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WCPO Skipjack Management Procedure Dry-run Re-run

SPC-OFP

1   Background

To support the development and adoption of a management procedure (MP) for skipjack tuna in the WCPO a 'dry-run' analysis was presented to SC18 (Scott et al., 2022) and subsequently to WCPFC19. The 'dry-run' skipjack MP was run using the latest available data (1972-2021) and demonstrated the hypothetical implementation of the skipjack MP in 2022. It provided an indication of how the MP would be expected to operate and how the results of the estimation model would feed into the harvest control rule (HCR) to set fishing opportunities for the subsequent management period (3 years).

The dry-run analysis returned an estimate of spawning potential depletion ($SB/SB_{F=0}$) of 0.54 which, combined with the HCR, implied a catch and effort scalar of 1.0. The $SB/SB_{F=0}$ estimate fell within the bounds of uncertainty identified from the MSE analyses. The estimation model was considered to have run successfully, however, some differences in model inputs compared to those assumed during the MSE testing were noted.

The dry-run analysis was based on the discussions on harvest strategy implementation at that time. Discussions following SC18 revised aspects of the skipjack MP, in particular the switch to effort scaling for pole and line fisheries, and changes to the year ranges over which baselines for catch and effort are calculated. These changes affected the baselines to which the resulting scalar is applied and not the estimation model itself. In addition, the HCR adopted at WCPFC19 differed slightly from the one assumed for the initial dry-run analysis.

Following its adoption in 2022 (CMM 2022-01), and as part of the scheduled implementation plan, the skipjack MP was run again in 2023 (Scott et al., 2023), this time using data for the period 1972-2022, and returned an estimate of $SB/SB_{F=0}$ of 0.42. The updated estimate of spawning biomass depletion remained on the flat part of the HCR corresponding to a catch and effort scalar of 1.0. Notably, model inputs for the 2023 implementation of the skipjack MP were more consistent with those assumed during the MSE testing. The change in estimated stock status from 0.54 to 0.42 in just one year, as well as discrepancies identified in the input data raised concerns regarding the initial dry-run analysis and a re-analysis of the 2022 skipjack MP dry-run was requested by SC19.

2   Dry-run re-run

The dry-run analysis of the WCPO skipjack MP was run again using data for the period 1972-2021, with input data prepared using the same procedures as outlined in WCPFC-SC19-2023/MI-WP-01. As for the 2023 implementation of the skipjack MP, model inputs were more consistent with those assumed during the MSE analyses (see Scott et al. (2023)) when compared to the original dry-run analysis.

The revised dry-run analysis provided an estimate of $SB/SB_{F=0}$ of 0.44, slightly higher than the

2023 implementation that used data to 2022. This revised value of terminal spawning potential depletion also lies on the flat part of the HCR corresponding to a catch and effort scalar of 1.0 (Figure 1).
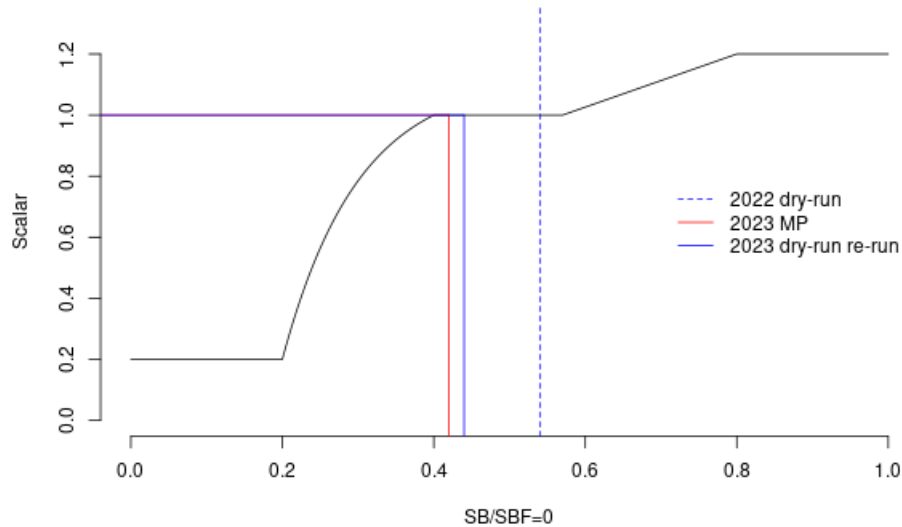

Figure 1: Application of the WCPFC19 agreed HCR (CMM 2022-01). Red line shows the estimated spawning potential depletion ($SB_{latest}/SB_{F=0}$) in 2022 (0.42) as determined from the estimation method and the corresponding catch and effort scalar. Blue dashed line shows the estimated spawning potential depletion ($SB_{latest}/SB_{F=0}$) determined by the original 2022 MP dry-run analysis. Solid blue line shows the updated dry-run estimates.

3 Discussion

Input data to the MP will be expected to change over time due to the accumulation of new data as well as ongoing data management practices that can modify historical data holdings, and also because inputs derived from model estimates (e.g. standardised CPUE) will be re-run and updated each time the MP is run. These changes can affect the historical patterns of input data as well as model outputs. However, with the benefit of hindsight, the magnitude of the changes in input quantities for the 2022 dry-run analysis should have prompted further investigation before the results were presented. Whilst some data sources showed greater change than others, discrepancies in the inputs were apparent in several of the input data sources (Scott et al., 2022).

A number of factors are likely to have contributed to these data discrepancies, not least the substantial change in SSP stock assessment personnel between the 2019 skipjack assessment and the 2022 dry-run analysis. In addition, the inputs to the dry-run were being compiled at the same time as the inputs to the 2022 stock assessment, a task often conducted under significant time pressure. Given resources available to the SSP and members this meant that individuals were working on

inputs for both the stock assessment and the MP at the same time. The generation of inputs to the stock assessment and the MP is a substantial task, particularly when they involve different proceedures, and the potential for errors to occur when these tasks are run in parrallel is increased. We therefore propose a number of measures to reduce the potential for such errors and to ensure greater consistency in future operations.

- The MP should not be run in the same year as the stock assessment. Where it is unavoidable that the stock assessment and the MP are run at the same time, the inputs to the models should be prepared by separate analysts. A clear separation of the two work streams should be maintained.

- A clearer protocol should be established for developing the inputs to the MP including specification of the data sets to use, the procedures to follow and the software to be employed.

- An archive of historical inputs, code and relevant documentation should be created to ensure consistency and reproducibility for future evaluations. The archive should have open access to enable the SSP and members to contribute to it.

To this end a git repository has been created to archive the scripts and associated documentation for the generation of data inputs and procedures for running the skipjack MP. This forms part of the SSP's ongoing work to improve transparency and reproducibility of the stock assessment process.

References

Scott, R., Teears, T., Yao, N., Scott, F., Peatman, T., and Pilling, G. (2023). WCPO skipjack management procedure. WCPFC-SC19-2023/MI-WP-01, Koror, Palau, 16-24 August 2023.

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