

OUTCOMES OF THE 24th SESSION OF THE SCIENTIFIC COMMITTEE

PREPARED BY: IOTC SECRETARIAT, 10 MAY 2022

PURPOSE

To inform participants at the 24th Working Party on Tropical Tunas Data Preparatory meeting (WPTT24(DP)) of the recommendations arising from the 24th Session of the IOTC Scientific Committee (SC) held from 6 -10 December 2021, specifically relating to the work of the WPTT.

BACKGROUND

At the 24th Session of the SC, the SC noted and considered the recommendations made by the WPTT in 2021 that included requests to address the deficiencies in data collection, monitoring and reporting by CPCs, as well as to carry out targeted research and analysis on tropical tuna species.

Tropical tunas caught in the IOTC area of competence and under the WPTT mandate

Common name	Species	Code
Bigeye tuna	<i>Thunnus obesus</i>	BET
Skipjack tuna	<i>Katsuwonus pelamis</i>	SKJ
Yellowfin tuna	<i>Thunnus albacares</i>	YFT

The recommendations on the deficiencies in data collection, monitoring and reporting by CPCs in relation to tropical tunas will be discussed in paper IOTC–2022–WPTT24(DP)–07 and are therefore not presented in this paper.

Based on the recommendations arising from the WPTT23, the SC24 adopted a set of recommendations, provide at [Appendix A](#) of this paper.

The recommendations contained in [Appendix A](#) were provided to the Commission for consideration at its 26th Session held in June 2022.

In addition, the SC24 reviewed and endorsed a Program of Work (2022–2026) for the WPTT, including a revised assessment schedule. A separate paper will be reviewed during the WPTT24(AS) and will outline the review and development process for a *Program of Work* for the WPTT for the next five years.

DISCUSSION

In addition to the recommendations outlined in [Appendix A](#), the following extracts from the SC24 Report (2021) are provided here for the consideration and action of the WPTT24(DP):

Report of the 23rd Session of the Working Party on Tropical Tunas (WPTT23)

79. The SC **NOTED** the report of the 23rd Session of the Working Party on Tropical Tunas ([IOTC–2021–WPTT23–R](#)), including the consolidated list of recommendations provided as an appendix to the report. The meeting was attended by 108 participants (cf. 111 in 2020). No MPF funding was provided as the meeting was held online.

7.4.1 Yellowfin tuna stock assessment

80. The SC **NOTED** that the 2021 yellowfin tuna assessment (using Stock Synthesis) concluded that the stock is overfished and is subject to overfishing. The SC further **NOTED** that the 2021 yellowfin tuna stock assessment captured structural uncertainty through a grid of 96 models covering alternative assumptions on spatial structure, tag data weighting, steepness, and longline catchability (single catchability vs independent catchabilities before and after the piracy period), growth, and natural mortality. Statistical uncertainty from individual models was incorporated into the estimates of stock status.

81. The SC **THANKED** the yellowfin assessment team and the WPTT participants that contributed to revising the assessment and to try and resolve the problems that have hindered this being revised for the past few years.

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82. The SC **NOTED** that while the assessment captures a broad range of uncertainty across the model grid, it does not capture some additional uncertainties, some of these (e.g., those related to the newly available estimates of growth, natural mortality, longline catchability increases), which were explored by sensitivity runs indicate the potential for a more depleted stock, whilst others (eg. Using all available abundance indices, random walk estimation of deviations on selectivity) suggests a more optimistic status (IOTC-2021-WPTT23-12, Table B1). The SC **NOTED** that it is important to acknowledge the potential impact of the additional uncertainty on the management advice. The SC also **NOTED** that the sensitivity runs were carried out without the optimal recruitment bias correction used for the reference grid and projections upon which the Executive Summary and K2SM are based.
83. The SC **NOTED** the unresolved issue of the diverging recruitment trends in the east and west IO which are unlikely to be realistic. This pattern is thought to be related to the spatial distribution of the known catches being incompatible with the CPUE trend, potentially indicating possible spatial misspecification in the model.
84. The SC **NOTED** that there is also the indication that the regional biomass estimates are not entirely consistent with regional catches (e.g., that the density of YFT was much higher in the eastern equatorial region, but the biomass in this region has been showing a major decline despite relatively small catches). The SC **NOTED** that the regional biomass distribution was pre-provided to the assessment model through an external analysis that used historical longline catch rates to estimate regional density. Therefore, the model estimates of regional biomass are primarily determined by these "regional scaling factors" that are implicitly provided as model inputs. The SC further **NOTED** that there is ongoing study to further improve the regional scaling factor estimates.
85. The SC **NOTED** that some of the factors and their combinations (e.g., "Dortel" growth, "Low" natural mortality, low steepness) in the uncertainty axes resulted in estimates of very low stock productivity and in those cases the model estimated low spawning biomass and highly depleted stock status. In these scenarios, a trend is detected in estimated recruitment deviations which means that they require above average recruitment in order to explain the recent catches. The SC **NOTED** that the trend in recruitment does not necessarily mean that the productivity parameters are incorrect, but only reflects signals in the data that need to be analyzed and understood. The SC **NOTED** that both the "Dortel" growth and "Low" natural mortality option are supported by the recent aging study.
86. The SC **NOTED** that stock biomass has been declining over the past decade. Total catches have increased through that time, despite decreases in the catches of some fleets, due to increasing catches of some artisanal fleets. Significant uncertainties in the fishing effort levels and trend over time from these artisanal fisheries needs to be further investigated, to better understand the reasons for reported catch increases. The relative impacts of these and other fisheries upon the stock over time also needs further investigation.
87. The SC **REQUESTED** that the Secretariat, with the assistance of the CPCs, provide a preliminary examination of the level and trend in fishing effort of the fishing fleets that captured YFT over the last 10 years. This analysis should look to utilise the best indicator of fishing effort for each fleet, including where actual fishing effort data is not available, proxy information such as the number of fishing vessels, their dimensions in length and tonnage or other information that can help estimate deployed fishing effort.
88. The Secretariat is also **REQUESTED** to identify the possible gaps in the reporting of the required information and to propose solutions to fill the most relevant gaps.
89. The SC **NOTED** that the stock reached the overfished status without going through the overfishing stage. The SC further **NOTED** this occurred around the period 2004-2006 when there were record catches of yellowfin which were thought to be potentially a result of oceanographic factors which increased productivity in the Indian Ocean. The SC **NOTED** that this period was immediately followed by a period of low productivity and deep thermoclines in the period 2007-2009 which may have led to the large decline in the CPUE series.
90. The SC **NOTED** a discrepancy between the decline in the longline CPUE index and the recent increase in average fish size for commercial longline catches. The SC further **NOTED** that the trend in fish sizes may be more linked to fleet composition changes in recent years (than changes in actual population size structure) with size data samples from non-Japanese fleets becoming dominant. Changes were taken into account in various hypothetical evaluations that explain changes in size data.
91. The SC **NOTED** the document [IOTC-2021-SC24-INF08](#) that summarised the projection of the yellowfin model to estimate K2SM probabilities, including the following abstract provided by the authors:
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“This document presents the projections and Kobe II Strategy Matrix (K2SM) for the 2021 Indian Ocean yellowfin Stock Synthesis assessment model. Deterministic projections for 2021-2030 were conducted for the 96 reference grid scenarios assuming a constant level of catch at 60%-120% of the 2020 catch. The projections incorporate the range of uncertainty among alternative model structures but do not describe uncertainty due to parameter estimation error or stochastic future recruitment variability.

The present projections incorporate an explicit recruitment bias adjustment to avoid the likely overly optimistic results as identified by the Working Party on Tropical Tunas during the 23rd WPTT Stock Assessment meeting (WPTT, 2021, paragraph 125), if no explicit bias adjustment controls are used in the forecast. Also, as requested at the WPTT 23rd Stock Assessment meeting, we examine the effects of bias correction on the projection outputs.”

92. The SC **NOTED** that the projections were conducted intersessionally and the results were reviewed by a special meeting of the WPTT held on 24th November. The projection implemented the optimal bias correction on recruitment, instead of the full correction as in the assessment model reviewed by the WPTT. The optimal bias correction was applied to both model and projection period and, therefore, stock status slightly changed from the WPTT stock assessment. Thus, updated stock status estimates are provided in the Executive Summary.
93. The SC **THANKED** the assessment team for their hard work which has enabled them to provide projections for this important stock, and for refining, clarifying the report further and including the additional requested information in the revised paper.
94. The SC **NOTED** that the bias correction is to ensure that on average the recruitment did not deviate significantly from the stock-recruitment relationship and this process is important to ensure that the average recruitment estimate is unbiased, while considering recruitment variability. The SC further **NOTED** that the optimal method determines the bias correction based on the amount of variability described by the data. Optimal bias correction is considered a better practice and is currently implemented in SS3's advanced model settings.
95. The SC **NOTED** that the different bias correction methods will not have an appreciable impact on biomass estimation for the data-rich period because the bias correction is effectively a constant offset through the time series of recruitment which could be compensated by the R0 parameters. The SC further **NOTED** that the optimal bias correction made a smaller downward adjustment on the mean recruitment when compared to the full correction. This resulted in a lower estimate of R0 (or B0), and as a result lower estimates of Bmsy and MSY.
96. The SC **NOTED** as is the case for the assessment, while the projections incorporate uncertainty associated with different model structures across the 96 scenarios from the main model grid, the projections do not capture some of the uncertainties (associated with the sensitivity runs, catch uncertainty, spatial recruitment trends) and perhaps even more importantly, don't account for stochastic future recruitment variability. The SC **NOTED** that yellowfin exhibited high recruitment variability and it is quite possible that not accounting for this in the projections could bias the impact of projected catches. The SC further **NOTED** the very large confidence intervals (90%) estimated in the projections, particularly for F/Fmsy estimates.
97. The SC **NOTED** that it is important that these issues and additional uncertainties are clearly noted in the advice to the Commission. This will ensure full transparency to the Commission on the state of scientific understanding on the current status and the future potential state of the stock under the range of catch scenarios.
98. The SC **NOTED** that sensitivity runs conducted during the WPTT using a new growth curve developed in 2021 ([Farley et al 2021](#)¹) and natural mortality estimated with an alternative method ([Hoyle 2021](#)²) led to a more pessimistic stock status than the average values estimated through the reference grid. The SC **NOTED** the statement by the EU that the stock status estimates from the sensitivity runs still fall within the range of uncertainty estimated by the reference model grid. The EU further stated that these sensitivity runs require further scrutiny and analyses.

¹ Farley J, et al. 2021. Estimating the Age and Growth of Yellowfin Tuna (*Thunnus Albacares*) in the Indian Ocean from Counts of Daily and Annual Increments in Otoliths (IOTC-2021-WPTT23-05)

² Hoyle S. 2021. Approaches for Estimating Natural Mortality in Tuna Stock Assessments: Application to Indian Ocean Yellowfin Tuna (IOTC-2021-WPTT23-08)

99. In discussing and finalising the management advice for Yellowfin Tuna, the SC **NOTED** the statement by Australia that highlighted the set of sensitivity runs (exploring uncertainties in growth, natural mortality and longline catchability) that estimated the stock to be in a more depleted state than the average depletion estimated by the reference grid. While acknowledging that these sensitivity runs were preliminary and will receive further scientific evaluation in future, Australia stated that in its view, the Commission should be made aware of the additional uncertainty and potential risk indicated by these runs, to allow the Commission the opportunity to consider if it wished to apply, as a result, a more precautionary approach in its management response. Australia noted that the SC has provided similar advice on applying a precautionary approach when faced with significant data or model uncertainty, for other stocks including albacore tuna, longtail tuna, and KawaKawa..
100. The SC **NOTED** document [IOTC-2021-SC24-INF05](#) that provides the terms of reference for the proposed external review of the yellowfin assessment.
101. The SC **NOTED** that the independent peer review is planned to take place in 2022-2023 and will consist of a series of activities including a review workshop led by an independent panel. The SC **AGREED** that the review panel should consist of leading stock assessment experts in the field who should have minimal or no involvement in the IOTC scientific process in order to provide a new perspective. The SC also **AGREED** that the panel will be elected via a direct selection process coordinated by the IOTC secretariat, the chairs of the SC and WPTT. The SC **AGREED** that the review is important to improve confidence in future yellowfin stock assessments and would also be relevant to the bigeye and skipjack assessments.
102. The SC **DISCUSSED** the timeframes and milestones of the review in the context of the assessment cycle of the yellowfin tuna, noting the particular economic importance of this stock and the need to ensure the review is comprehensive and useful. The SC also provided further refinement on the TOR (IOTC-2021-SC24-INF05_rev1) including the assessment of the plausibility of low productivity scenarios, and the implementation of stochastic projections. The updated Terms of Reference as **AGREED** by the SC are contained in [Appendix 6c](#)
103. The SC **NOTED** the importance of the peer review process and its role in providing improved scientific advice for management. The SC therefore **RECOMMENDED** that the Commission endorse the process for a YFT stock assessment review as well as the BET MSE review and provide the financial resources to conduct the work planned.

7.4.2 Update on the WGFAD02

104. The SC **NOTED** that the 2nd ad hoc working group meeting on FADs was held online from the 4-6 October. The SC **NOTED** the final report was not yet ready as consensus on the text had yet to be reached.
105. The SC **NOTED** that WGFAD is tasked with providing advice on FAD management, especially with respect to the impact of dFAD on tropical tuna stocks and the assessment of the optimal number of dFADs to deploy. The SC **NOTED** no such advice was provided. This was due to the lack of transparency to provide data that would allow for a qualitative or quantitative assessment to be conducted. The SC **REQUESTED** future WGFAD meetings to take a more pragmatic approach and focus more on technical issues on FAD management.
106. The SC **NOTED** Japan's proposal to request a study of the major impacts of fisheries (especially FAD fisheries) on tropical Tuna species using the stock assessment results. Such analysis can be used to provide the basis for determining the optimal number of dFADs. The study should be reviewed at the next WGFAD meeting. It was also proposed that the SC convene a special meeting to discuss the results in order to provide advice in time for the Commission meeting in May.
107. The SC **RECOMMENDED** the Commission endorse the process to improve current definitions of FAD types and FAD activities used by the IOTC, to be conducted by the WPTT and WGFAD.

7.4.3 Other Matters

108. The SC **NOTED** the importance of environmental data, particularly in relation to the understanding of the impact of climate change on tropical tuna fisheries. The SC **NOTED** the suggestion to investigate the potential incorporation of the climate change effect into the CPUE standardisation processes.
109. The SC **NOTED** the WPTT Program of work, with high priorities being given to stock assessment model data review (size and tagging data), development of fleet-specific standardised CPUE indices and fishery-independent indices including acoustic FAD monitoring, and fishery impact analysis.

RECOMMENDATION

That the WPTT:

- 1) **NOTE** paper IOTC–2022–WPTT24(DP)–03 which outlined the main outcomes of the 24th Session of the Scientific Committee, specifically related to the work of the WPTT.
- 2) **CONSIDER** how best to progress these issues at the present meeting.

APPENDICES

Appendix A: Consolidated set of recommendations of the 24th Session of the Scientific Committee to the Commission, relevant to the Working Party on Tropical Tunas.

APPENDIX A

CONSOLIDATED SET OF RECOMMENDATIONS OF THE 24TH SESSION OF THE SCIENTIFIC COMMITTEE (6–10 DECEMBER 2022) TO THE COMMISSION

STATUS OF TUNA AND TUNA-LIKE RESOURCES IN THE INDIAN OCEAN AND ASSOCIATED SPECIES

Tuna – Highly migratory species

SC24.01 (para. 154) The SC **RECOMMENDED** that the Commission note the management advice developed for each tropical and temperate tuna species as provided in the Executive Summary for each species, and the combined Kobe plot for the four species assigned a stock status in 2021 (Fig. 1):

Albacore (*Thunnus alalunga*) – [Appendix 8](#)

Bigeye tuna (*Thunnus obesus*) – [Appendix 9](#)

Skipjack tuna (*Katsuwonus pelamis*) – [Appendix 10](#)

Yellowfin tuna (*Thunnus albacares*) – [Appendix 11](#)

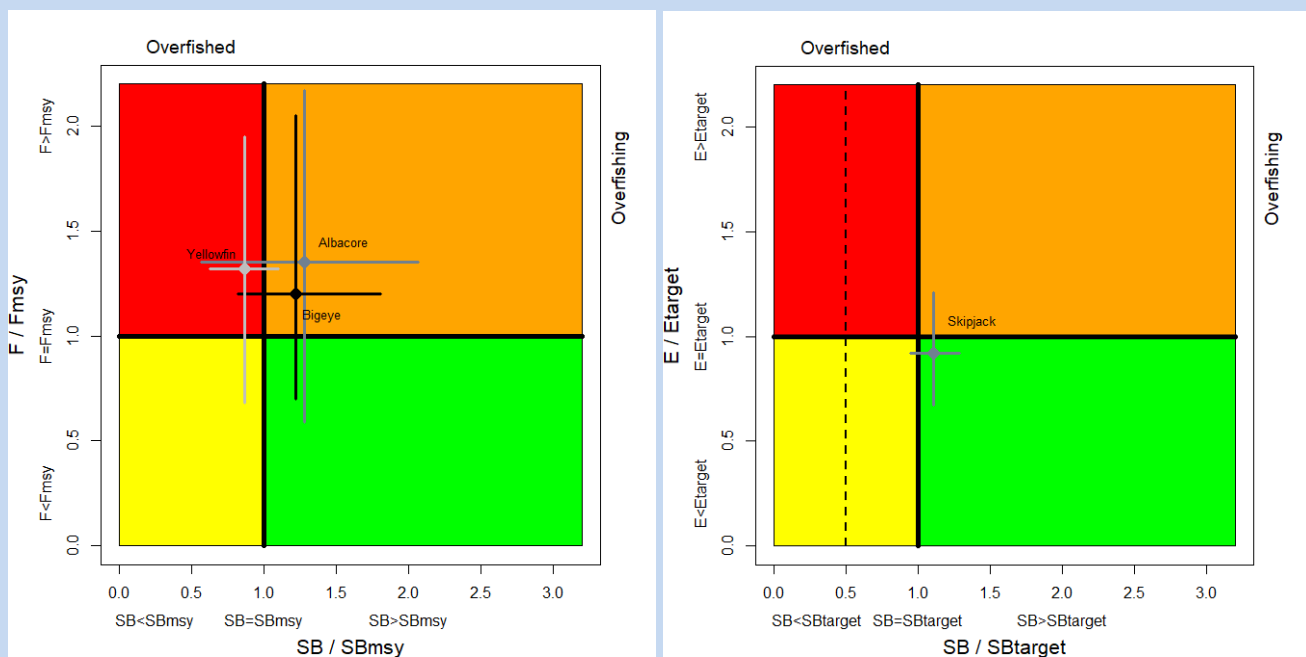


Fig. 1. (Left) Combined Kobe plot for bigeye tuna (black: status in 2018, based on the assessment conducted in 2019), and yellowfin tuna (light grey: 2020, with assessment conducted in 2021) and albacore (dark grey: 2017 with assessment conducted in 2019) showing the estimates of current spawning biomass (SB) and current fishing mortality (F) in relation to optimal spawning stock size and optimal fishing mortality. (Right) Kobe plot for skipjack tuna (2019 with assessment conducted in 2020) showing the estimates of the current stock status (The dashed line indicates the limit reference point at 20%SB0 while SBtarget=0.4 SB0). Cross bars illustrate the range of uncertainty from the model runs with an 80% CI (95% CI for albacore).

GENERAL RECOMMENDATIONS TO THE COMMISSION

Yellowfin tuna Stock Assessment

SC24.15 (para. 103) The SC **NOTED** the importance of the peer review process and its role in providing improved scientific advice for management. The SC therefore **RECOMMENDED** that the Commission endorse the

process for a YFT stock assessment review as well as the BET MSE review and provide the financial resources to conduct the work planned.

Update on the WGFAD02

SC24.16 (para. 107) The SC **RECOMMENDED** the Committee endorse the process to improve current definitions of FAD and FAD activities used by the IOTC, to be conducted by the WPTT and WGFAD

SUMMARY DISCUSSION OF MATTERS COMMON TO WORKING PARTIES (CAPACITY BUILDING ACTIVITIES – STOCK ASSESSMENT COURSE; CONNECTING SCIENCE AND MANAGEMENT, ETC.)

Invited Expert(s) at the WP meetings

SC24.23 (para. 145) Given the importance of external independent review for working party meetings, the SC **RECOMMENDED** the Commission continues to allocate sufficient budget for invited scientific experts to be regularly invited to scientific working party meetings.

Meeting participation fund

SC24.24 (para. 147) The SC reiterated its **RECOMMENDATION** that the IOTC Rules of Procedure (2014), for the administration of the Meeting Participation Fund be modified so that applications are due not later than 60 days, and that the full Draft paper be submitted no later than 45 days before the start of the relevant meeting. The aim is to allow the Selection Panel to review the full paper rather than just the abstract, and provide guidance on areas for improvement, as well as the suitability of the application to receive funding using the IOTC MPF. The earlier submission dates would also assist with visa application procedures for candidates.

IOTC species identification guides: Tuna and tuna-like species

SC24.25 (para. 148) The SC reiterated its **RECOMMENDATION** that the Commission allocates budget towards continuing the translation and printing of the IOTC species ID guides so that hard copies of the identification cards can continue to be printed as many CPC scientific observers, both on board and at port, need to have hard copies.

Chairpersons and Vice-Chairpersons of the SC and its subsidiary bodies

SC24.26 (para. 150) The SC **RECOMMENDED** that the Commission note and endorse the Chairpersons and Vice-Chairpersons for the SC and its subsidiary bodies for the coming years, as provided in [Appendix 7](#).

PROGRAM OF WORK AND SCHEDULE OF WORKING PARTY AND SCIENTIFIC COMMITTEE MEETINGS

Consultants

SC24.27 (para. 181) Noting the highly beneficial and relevant work done by IOTC stock assessment consultants in previous years, the SC **RECOMMENDED** that the engagement of consultants be continued for each coming year based on the Program of Work. Consultants will be hired to supplement the skill set available within the IOTC Secretariat and CPCs.

REVIEW OF THE DRAFT, AND ADOPTION OF THE REPORT OF THE 23RD SESSION OF THE SCIENTIFIC COMMITTEE

SC24.28 (para. 190) The SC **RECOMMENDED** that the Commission consider the consolidated set of recommendations arising from SC24, provided at [Appendix 38](#).