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Bigeye Tuna Management Procedure (MP) Progress and Key Decision Points

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1. EXECUTIVE SUMMARY

This paper provides a summary of the decisions made and work to date underpinning the bigeye management procedure (MP). It summarises the settings and results of the preliminary analyses provided to SC21 that were guided by the three candidate target reference points (TRPs) identified by WCPFC21. The discussion of CCMs on the outputs of those analyses are provided.

Further input is needed from WCPFC22 to guide future work. This includes:

- Consideration of the defined range of candidate TRPs against WCPFC management objectives;
- Clarification of the target or threshold nature of those TRPs, and if designated as threshold TRPs, the desired probability of being above the TRP;
- Guidance on the FAD closure arrangements and associated MP designs to be considered when developing and evaluating candidate bigeye MPs;
- Definition of whether the output of the MP should be catch or effort, noting that conversion between those two metrics can be performed outside the MP process to match existing management regimes as required;
- Definition of scenarios for future catches of bigeye tuna in areas/fisheries outside of the MP's control, noting the proportion of the total catch of bigeye tuna taken by the tropical longline fishery controlled by the preliminary bigeye MP in recent years is around 27%, and around 17% of bigeye total catch is taken in archipelagic waters not subject to MP control. The SSP proposes developing sensitivity scenarios that capture levels from recent averages to those that exceed historical highs, as well as scenarios based on the impacts of recent management measures in Indonesia; and
- Consideration of the range of performance indicators provided and whether additional indicators would help inform management decision making.

Given the agreed deadline for adoption of a bigeye MP in 2026, and the limited opportunities for manager-level input in the period between Commission meetings, WCPFC22 may also wish to consider mechanisms and opportunities to provide strategic guidance throughout 2026.

2. OVERVIEW

This section provides a summary of the decisions made and work to date underpinning the bigeye management procedure (MP). Under the Indicative Harvest Strategy Workplan, the Commission is scheduled to adopt an MP for bigeye tuna in 2025 or, failing that, in 2026. Specific tasks for the adoption of an MP for bigeye include:

- Development of a reference set of operating models for testing candidate MPs and a robustness set for sensitivity testing.
- Development of candidate management procedures, including
    - Identification of management objectives including candidate TRPs.
    - A robust estimation method for the reliable estimation of stock status.
- MP evaluations to support comparison of relative performance of candidate MPs.

WCPFC21 supported a sequenced approach to the development of TRPs for bigeye and yellowfin whereby the Commission first addresses the TRP for bigeye and subsequently evaluates its implications for achieving management objectives for yellowfin. WCPFC21 identified 3 candidate TRPs for bigeye tuna:

1. 2012-2015 average spawning biomass depletion (currently estimated at 34% $SB_{F=0}$)[1]
2. 0.94 x 2012-2015 average spawning biomass depletion (estimated at 32% $SB_{F=0}$)
3. 1.06 x 2012-2015 average spawning biomass depletion (estimated at 36% $SB_{F=0}$)

The Commission noted that these candidate TRPs may in future be specified as threshold targets for which associated probabilities of being "at or above" would need to be specified.

SC21 reviewed preliminary work to develop and test candidate management procedures for bigeye including:

- A proposed OM reference set developed from the most recent stock assessment (SC21-MI-WP-05)
- Candidate MP designs including a proposed Estimation Method for bigeye tuna (SC21-MI-WP-06)
- Preliminary MSE evaluations of candidate MPs for bigeye tuna (SC21-MI-WP-07)

Under the mixed fishery framework, the bigeye MP primarily controls the catch of the tropical longline fishery (operating in the WCPFC-CA, 20°N to 10°S; Figure 1) and adjusts that level as needed to achieve management objectives. It ultimately works in conjunction with the skipjack MP and South Pacific albacore MP that define fishing levels in other key fishery components. This includes the purse seine fishery, where in bigeye MP evaluations presented to SC21, future activity was assumed consistent with the skipjack MP scenario in the recent Tropical Tuna Measure (TTM) evaluations. These included the FAD closure period described in CMM 2023-01.

The three candidate MPs for bigeye were developed to achieve, on average, each of the three candidate TRPs specified by WCPFC21 (Figure 2). During discussions, SC21 noted the implications of the TRPs for tropical longline vulnerable biomass (CPUE) and discussed the settings of those fisheries catching bigeye tuna that were not specifically controlled by the bigeye MP.

[1] From the most recent stock assessment. Note that the stock assessment model grid and OM grid will differ.

Table 1. Mean catch proportion (2020-22, by weight) by gear type for the 4 main tuna stocks in the WCPFC-CA (South Pacific albacore for WCPFC-CA south of the equator only)

	Tropical Longline	Southern Longline	Northern Longline	Pole & Line	Purse Seine	Troll	Other
Skipjack	0.00	0.00	0.00	0.09	0.83	0.00	0.08
South Pacific albacore	0.12	0.81	0.00	0.00	0.00	0.07	0.00
Bigeye	0.27	0.05	0.06	0.01	0.45	0.00	0.15
Yellowfin	0.08	0.02	0.01	0.03	0.55	0.00	0.31

SC21 noted the following outcomes with respect to the development of a harvest strategy for bigeye tuna:

- supported [the proposed OM grid] as the basis for initial testing of candidate MPs, but… recommended a number of additional sources of uncertainty be further investigated.
- noted that assumptions around the purse seine FAD closure period may not need to be included in the OM reference set, but … can be addressed through specific MP design and sensitivity analyses.
- endorsed the general approach for estimating stock status.
- highlighted that the bigeye MP controls the tropical longline fishery which accounts for just 27% (average 2020-2022) and stressed the importance of considering the dynamics of other fisheries that catch bigeye.
- considered the six performance indicators should be used to summarize future evaluations and should be kept consistent for yellowfin, and encouraged further consideration of options to better inform decision making, including through feedback from WCPFC22.

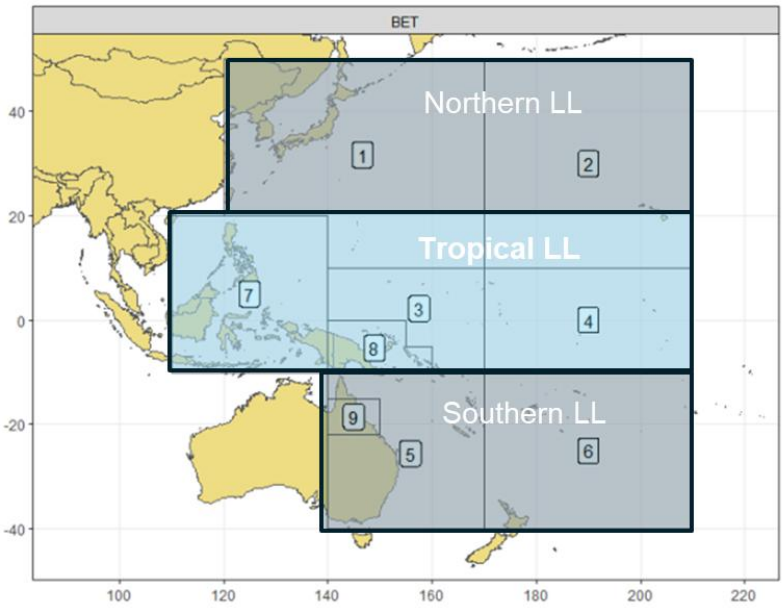

Figure 1: Spatial extent of the tropical longline (TLL) fishery from 20°N to 10°S (within the WCPFC-CA). Evaluations to date have assumed the BET MP applies to the TLL fishery and that the southern longline and tropical purse seine fisheries are controlled by the South Pacific albacore and skipjack MPs respectively.

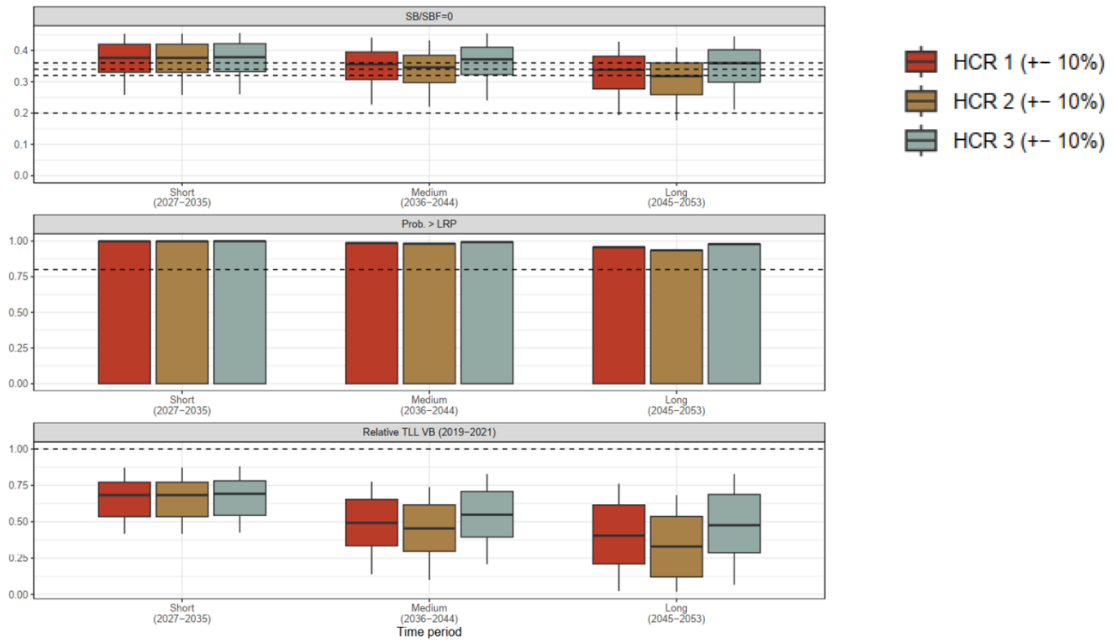

Figure 2: Box plots of bigeye SB/$SB_{F=0}$ in the WCPFC-CA and vulnerable biomass (proxy for CPUE) for the tropical longline fisheries in the WCPFC-CA (10°S to 20°N) relative to the level in 2019-2021, and a bar plot (middle) of probability of being above the LRP. The whiskers show the 95th percentile range, the box shows the 60th percentile range, and the horizontal line is the median value. Horizontal lines on the SB/$SB_{F=0}$ plot are the candidate TRPs from WCPFC21 (top three lines) and the LRP (bottom line). The horizontal line on the Prob. > LRP plot is at 0.8, the minimum required by WCPFC (see SC21-MI-WP-07).

3. INFORMATION REQUIRED TO PROGRESS DEVELOPMENT OF A MANAGEMENT PROCEDURE FOR BIGEYE TUNA

This section highlights the areas of guidance required from the Commission. In order to develop the preliminary evaluations of candidate MPs (SC21-MI-WP07), it was necessary to make a number of assumptions about the MP design and its implementation. These include:

1. The MP applies only to the tropical longline fishery which extends from 20°N to 10°S, given that other fisheries catching BET fall under the MPs for other stocks.
    a. the southern longline fishery will be managed by the South Pacific albacore MP
    b. total effort of the tropical purse seine and pole and line fisheries, and catch of relevant domestic fisheries of ID/PH will be managed or defined by the WCPO skipjack MP and its associated monitoring strategy.
2. A 3-year management period with a 2-year data lag.
3. Three candidate TRPs were considered, as requested by WCPFC21.
4. The output of the bigeye MP was a measurement of catch.
5. The HCR was based on a Hillary step design with a ±10% constraint applied.

Guidance is sought on the validity of these initial assumptions and, where necessary, on alternative options for MP design. Additional considerations for which guidance from the Commission is requested at WCPFC22 include:

<u>Management objectives</u>

Preliminary evaluations have been conducted based on the three candidate TRPs proposed by WCPFC21. These evaluations have assumed that the tropical purse seine fishery; pole and line fishery and relevant domestic fisheries of ID/PH are controlled or defined by the skipjack MP at their

respective baseline levels and that the southern longline fishery is controlled by the South Pacific albacore MP at baseline 2020-22 levels. Under these conditions there is scope for increases in bigeye catch in the tropical longline fishery of between 10% to 50% depending on TRP. However, under these catch increases, CPUE in the TLL is predicted to decline (Figure 2). Given this outcome, the Commission may wish to consider the range of candidate TRPs against the Commission's management objectives.

Treatment of the FAD closure period

For the preliminary evaluations outlined in SC21-MI-WP-07, it has been assumed that the current FAD closure arrangements will continue (1.5 months EEZ and high seas, plus 1 month high seas). At SC21 some CCMs requested that the baseline assumption, when designing and testing MPs, be that no FAD closure applies, and that alternative FAD closure assumptions be tested through sensitivity analyses. Other CCMs questioned whether the FAD closure period could be determined as part of the bigeye MP.

SC21 considered this to be a management issue requiring the consideration of the Commission to provide clear guidance to the SSP on the FAD closure arrangements and associated MP designs to be considered when testing and evaluating candidate bigeye MPs.

Compatibility with existing arrangements

Pending formal agreement, the output of the MP for the preliminary evaluations was a measure of catch, expressed as a scalar relative to average values over a baseline period (2012-2015). MP designs that output a measure of effort (either relative to some baseline, or as absolute values) can be applied for future evaluations if desired. We note that a conversion between catch and effort can be applied that would allow the output of the MP and the management metric to differ, as has been considered for the South Pacific albacore MP.

Sensitivity scenarios for bigeye catches in fisheries not under bigeye MP control

The proportion of the total catch of bigeye tuna taken by the tropical longline fishery in recent years is around 27% (2020:22, Table 1). Around 17% of bigeye catch has been taken in the domestic fisheries of Indonesia, Philippines and Vietnam, a large proportion of which is from archipelagic waters and therefore not subject to control by WCPFC MPs. Fisheries in these archipelagic waters are subject to variable fishery dynamics in recent years and face challenges in catch reporting leading to increased uncertainty in future catch levels. Recent trends show a progressive reduction in longline catches as effort increasingly switches to smaller scale fishing operations (e.g. handline and troll). An increase in catches of bigeye for the "other" gear category (Figure 3) is apparent for 2024 which may be a consequence of recently introduced management measures for yellowfin and skipjack in the archipelagic waters of Indonesia. Catch and effort levels for this region are quite uncertain but show progressive increases in recent years. It remains unclear to what extent the data reflect changes in fishery dynamics or changes in data reporting and raising practices.

Work is ongoing to try to resolve these issues and the results of those analyses will be used to better inform the range of scenarios required for testing candidate bigeye MPs. In the meantime, the SSP proposes developing sensitivity scenarios that capture levels from recent averages to those that exceed historical highs, as well as scenarios based on the impacts of recent management measures in Indonesia.

We note that the primary objective when testing candidate MPs is to determine their relative performance under a range of potential scenarios. These scenarios should be plausible, but should not be considered to be predictions of what will happen. Instead they identify the range of conditions under which a particular MP is likely to succeed, or to fail.

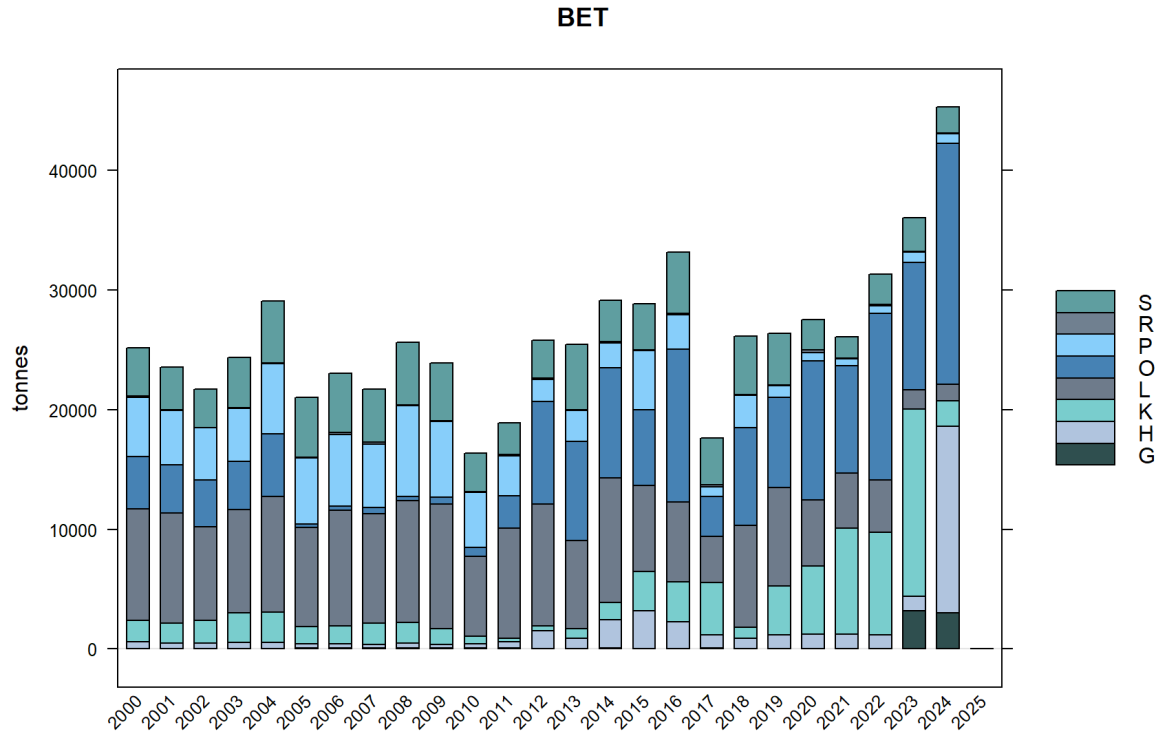

Figure 3. Bigeye catches (EEZ and AW combined) by gear type in region 7 of the 2023 bigeye stock assessment (S seine, R ringnet, P pole & line, O other, L longline, K small fish handline, H large fish handline, G gillnet).

4. FURTHER CONSIDERATIONS

The challenging time scale for the adoption and implementation of management procedures under the WCPFC harvest strategy approach means there are limited opportunities for substantive discussion on key elements and critical guiding input from managers. Whilst the seven-month period between the annual meeting of the Commission and the Scientific Committee allows time for complex and computationally intensive evaluations to be undertaken, it provides no opportunity for input from CCMs until the latter part of the year, and hence limited time for further analyses prior to the subsequent Commission meeting.

Given the agreed deadline for adoption of a bigeye MP in 2026, the Commission may wish to consider mechanisms and opportunities to provide strategic guidance throughout 2026.

ACKNOWLEDGMENTS

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