



**TECHNICAL AND COMPLIANCE COMMITTEE
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**Update on progress of analyses to inform WCPFC17 discussions on
candidate TRPs for WCPO bigeye and yellowfin tuna**

**WCPFC-TCC16-2020-IP-11
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Paper prepared by the Oceanic Fisheries Programme (OFP)
Pacific Community (SPC)

Summary

SC16 requested that the Scientific Service Provider perform analyses to inform the Commission's ongoing discussion on candidate target reference points (TRPs) for bigeye and yellowfin tuna, based upon the 2020 stock assessments (SC outcomes document paragraphs 70-72). SC16 also requested information to inform the Commission of options for the tropical tuna CMM (SC outcomes document paragraph 79) that were also of direct relevance to TRP discussions. SC16 recommended that a paper summarizing analyses undertaken so far and tentative results be forwarded to the TCC16, with final results to be presented to WCPFC17 (see Appendix 1).

The current information paper provides details of current progress relative to the SC16 requests. Following consideration, the Science Services Provider has first undertaken analyses relevant to SC16 outcomes document paragraph 79. Specifically, the levels of bigeye and yellowfin equilibrium stock depletion resulting under a range of purse seine effort and longline catch combinations have been estimated. This analysis uses stochastic projections from the latest bigeye and yellowfin stock assessments, where future fishery conditions are defined under the specified grid elements of future fishery effort (purse seine) and catch (longline) multipliers.

The range of scalar combinations requested within the grid represent the outputs from up to 970,000 projections for each stock. The following procedure was used:

- Stochastic projections were run for 30 years into the future from each 2020 stock assessment model within the agreed structural uncertainty grid for the bigeye or yellowfin stocks.
- Sufficient projections were performed from each grid model to approximate 1000 simulations for each purse seine/longline fishing combination for a stock.
- Each future purse seine effort/longline catch fishing level combination was defined as a multiplier (scalar) relative to a baseline average period of 2016-2018.
- Future recruitments to the stock were defined by the estimated stock recruitment relationship, with variability around it defined by recruitment estimates from the stock assessment over the most recent 10 years ('recent' recruitment; bigeye only) or the long term (1962 – 2016).
- Catchability was assumed to remain constant into the future.
- The 'equilibrium' depletion level under the specified purse seine/longline fishing combination was calculated as the median $SB_{2048}/SB_{F=0, 2038-2047}$; after 30 years, the median level had reached equilibrium with the future fishing conditions assumed.
- Risk of the stock falling below the limit reference point (LRP) under the specified purse seine/longline fishing combination was calculated as the proportion of depletion outcomes across the projections under the specified purse seine/longline fishing combination that in 2048 were below $20\%SB_{F=0}$.

Preliminary results are available for WCPO bigeye tuna, under two scenarios: that 'recent' recruitment conditions hold into the future and that 'long term' recruitment patterns continue. Preliminary results are also available for WCPO yellowfin tuna. These preliminary results are presented in terms of the equilibrium depletion level and level of risk of falling below the LRP resulting from the each gear combination for bigeye tuna (Figure 1, Figure 2 and Figure 3, Figure 4 for recent and long term recruitment assumptions, respectively) and yellowfin tuna (Figure 5 and Figure 6).

Preliminary results presented here are progress towards but do not respond to all requests within SC16 outcomes document paragraph 79. They also provide information that will help refine the search required to examine the specific TRP levels requested in SC16 outcomes document paragraphs 70-72. The request of paragraphs 70-72 requires considerably more information on stock and fishery outcomes at each specified TRP level, and this will be the next piece of work performed by the SSP. The results of all SC16 requests will be available for discussion at WCPFC17.

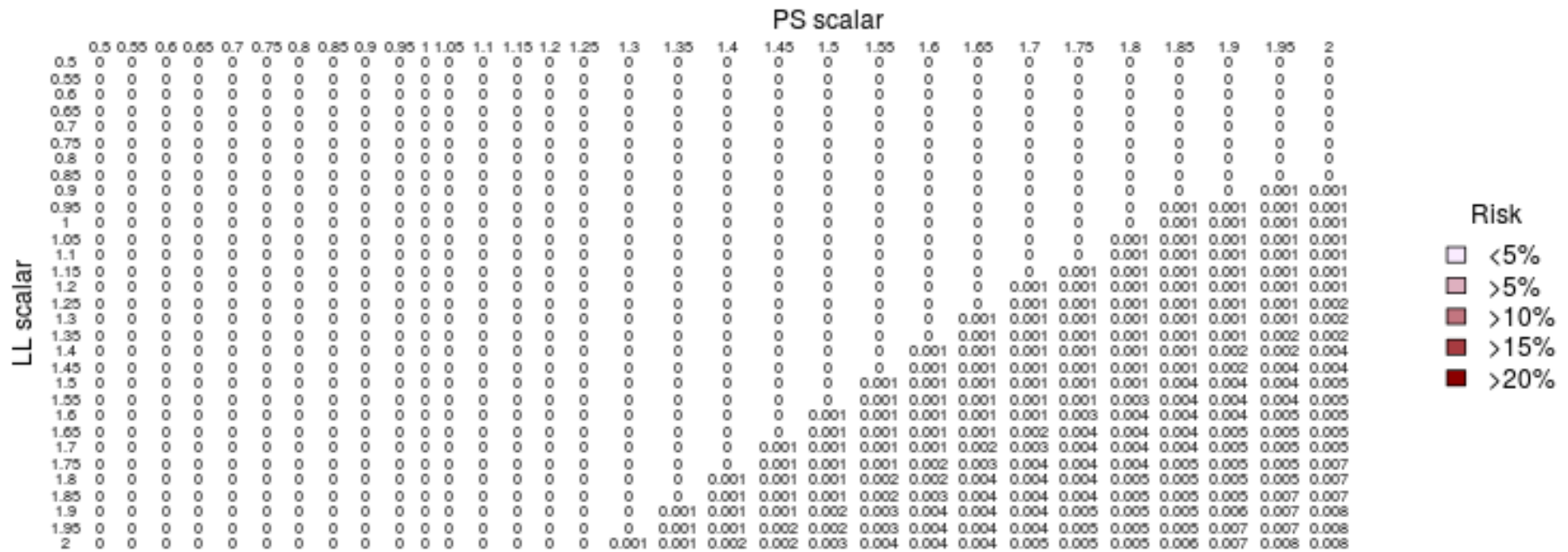


Figure 6. Risk that the yellowfin stock depletion levels ($SB/SB_{F=0}$) resulting under the different purse seine and longline scalars (relative to 2016-18 levels), under the assumption that 'recent' recruitment levels continue into the future, will fall below the limit reference point. Values indicate the risk level under those fishery conditions, shading indicates those risk levels relative to 5%, 10%, 15% and 20%.

Appendix 1. Summary of SC16 requests

70. Noting the request from WCPFC16 for the Scientific Committee to provide advice on the formulation of TRPs for bigeye and yellowfin tuna, and for the Scientific Service Provider to conduct an analysis for bigeye and yellowfin tuna similar to that undertaken in working paper WCPFC16-2019-14 (Current and projected stock status of WCPO skipjack tuna to inform consideration of an updated target reference point), as outlined in para. 273-275 of the WCPFC16 Summary Report, SC16 reviewed SC16-MI-WP-01 and requested the Scientific Services Provider undertake the analyses for bigeye and yellowfin tuna according to the criteria outlined in the table below:

Issue	Requested Scenario
Model settings and the uncertainty grid	The SC16 agreed structural uncertainty grid.
Additional scenarios	To use both short- and long-term recruitment for bigeye tuna.
The range of candidate TRPs to be explored:	<p>There are some advantages to defining candidate target stock depletion relative to the average biomass within a recent time period. This is consistent with the approach taken for development of the South Pacific Albacore interim TRP and serves to “future proof” the candidate TRP from changes in the biomass time series that have been noted with updated assessments. Specifying a time period also allows reference to some fisheries performance metrics within that period, such as CPUE.</p> <p>The following candidate TRPs are specified:</p> <ul style="list-style-type: none"> • Average SB/SB_{F=0} for 2012-2015 (consistent with the Aims of CMM-2018-01) • 10% above Average SB/SB_{F=0} for 2012-2015 • 10% below Average SB/SB_{F=0} for 2012-2015 • TRPs at intermediate steps between the candidates outlined above (e.g. at 5% intervals) were also recommended. • An alternative TRP based on the average SB for 2000-2004 should also be explored. • Additional candidate TRPs can be identified in terms of the risk of breaching the LRPs; in particular: the SB/SBF=0 levels associated with 10% and 20% risks of breaching the LRP based on an updated analysis using the SC16 adopted structural uncertainty grid.
Time period of the projections	30 years, consistent with the earlier skipjack analyses. Intervals of 10 years will be presented within this period. The rationale is to have a period to allow the population to reach equilibrium.
Use of catch or effort	<ul style="list-style-type: none"> • PS – effort • LL – catch • Other fisheries – catch <p>SC16 noted that this is for the purposes of these analyses and without prejudice to preferred management arrangements.</p>

The baseline catch and effort levels	A recent period is preferable because it is more relevant to recent activity levels and also a more realistic reflection of IND/PHI fisheries catches.
Limits to the range of the fishery scalars	<p>SC16 noted that if scalars are too constrained then it might not be possible to achieve the different biomass TRP levels and some guidance on this issue was sought from the SSP.</p> <p>Scalars would be applied equally to purse seine effort and longline catch. For other fleets, recent catch levels would be assumed. SC16 also noted that this is an exploratory exercise to see what the consequences could be for different TRP choices and not a management recommendation that sets up any kind of precedent.</p>
Reporting the output of the analysis:	Similar outputs to the skipjack work reported in WCPFC16-2019-14. In addition, SC16 recommended reporting against the Aims of CMM-2018-01 paras 12 and 14 being “average SB/SB _{F=0} for 2012-2015”.

71. Noting the large number of scenarios included in the above request, possible analytical challenges that may arise, and the heavy workload of the Scientific Service Provider due to other requests, the following priority was placed on the TRPs to be evaluated.

- a) The initial average and +/- 10% proposal (3 scenarios)
- b) The additional runs for 10% and 20% risk and the average SB for 2000-2004 (3 scenarios)
- c) Intermediate values based upon the results of the above work (e.g., 2-5 scenarios)

72. SC16 recommends that the above analyses be completed by the Scientific Service Provider and a paper summarizing both the analyses undertaken and the tentative results be forwarded to the TCC16 and final results to WCPFC17.

79. To provide additional information to the Commission on options for CMM-2018-01, SC16 recommends that the Scientific Services Provider provide to the Commission as early as reasonable, the following:

- 1) Any updates to SC15-MI-WP01, “minimum target reference points for WCPO yellowfin and bigeye tuna consistent with alternative LRP risk levels, and multispecies implications,” and the following additions to the deterministic projections in Figure 3a and 3b for bigeye tuna (and to Figures 2a and 2b for yellowfin tuna if possible) (as in the original paper, the PS scalar should scale overall PS fishing effort, including both associated and unassociated fishing effort):
 - a) Inclusion on the x axis (PS scalar) and y axis (LL scalar) of the absolute quantities that correspond to the scalars (for PS scalar, numbers of both associated sets and unassociated sets, and for LL scalar, longline catch in mt).
 - b) Inclusion on the x axis and y axis of the expected fishery impact of the sector on SSB (SB2045/SBF=0) that correspond to the scalars, assuming the other sectors’ (e.g., pole-and-line and other) impacts are as they were in 2013-2015, on average.
 - c) Extension of the ranges of the x and y axes to scalars as high as 2.0 (from 1.5).
 - d) Indications of the expected PS scalars for the purse seine management regime under CMM 2018-01.
- 2) One or more tables showing as long a time series as possible, of fishery impact on WCPO bigeye tuna SSB, by fishery sector (for just the diagnostic case, and including at a minimum: longline, purse seine associated, purse seine unassociated, pole-and-line, and other).