



**SCIENTIFIC COMMITTEE
SEVENTEENTH REGULAR SESSION**

Online meeting
11-19 August 2021

**Terms of reference for an independent peer review of the
2020 WCPO yellowfin tuna assessment
(FINAL VERSION)**

**WCPFC-SC17-2021/ SA-WP-06
(11 January 2022)**

SPC-OFP, Pacific Community (SPC), Noumea, New Caledonia

Introduction

The 2020 yellowfin tuna (YFT) assessment ([Vincent et al. 2020](#)) in the WCPO (Western and Central Pacific Ocean) conducted by SPC using the MULTIFAN-CL assessment software was accepted by SC16 as the ‘best available science’ to inform managers of stock status. However, SPC noted that areas of uncertainty in the assessment required follow up investigation and expert advice, and that the assessment outcomes might provide an overly optimistic perception of stock status and the impact of fishing. SC16 recommended that follow-up work, including an independent peer review, was important to improve confidence in future YFT assessments for the WCPO. Given the similarities in model structure and data inputs, the follow-up work and peer review of the YFT assessment would also be relevant to the BET assessment ([Ducharme-Barth et al. 2020](#)).

This paper outlines a TOR for the peer review of the YFT assessment to be considered by SC17, which will guide the external review panel in their work. See Appendix 1 for the relevant extract relating to the SC16 recommendation for this peer review and suggested timelines.

This TOR provides the objectives and scope for the peer review. The process for running peer reviews of WCPFC stock assessments is outlined in the WCPFCs guidelines from SC12: [Process for the Independent Review of stock assessments \(Attachment K\)](#).

Background

The 2020 YFT assessment, beyond the addition of three years of tagging, catch, effort and size composition data, involved some notable changes from the previous assessments, namely:

- The implementation of the index fishery approach that used the geospatial (VAST) approach for CPUE standardisation
- Changes to how size composition data were prepared/reweighted
- Changes to the tagging data treatment
- Incorporation of new growth data from otoliths

Of these changes the tag mixing period, new growth estimation, selectivity assumptions, and data weighting appeared to have notable influence on the estimation of the key management quantities. The stock assessment indicated a more optimistic level of biomass and depletion than the previous assessments. A key concern, however, was that there was conflict among data sources in this assessment and depending on the amount of weight placed on different data sources, estimates of key management quantities could be quite different. The model structure may have also been overly complex given the available data and biological information. Further considerations post-assessment identified a number of areas related to input data, model structure and estimation approaches where follow-up investigations and advice were warranted. These considerations form the basis for the scope of this review.

Objectives

1. Undertake, in consultation with the stock assessment team (SPC), following the guidelines described in [Process for the Independent Review of stock assessments \(Attachment K\)](#), a peer review of the 2020 YFT stock assessment in the Western and Central Pacific Ocean (WCPO).
2. Based on the review work provide recommendations for improving the assessment, including data inputs, modelling approaches and treatment of uncertainty.
3. In conjunction with the SPC assessment scientists, identify improvement options that are feasible for application to the 2023 YFT assessment.

Scope

The key areas for consideration by the peer review panel based on the recommendations of the stock assessment report and follow-up considerations of the assessment team are listed below:

1. Model inputs, commenting on the adequacy and appropriateness of data sources and data inputs to the stock assessment, with particular attention to:
 - a. **Growth:** review the approach to estimation of growth parameters and consider the implications of potential regional variations in growth.
 - b. **Tagging data:** review the approach used to treat tagging data as model inputs, and how the tagging data are used within the modelling.
 - c. **Size composition:** review the approach for pre-treatment of size composition data (i.e., re-weighting) and how size composition is weighted for the likelihood function.
 - d. **Natural mortality:** review the approach used to determine M-at-age and implications of alternative M assumptions.
 - e. **Data inputs:** identify and provide recommendations on the key areas for improvement in data collection (both fishery data and biological information).
2. Model configuration, assumptions and settings, with particular attention to:
 - a. **Model complexity:** review the appropriateness of the model complexity, including spatial and fishery structure, in relation to data inputs and other available information.
 - b. **Selectivity:** review selectivity assumptions and settings.
 - c. **Uncertainty:** review the approach used to represent uncertainty in model-derived management quantities, considering structural, model and input data uncertainty.
3. Model diagnostics, with particular attention to:
 - a. Review the suitability of the diagnostics used and reported for the assessment.
 - b. Consider the diagnostics provided for the 2020 YFT assessment and provide guidance on follow-up work where the diagnostics suggest issues, i.e., data conflicts.
4. Recent MULTIFAN-CL model developments, with particular attention to:
 - a. new MULTIFAN-CL features in relation to their application to the 2023 scheduled YFT assessment.
5. Future research areas, with the identification of priorities to improve future assessments.

While these key topics will be a focus of the peer review, other aspects of the assessment and data inputs may become focus areas as the review progresses.

Key activities and outputs from the peer review:

| Activity | Output | Timeframe |
|---|---|---|
| Review of the 2020 WCPO yellowfin stock assessment report | Summary paper of general comments and suggestions for any pre-workshop modelling or further information/data required by the review panel | To be provided by SPC to the panel by Jan 31, 2022. |
| Pre-workshop planning meeting. (Online) | Plan for the in-person workshop developed | At least 1 month prior to the September workshop. |
| In-person modelling workshop at SPC, Noumea | Completion of 5 day + travel in-person modelling workshop in Noumea | Planned date for this workshop is from 5-12 th September 2022. |

| | | |
|---------------------------------------|---|--|
| Review outcomes of modelling workshop | Draft workshop report to SPC | With 2 weeks of the end of the in-person modelling workshop. |
| SPC review of draft report | Draft report with any additional responses of SPC | The panel report with SPC comments is expected by mid-November 2022 and would align with any SC special session if this is requested by SC18. |
| Final report | Deliver report to WCPFC for posting | Final report be delivered to the WCPFC in February 2023 ahead of the SPC 2023 pre-assessment workshop in March/April. Final report to be discussed at the pre-assessment workshop to inform 2023 assessment. |

The panel

The peer review panel was selected based on a CCM voting process co-ordinated by the secretariat, and is:

Dr André Punt – University of Washington
 Dr Jim Ianelli – NOAA
 Dr Mark Maunder – Inter-American Tropical Tuna Commission

Logistics and COVID implications

The expectation following SC16 was that the review would commence at the start of 2022 with the review reporting to SC18 (August 2022) and informing development of the 2023 YFT assessment. The SPC assessment team, including people involved in the previous peer review of the BET assessment, and expressions of some CCMs at SC17, indicate a strong preference for an in-person workshop in Noumea to be part of the review process. The peer review is unlikely to be successful without the free discussion and adaptability of an in-person modelling workshop. The issue of time differences also makes working online in a flexible, interactive and adaptive way very difficult. The uncertainty of the COVID-19 situation and travel options means that timing of the Noumea workshop will need to be flexible. There is also the issue of the requirement for a quarantine period (currently 7 days for arrivals in New Caledonia if vaccinated). This is not ideal given the busy schedules of the review panel and the SPC assessment staff. It now appears that the workshop will not be feasible before SC18 and will need to be scheduled later in 2022, SPC suggested two options for the SC17 to consider:

1. The review report be presented to the SPC Pre-Assessment Workshop in 2023 to provide the opportunity for CCMs to comment and discuss recommendations and approaches to consider for the 2023 YFT (and BET) assessment. In that case the review report would be formally submitted to SC19 as a supporting document for the 2023 assessment.
2. Submit the review report some time after SC18 for intersessional consideration, either through an ‘Online Discussion Forum’ or an online meeting, or potentially both. Submit the revised report, with responses to comments, to the Secretariat for posting, and then present an overview of the review findings and recommendations at the SPC Pre-Assessment Workshop in 2023.

Note: SC17 (summary report paras 242-245) did not provide any specific recommendations on the process for delivery of the peer review outcomes but some CCMs noted strong preference that the review include

an in-person workshop between SPC and the peer review panel, and others expressed support for Option 2 including to have a 1-2 day special SC session before work on the 2023 stock assessments commences.

While the in-person workshop is a key part of the review process, it is now also planned to have approximately 3 monthly meetings between the peer review panel and SPC staff to discuss and set modelling tasks and review results of previous tasks. In this way the review work can progress in an iterative fashion and not be totally dependent on the work shop.

References

Ducharme-Barth, N., Vincent, M., Hampton, J., Hamer, P., Williams P., and Pilling, G. (2020). Stock assessment of bigeye tuna in the western and central Pacific Ocean. [WCPFC-SC16-2020/SA-WP-03\(REV3\)](https://www.wcpfc.int/SA-WP-03(REV3))

Vincent, M., Ducharme-Barth, N., Hamer, P., Hampton, J., Williams P., and Pilling, G. (2020). Stock assessment of yellowfin tuna in the western and central Pacific Ocean. [WCPFC-SC16-2020/SA-WP-04-Rev2](https://www.wcpfc.int/SA-WP-04-Rev2)

Appendix 1

Relevant Extract Form SC16 Outcomes Document <https://www.wcpfc.int/node/47653>

3.6.2 Peer Review Recommendations

70. SC16 supports an external expert peer review of the yellowfin stock assessment. This would also allow several components of the bigeye tuna assessment to be reviewed given the similar data input structure. This review would examine a number of issues such as model complexity, weighting of data sources, spatial approaches and the extreme sensitivity to assumptions on growth amongst a range of other issues.

71. SC16 provides the following provisional time-line for an external expert peer review.

- a) Year 1 would be set aside to allow the SSP to conduct an initial range of testing and analysis internally focussed on YFT and report these findings to SC17. SC17 to finalize ToRs for the external expert review.
- b) Year 2 would be set aside for the SSP to conduct further testing and analysis internally focussed on BET and YFT, following SC17 input, and for the external expert review (commencing at the start of 2022) with the review reporting to SC18.
- c) Year 3 would provide updated YFT and BET stock assessments which respond to the review. The two assessments would be reported to SC19.

72. In accordance with this, SC16 identified the external review as a project in the budget (provisionally estimated at \$USD 50,000) but with no funding commitment until 2022 and 2023.

73. SC16 also tasked the SSP with preparing a draft terms of reference for the external expert review for the consideration of SC17 which would be informed by their analyses during 2021. The draft terms of reference would give consideration to including the bigeye stock assessment in the external review process.

74. Further, SC16 noted that peer review experts of the required calibre may not be easy to secure, thus efforts should be made during late 2020/early 2021 to have them express interest and availability.