SCIENTIFIC COMMITTEE
EIGHTEENTH REGULAR SESSION
Online
10–18 August 2022

Yellowfin tuna assessment peer review status update

WCPFC-SC18-2022/SA-IP-08

23 July 2022

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1 Introduction

1.1 Background

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 provides a status update of the preparatory work done so far, upcoming analyses, a draft agenda for the review workshop, as well as anticipated model development for the 2023 assessment.

The TORs for an independent peer review of the 2020 WCPO yellowfin tuna assessment were presented at SC17 in 2021 and finalized in SPC-OFP (2022).

2 Summary of work done so far

2.1 Meeting logistics

The review workshop has been scheduled 7–13 September 2022 in Noumea, and travel arrangements have been made for the panelists.

The following draft agenda was circulated in June:

Day 1	Overview of 2017 and 2020 assessments, focus on regions and selectivities
Day 2	Diagnose why 2020 assessment was more optimistic than the 2017 assessment
Day 3	Synthesis of days 1 and 2, formulation of requested additional diagnostics
(Weekend)	
Day 4	Synthesis of additional diagnostics, model development for 2023 assessment
Day 5	Compare simple vs. complex regional structure, discussions, outline of report

2.2 Material provided to the panel

An initial meeting with the panel was held on 16/17 Dec 2021, with two presentations (links to presentations and other documents below):

Overview of 2020 assessment

Initial plan and discussion

A status update document was sent to the panel on 25 February 2022:

Outline of issues and work plan

Two presentations from PAW (31 March 2022) related to the YFT review were also shared with the panel:

Background and work plan

Open and reproducible fisheries science

2.3 Internal preparatory work

The assessment scientists tasked with conducting work and overseeing the review are new to SPC and to MFCL and required a considerable amount of training in order to begin working with the yellowfin tuna assessment model. In addition to a general introduction to Multifan-CL (MFCL) through weekly tutorials with Nick Davies, skills were developed in submitting jobs to Condor and using a range of R packages (FLR4MFCL, R4MFCL, diags4MFCL) enabling stock assessment models to be run and analyzed. These skills were necessary to be able to rerun the model, produce diagnostic plots, and trace key steps in the stepwise development of the 2020 assessment model.

The standard workflow for SPC stock assessments is that once the assessments have been finalized, all analytical scripts and supporting files are stored in a directory tree on a shared network drive, referred to here as Penguin. This directory tree contains the different stages of the stock assessment work: data preparation, stepwise model development, a running version of the diagnostic model, one-off sensitivities, the structural uncertainty grid, retrospective runs, and scripts for all plots that are found in the assessment report. This makes it possible for the stock assessment team to browse through, revisit, and rerun these key analyses underpinning the scientific advice.

Analytical work began in March 2022, in preparation for the review workshop. Unfortunately, it was discovered that the following analytical steps were not found on the Penguin drive:

- The diagnostic model was not in a form that can be rerun. After examining several directories and scripts, it became clear that two separate intermediate manual steps were required (steps 10a and 12a, near the 24 hour runtime mark) to run the full model. These steps had not been scripted.
- The main plot script used to create the figures for the report was referred to but not found.
- The full set of stepwise model runs was not found. Multiple stepwise model runs were examined, but they did not match those presented in the stock assessment report.

Eventually, the last two of these issues were resolved with the assistance from former staff and IT support, when a complete laptop backup archive from previous staff (300 GB) was recovered. The main plot script was found, as well as additional model runs that have now been combined to make a full set of stepwise model runs.

Working through this process to be able to recreate the 2020 yellowfin diagnostic and stepwise model runs was time consuming, but worthwhile in relation to this review process. It highlighted areas for improving the repository processes for the assessment, so that repeatability can be more assured in future. This will be relevant to all SPC run assessments.

2.4 GitHub sites

The review work has been organized on SPC GitHub sites that are open to the public. The two main repositories are:

yft-review – material for the review panel

yft-review-analysis – analysis related to the review

Other repositories have also been created to support the ongoing development:

yft-2017-diagnostic – 2017 assessment results

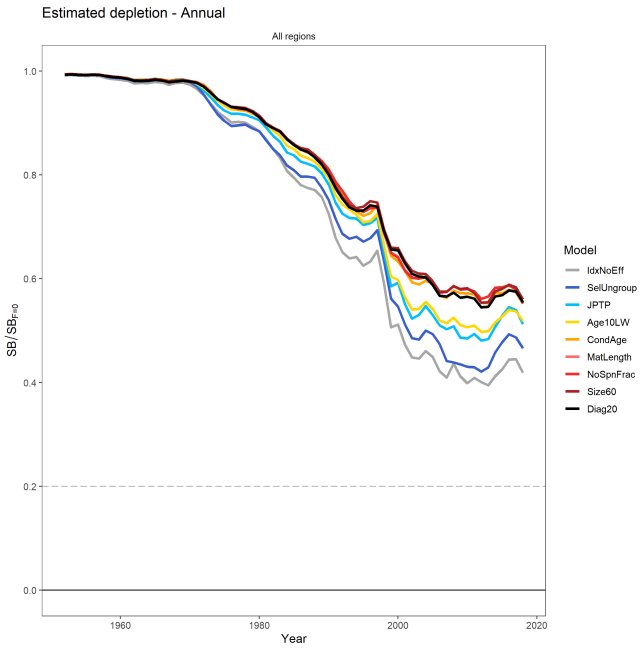
yft-2020-grid – 2020 assessment results

yft-cc – preliminary tests of new MFCL features

3 Upcoming analyses

3.1 Review of changes introduced in the 2020 assessment

Figure 14b in the stock assessment report shows the changes in the stepwise development from the 2017 assessment to the 2020 assessment which had the greatest impact on the management quantity $SB/SB_{F=0}$:



Based on an examination of which steps seemed most influential in the stepwise analysis, along with discussions with the panel so far, the review can be expected to focus especially on the following key topics:

Selectivity grouping/ungrouping between regions, non-decreasing shape.

Growth addition of otoliths through conditional age-at-length, parametric curve vs. free form.

Maximum age in the model, changed from 7 to 10 years.

Tags from the JPTP program added, mixing period changed from 1 to 2 quarters.

Regional structure was not altered in the 2020 assessment, but has been identified as a potential focus topic for the review.

New MFCL features proposed to be adopted in the 2023 assessment will also be reviewed.

These topics can also be expected to form the main body of analytical work before, during, and after the YFT assessment review, leading up to the 2023 assessment.

4 Summary

We invite the SC18 to note:

- The progress with the assessment review, and the issue resolved to re-establish the original models.
- The dates and agenda for the in-person workshop with the review panel.
- The availability of information related to the review in the following repository: https://github.com/PacificCommunity/ofp-sam-yft-review

5 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. Rev. 03. WCPFC-SC16-2020/SA-WP-03.

SPC-OFP. (2022). Terms of reference for an independent peer review of the 2020 WCPO yellowfin tuna assessment. Final version. WCPFC-SC17-2021/SA-WP-06.

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. Rev. 03. WCPFC-SC16-2020/SA-WP-04.