



SECOND BIGEYE TUNA MANAGEMENT WORKSHOP (BMW02)

1 – 2 October 2026

Honolulu, Hawaii (Hybrid)

**OPERATING MODEL FRAMEWORK AND ROBUSTNESS TESTING FOR BIGEYE TUNA IN THE
WCPO: UPDATES TO THE OPERATING MODELS FOLLOWING SC22**

WCPFC-BMW02-2026-WP02

25 September 2026

SPC-OFP

1 Introduction

Management procedures (MPs) should ideally be tested prior to implementation. An iterative testing process can help ensure that the MP is likely to achieve management objectives as well as provide managers an opportunity to better understand how the MP functions and refine its design prior to adoption and implementation.

Operating models (OMs) comprise the range of scenarios against which candidate MPs are tested. The OMs should represent a range of plausible scenarios for stock and fishery dynamics that sufficiently captures uncertainty in the biological, technical and environmental processes that impact the stock and fishery.

2 Background

A grid of 480 OMs for WCPO bigeye tuna was presented to WCPFC-SC22. In accordance with the recommendations of WCPFC-SC21 the grid was based on the 2023 stock assessment but represented a broader range of uncertainty.

An updated stock assessment for WCPO bigeye tuna was also presented to SC22. It provided revised estimates of stock status and indicated that, while the stock was not overfished on average, the stock was more depleted than indicated by the 2023 assessment and there was a greater chance of being below the limit reference point (LRP). Subsequent updates to the OM grid, conducted prior to SC22, provided reduced estimates of stock status but did not represent depletion levels below the LRP. Although the updated stock assessment was not accepted by SC22 as the basis of management advice, SC22 requested the SSP further explore options to expand the uncertainty range of the OM grid, in particular to cover the lower depletion range suggested by the 2026 stock assessment.

This brief document outlines the basis of the revised BET OMs requested by SC22.

3 BET OMs revised for BMW02

The revised OM grid (Table 1) continues to be based on the 2023 assessment input data (ending 2021) and retains many of the 2023 stock assessment model settings. However, it includes an expanded range of tag overdispersion and tag mixing settings and, relative to the initial OM grid, a reduced set of natural mortality values. The revised OM grid provides estimates of stock status that more closely represent those of the 2026 assessment (Figure 1).

The revised OMs presented here comprise the reference set of OMs (1152 scenarios, based on 288 model fits). These represent the primary basis for testing candidate MPs, the results of which form the performance indicators. A robustness set, comprising more extreme settings including scenarios for persistent low recruitment and alternative catches in fisheries not controlled through the MP, remains under development.

The technical details of the revised OMs will be presented for review and formal adoption at the special SC meeting to be held immediately prior to WCPFC 23.

Status quo, effort-based, stochastic projections conducted across the OM grid, for which average effort for 2019-21 is assumed to persist into the future (Figure 2) shows a broad range of outcomes for spawning biomass depletion with average depletion levels increasing to around 0.35, but with a number of projection runs remaining below the LRP into the future.

4 Re-testing the estimation method with the updated OMs

The estimation method (EM) is a pre-agreed method for determining the level of stock status that is input to the harvest control rule each time the MP is run. An updated EM, modified to take into account the recommendations of SC21, was presented to SC22. SC22 supported the use of the revised EM for the BET MP, noting that its performance should be re-evaluated once the OM grid has been updated.

Re-evaluation of the EM showed very similar performance under the updated OM grid to that of the previous OM grid. Further details of the testing process and results will be presented for review and adoption to the special SC meeting.

5 Conclusions

The operating models for bigeye tuna in the WCPO have been revised in accordance with the request of SC22 to cover the lower depletion range suggested by the 2026 stock assessment. The revised OMs have lower average spawning biomass depletion ($SB/SBF=0$) than the previous OM grid presented to SC22 and a greater probability of being below the LRP.

We invite BMW02 to note:

- The revised OMs represent scenarios for lower average spawning biomass depletion ($SB/SBF=0$) than the previous OM grid, and have a greater probability of being below the LRP.
- Re-evaluation of the estimation method under the revised OM grid showed very similar performance to that of the previous OM grid.
- Details of the revised OM grid and EM testing will be submitted to the special SC for formal adoption prior to WCPFC23.

Table 1: Revised bigeye tuna OM uncertainty grid (reference set, 1,152 scenarios). ‡ denotes those scenarios for which a dedicated fit of MULTIFAN-CL is required (288 scenarios).

Axis	Levels	Options			
		1	2	3	4
Process Error					
Recruitment variability	2	1962-2020	2010-2020		
Observation Error					
Catch and effort	1	20%			
Model Error					
Steepness ‡	3	0.8	0.65	0.95	
Mixing period (qtr) ‡	4	1	2	3	4
Tag overdispersion (τ) ‡	3	2	4	8	
Growth ‡	4				
Lmin		22	38	22	30
Lmax		150	155	160	150
k		0.118	0.066	0.118	0.09
Natural mortality ‡	2	0.1	0.15		
Movement ‡		estimated internally			
DD catchability		not currently implemented			
Implementation Error					
Effort creep	2	0%	PS 2%, LL 1%		

Table 2: Comparison of terminal depletion (SBRecent/SBF=0) estimates between model grids. Values for 2024 based on OM projections

	2023 Assessment	2026 Assessment	OM grid BMW02
SBSBF0 recent 2021 (max)	0.41	0.53	0.51
SBSBF0 recent 2021 (min)	0.28	0.13	0.15
SBSBF0 recent 2021 (median)	0.35	0.29	0.29
SBSBF0 recent 2021 relative to 2012-15	1.02	1.01	0.95
SBSBF0 recent 2024 (max)	-	0.50	0.48
SBSBF0 recent 2024 (min)	-	0.13	0.13
SBSBF0 recent 2024 (median)	-	0.28	0.28
SBSBF0 recent 2024 relative to 2012-15	-	0.95	0.93

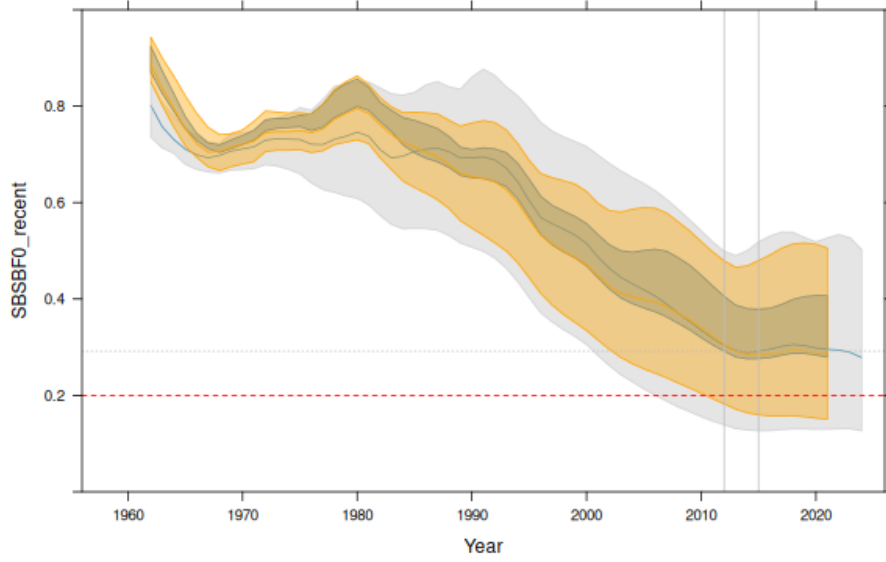


Figure 1: Estimated depletion (SB_{recent}/SBF_0) across the updated OM grid (orange shading) and the range of estimated depletion from the 2023 and 2026 stock assessments (dark- and light-grey shading respectively). Median depletion is shown for the OM grid (orange line) and 2026 assessment (blue line). Horizontal dashed lines show the LRP (red) and the average of 2012 to 2015 depletion for the OM grid (grey). Vertical lines show 2012 and 2015.

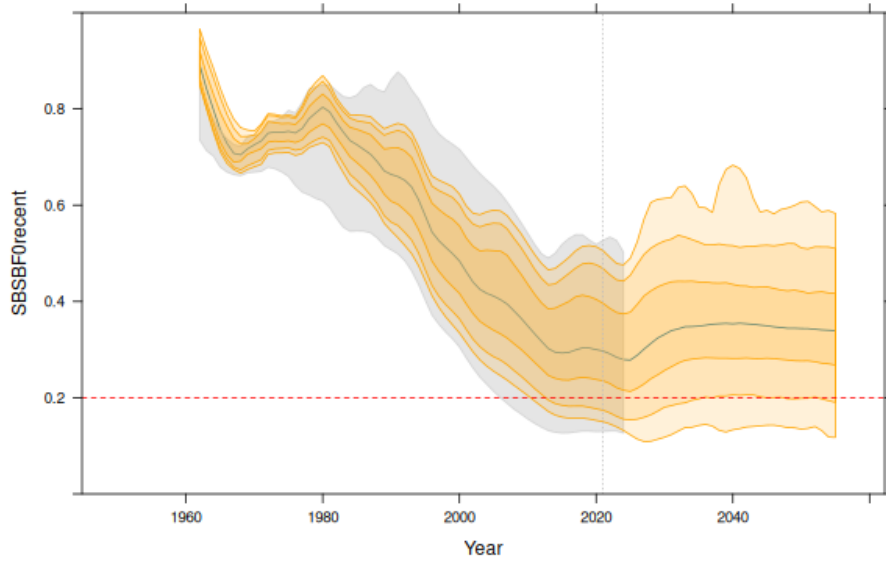


Figure 2: Estimated depletion (SB_{recent}/SBF_0) for the period 1960 to 2055 for 1,152 status-quo, effort-based, stochastic projections conducted across the OM grid. Shaded areas show the full extent of the results, and 95th and 60th percentiles. The median of the OM estimates is shown in the solid blue line. Dotted red line shows the LRP. Vertical grey line shows the start of the projection period.