/or other model projections into the skipjack management strategy evaluation operating model grid.

This paper summarises the work conducted to address these outstanding issues.

3. ISSUES ARISING

The experience of implementing the skipjack MP for the first time has highlighted a number of issues that were not foreseen during its development and testing. These relate specifically to the monitoring of catch and effort in the fishery to both ensure and demonstrate compliance with the MP, as well as some practical issues encountered when running the MP and implementing the catch and effort limits output from it.

Representativeness and appropriateness of candidate CPUEs (Table 1, 1b)

The skipjack MP was implemented in 2023, with the resulting catch and effort limits being applied for the period 2024 to 2026. Although the MP ran successfully, it was noted that the contraction of pole and line fishing in key regions of the skipjack fishery had impaired the ability to index relative abundance of WCPO skipjack across the equatorial region. Diagnostic analyses indicated that sustained low levels of effort of these fisheries may affect the future performance of the MP. SC19 recommended that further work be undertaken to develop and test an alternative estimation model for future use in the WCPO skipjack MP. WCPFC20 noted that 'a re-evaluation of the skipjack estimation method needs to be undertaken prior to the next implementation of the Management Procedure' (WCPFC20 summary report, paragraph 302).

WCPFC-SC21-2025/MI-WP-01 investigates a number of issues related to the development and use of pole and line (JPPL) tuning indices within the skipjack MP. It identifies inconsistencies in the approaches used in previous analyses and investigates the use of alternative platforms for future index development. It outlines simulations conducted to determine likely MP performance under significant degradation of JPPL data in equatorial regions. The analyses conclude that the current skipjack MP remains valid. Simulations indicate it is robust to short-term degradation of JPPL data and is recommended for use in the next management cycle. However, long-term degradation of the indices remains a risk and will need to be addressed.

Changes to the extent of the FAD closure (Table 1, 3a)

The development and testing of the skipjack MP was based on the assumption that a FAD closure of 3 months in EEZs and high seas plus an additional two months on the high seas would be in force. In 2024 the extent of the FAD closure was reduced to 1.5 months in EEZs and high seas plus an additional 1 month on the high seas.

To determine the potential impact of changes to the duration of the FAD closure on the expected performance of the skipjack MP, the MP evaluations were re-run under three FAD closure scenarios; a base case scenario consistent with the original assumptions; a scenario that reflects the current reduced FAD closure period and a scenario under which the FAD closure is completely removed. The results indicate that the expected performance of the skipjack MP is largely unaffected by changes to the mix of FAD and free-school sets in the purse seine fishery.

Catch and effort reporting (Table 1, 1a)

The skipjack MP applies to the catch and effort of purse seine and pole and line fisheries, and other commercial fisheries referred to in paragraph 47 of CMM 2023-01 taking more than 2,000 tonnes of tropical tunas (bigeye, yellowfin and skipjack) in the EEZs and high seas.

TCC20 noted that the regularly provided summaries of tropical tuna fisheries catch and effort only partially covers the information required to monitor implementation of the skipjack MP. Future data submissions will need to provide TCC with sufficient information to monitor annual fishing levels of fisheries subject to the MP relative to the MP output. Specifically, effort data for pole and line fisheries and skipjack catch data for the relevant fisheries within Region 5 of the 2022 assessment model will be required. This additional information will need to be provided both for the time-period under consideration of the monitoring strategy and for the baseline year ranges (2016-18 ID-PH fisheries; 2001-04 JP pole and line fisheries).

These data will be included in the data summaries for tropical tunas to be provided to TCC21.

Incorporation of climate change scenarios into the skipjack OM grid. (Table 1, 3a)
The development of climate change scenarios and their incorporation into the skipjack OM grid has been identified as an important task. In particular, the development of scenarios to investigate the potential impacts of warm pool expansion in the WCPO. This task is non-trivial and is expected to occur over a longer timeframe. The implementation of time-varying parameters for movement, growth, recruitment, etc. that would be necessary to best investigate the effects on the stock and fishery of a progressively changing environment is not possible using MULTIFAN-CL in its current form.

To address these, and other, issues an alternative modelling framework has been developed for running MSE analyses for WCPO tuna stocks. The framework implements deterministic and stochastic projections in the same way as MULTIFAN-CL but allows for a much larger and more flexible range of stochastic inputs. Testing of the framework yields identical projection outcomes to those from MULTIFAN-CL for projections conducted with either catch or effort fishery constraints (further details are provided in MI-WP-05, appendix D).

The bigeye tuna MP evaluations presented in MI-WP-07 have been run using the new framework. However, there has been insufficient time to set up the skipjack OMs. This work will be further progressed in 2026 with a view to presenting initial results to SC22.

4. MONITORING PERFORMANCE OF THE MANAGEMENT PROCEDURE

The monitoring strategy (as outlined in Table 1, below) addresses three main aspects of the design, testing and implementation of the MP as well as monitoring its outcomes in relation to defined objectives, with consideration of these aspects divided amongst the various bodies of the Commission as appropriate. Table 1 outlines the issues to be considered and what advice is required. Where these issues have previously been considered the resulting recommendations are also provided. Where work has been conducted to resolve outstanding issues, as described in Section 3 of this report, SC21 may consider removing those comments from the table. Where work has partially addressed the outstanding issues, SC21 may consider updating the text provided.

An updated stock assessment of WCPO skipjack tuna is scheduled for 2025. SC19 noted that this stock assessment will include data up to 2024 and that only one year of MP implementation will be included. As such it will provide only a preliminary indication of MP performance. The stock assessment was incomplete at the time of preparing this report. It will need to be reviewed by SC21 before it can be considered in the context of monitoring the skipjack MP's performance (Table 1, 1a).

Table 1: Monitoring strategy for the skipjack Management Procedure (CMM 2022-01).

1. Review of MP performance		
a. Comparison of predicted MP performance against latest stock assessment outcomes		
SC	TCC	Commission
Regularly review/check the performance and outputs of the MP, including the indicators set out in Annex III of CMM 2022-01 and provide advice to the Commission on: a) The performance of the MP in managing skipjack tuna to achieve defined objectives including the TRP. This includes the robustness of the MP to changes in the fishery and any exceptional circumstances consistent with Annex IV of CMM 2022-01. b) The application of the MP outputs to CMM 2023-01. SC19: With the first implementation of the MP in 2024, the stock assessment in 2025 will be the first in which the impact of the MP on stock status will be experienced. Only one year of MP implementation will be included in that assessment and it will therefore provide only a preliminary measure of performance. The MSE predicted outcomes of the adopted MP and the 2022 stock assessment show good correspondence with assessed status for the most recent years but some departure for the historical period. SC20: No new information	Regularly review/check the performance and outputs of the MP, including the indicators set out in Table 3, Annex III of CMM 2022-01 and provide advice to the Commission on: a. Catch and effort levels for all fisheries subject to the MP relative to maximum levels specified under the most recent output of the MP. b. Identify quality of information and gaps in available data that would affect ability to monitor the implementation of the MP relative to the MP outputs. TCC20: Additional information on relevant catch and effort for the fisheries subject to the MPs will be needed by TCC.	WCPFC20: Noted the successful running of the MP as outlined in SC19-MI-WP-01
b. Data availability to run the MP		
SC	TCC	Commission

Check availability, quantity and quality of data necessary to run the MP (e.g. the estimation method) SC19: Sufficient data were available to run the MP. However, declining effort in the pole and line fishery in some regions (e.g. tropical region) and consequent reduction of informative CPUE data represents a risk to the future performance of the MP. A re-evaluation of the estimation method may need to be undertaken prior to the next implementation of the MP. **High priority** SC20: The effect of changes made to the historical data is not known.	Check availability, quantity and quality of data necessary to run the MP (e.g. the estimation method) TCC20: No new information	WCPFC20: Noted that a re-evaluation of the estimation method may need to be undertaken prior to the next implementation of the MP.
c. Other sources of data to monitor performance		
SC	TCC	Commission
Identify any other data, as available, that might not be included in the MSE framework, that can inform on performance indicators (economic, social, ecosystem, etc.) SC19: No new information noted at SC19. SC20: No other sources of data have been identified.	Identify any other data, as available, that might not be included in the MSE framework, that can inform on performance indicators (economic, social, ecosystem, etc.) TCC20: No new information	
d. Performance of the estimation method (EM)		
SC	TCC	Commission
Confirm the EM is performing well and not subject to estimation failure. SC19: Overall the EM performed well and provided estimates of stock status within the prediction range of the MSE.	No input anticipated.	
2. Review of the MP design		

a. Management objectives		
SC	TCC	Commission
No input anticipated.	No input anticipated.	Review the TT-CMM, taking account of the outputs of the SKJ MP. Check that overall objectives of the MP remain appropriate. Revise catch and effort limits for 2024-06 as necessary. WCPFC20: CCM requests for further work to better align the skipjack MP with the TT-CMM.
b. Scope of the management procedure		
SC	TCC	Commission
Confirm the fisheries controlled by the MP, and the method of control, remains appropriate SC19: No new information at the time of SC19. SC20: No change.	Confirm the fisheries controlled by the MP, and the method of control, remains appropriate TCC20 No new information	Confirm the fisheries controlled by the MP, and the method of control, remains appropriate
c. Exceptional circumstances		
SC	TCC	Commission
Provide technical advice to identify the occurrence of exceptional circumstances (see CMM 2022-01 Annex IV) and review, modify or replace the MP as appropriate. SC19: None identified. SC20: None identified.	Provide technical advice to identify exceptional circumstances (see CMM 2022-01 Annex IV) and recommend remedial action where necessary. TCC20: No new information	Identify the occurrence of exceptional circumstances (see CMM 2022-01 Annex IV) and review, modify or replace the MP as appropriate.
3. Review of MSE		
a. Operating model grid		
SC	TCC	Commission
Ensure the most important sources of uncertainty are included in the OM grid. SC19: OM grid to be extended to include climate change scenarios (robustness set). In particular the	No input anticipated.	

effects of warm pool expansion in the WCPO. This requires further analysis of SEAPODYM outputs and may occur over an extended time frame. **Medium priority** Further investigation of the OM grid is suggested to investigate the lack of overlap in estimates of stock status for the historical period. These issues will be considered for inclusion when the current MP is reviewed. **Low priority** SC20: Impacts of changes to FAD closure period from 2024 should be investigated and where necessary the OM grid modified to better represent fishery dynamics.		
b. Calculation of performance indicators		
SC	TCC	Commission
Check that performance indicators adequately represent management objectives SC19: No new information at the time of SC19.	No input anticipated.	
c. Modelling assumptions		
SC	TCC	Commission
Consider the technical details of the simulation and testing framework SC19: While no major issues are identified, any re-evaluation of the skipjack EM (identified under 1.2) may require a re-evaluation of the modelling framework	No input anticipated.	
d. Data availability to support the MSE framework		
SC	TCC	Commission
Identify any improvements in data collection to either enhance the OM framework or reduce uncertainty included in the OM grid.	No input anticipated.	

5. MONITORING SCHEDULE

Many elements of the monitoring report depend either on the outputs of an updated stock assessment or on the running and implementation of the MP itself. To date, the MP has been implemented just once (in 2024) and the subsequent considerations of SC19 and WCPFC20 are provided above. An updated assessment of WCPO skipjack has been conducted in 2025 and, subject to review by SC21, may be considered for the monitoring strategy.

Some aspects of the monitoring report can be updated on a more frequent basis, such as annual estimates of catch and effort and corresponding inter-annual variations in catch and effort. In some cases these data may be available in-year, however, due to time lags in the reporting and processing of data, some delay in the reporting of these figures is likely. CMM 2022-01 outlines a repeating 3-year schedule for the implementation and review of the skipjack MP (Table 2).

WCPFC-SC21-2025/MI-WP-10 outlines proposed changes to the harvest strategy workplan to better align the implementation of management procedures with updates to the implementing measures and the stock assessment schedule. These proposed changes have potential consequences for the schedule outlined in Table 2, taken from CMM 2022-01. SC21 is invited to consider what changes to Table 2 may be required to ensure it remains consistent with any changes made to the schedule of work detailed in the workplan.

Table 2: Schedule for the implementation and review of the skipjack MP (from CMM 2022-01)

Year	Science Services Provider	Scientific Committee	Commission
2023	Run the MP (using data to 2022). Support the SC and Commission consideration of the MP	Provide advice to the Commission on the MP outputs for the period 2024-2026	Review the Tropical Tuna CMM, taking into account the output of the MP. Revise catch and effort related limits for 2024-2026
2024		Data to monitor performance of the MP not available in first year of implementation.	Apply Tropical Tuna CMM
2025	Perform full stock assessment (with data up to and including 2024).	Review performance of the MP including potential exceptional circumstances and advise Commission.	Apply Tropical Tuna CMM. Review the performance and use of the MP.

2026	Run the MP (using data to 2025). Support SC and Commission consideration of the MP.	Monitor the performance of the MP using available data to 2025. Provide advice to Commission on the MP outputs for the next management period (2027-2029).	Review the Tropical Tuna CMM, taking into account the output of the MP. Revise catch and effort related provisions for 2027-2029
2027		Monitor the performance of the MP using available data to 2026.	Apply Tropical Tuna CMM.
2028	Perform full stock assessment (with data up to and including 2027).	Review performance of the MP including potential exceptional circumstances and advise Commission.	Apply Tropical Tuna CMM. Review the performance and use of the MP.
2029	Run the MP (using data to 2028). Support SC and Commission consideration of the MP.	Monitor the performance of the MP using available data to 2028. Provide advice to Commission on the MP outputs for the next management period (2030-2032).	Review the Tropical Tuna CMM, taking into account the output of the MP. Revise catch and effort related provisions for 2030-2032

6. RECOMMENDATIONS

This paper updates the skipjack MP monitoring strategy to reflect Commission discussions and observations at WCPFC21 and summarises subsequent work conducted to address outstanding issues.

We invite SC21 to:

- Consider the work presented in MI-WP-01 and MI-WP-02 and amend table 1, parts 1b and 3a as appropriate.
- Note that additional data to address issues in Table 1 part 1a will be provided to TCC21.
- Update any other parts of Table 1, as appropriate.
- Note that the monitoring strategy report will be further updated and provided to WCPFC22 following consideration by SC21 and TCC21.

ACKNOWLEDGMENTS

We gratefully acknowledge funding for this work from the New Zealand Ministry of Foreign Affairs and Trade (MFAT) funded project 'Pacific Tuna Management Strategy Evaluation'.

7. ANNEX A

Recent decisions of the Commission and subsidiary bodies on the skipjack monitoring strategy

SC20 noted the following outcomes with respect to the skipjack monitoring strategy:

- SC20 requested that the SSP conduct the following analyses related to the monitoring strategy for skipjack:
  - Evaluate whether changes in the FAD closure duration (as adopted in CMM 2023-01) will affect the performance of the interim MP;
  - Representativeness and appropriateness of candidate CPUEs for the use in MP.

- SC20 recommended that in years when an assessment is not conducted, the monitoring strategy could be reviewed by SC and feedback provided through the Online Discussion Forum.

- SC20 was invited to review the information provided in the Monitoring Strategy included in Table 1 of SC20-MI-WP-02, and to update the text in column 1 (SC) as appropriate. SC20 recommended the following modifications to Table 1: Monitoring strategy for the skipjack Management Procedure:
  - Amend sub-paragraph a) of Element 1.a) (comparison of predicted MP performance against the latest stock assessment outcomes) to read "The performance of the MP in managing skipjack tuna to achieve defined objectives, including the TRP".
  - Amend element 1.b) (Data availability to run the MP) to include a new comment for SC20: "The effect of changes made to the historical data is not known".

- SC20 recommended the monitoring strategy be forwarded to the SMD, TCC and the Commission for their consideration.

SMD02 noted the following outcomes from its discussion of the skipjack monitoring strategy:

- SMD02 thanked the SSP for the updated skipjack monitoring strategy (**WCPFC-SMD02-2024-BP-06**), which, amongst other things, provided clear guidance on what technical advice TCC can provide to the Commission. SMD02 supported the approach of not making adjustments to the key elements of the management procedure on an annual basis, but that modelling be undertaken as part of the next review of the management procedures in 2026, including for scenarios related to climate change.

- SMD02 recommended that as part of the next regular review of the skipjack management procedure, the Commission directly incorporate SEAPODYM and/or other model projections into the skipjack management strategy evaluation operating model grid projections.

TCC20 noted the following outcomes from its discussion of the development of a monitoring strategy for Skipjack tuna.

- TCC20 recommended to the Commission that it adopt the skipjack MP monitoring strategy (TCC20-2024-17 rev1) noting the updates and input provided by TCC20.

- TCC20 noted that, as the Commission adopts more management procedures, there could be a need for a standing item on the TCC agenda to consider management procedures.

WCPFC21 adopted the SKJ Monitoring Strategy, as recommended by SC20 and TCC20, noting the review of the SKJ Monitoring Strategy which will take place in 2025, and encourages ongoing work to consider climate change impacts within the SKJ MP operating model grid.