



Report of the 6th IOTC Technical Committee on Management Procedures

Mauritius, 5–6 May 2023

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ACRONYMS

BET	Bigeye Tuna
BMSY	Biomass that achieves maximum sustainable yield
CMM	Conservation and Management Measure (of the IOTC; Resolutions and Recommendations)
CPCs	Contracting parties and cooperating non-contracting parties
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
IOTC	Indian Ocean Tuna Commission
MP	Management Procedure
MPD	Management Procedures Dialogue
MSE	Management Strategy Evaluation
MSY	Maximum Sustainable Yield
SC	Scientific Committee, of the IOTC
SSB	Spawning stock biomass
SPC	Secretariat of the Pacific Community
tRFMO	tuna Regional Fisheries Management Organization
TAC	Total Allowable Catch
TCMP	Technical Committee on Management Procedures
WP	Working Party of the IOTC
WPB	Working Party on Billfish of the IOTC
WPEB	Working Party on Ecosystems and Bycatch of the IOTC
WPM	Working Party on Methods of the IOTC
WPNT	Working Party on Neritic Tunas of the IOTC
WPDCS	Working Party on Data Collection and Statistics of the IOTC
WPTmT	Working Party on Temperate Tunas of the IOTC
WPTT	Working Party on Tropical Tunas of the IOTC
YFT	Yellowfin Tuna

STANDARDISATION OF IOTC WORKING PARTY AND SCIENTIFIC COMMITTEE REPORT TERMINOLOGY

SC16.07 (para. 23) The SC **ADOPTED** the reporting terminology contained in Appendix IV and **RECOMMENDED** that the Commission considers adopting the standardised IOTC Report terminology, to further improve the clarity of information sharing from, and among its subsidiary bodies.

HOW TO INTERPRET TERMINOLOGY CONTAINED IN THIS REPORT

Level 1: From a subsidiary body of the Commission to the next level in the structure of the Commission:

RECOMMENDED, RECOMMENDATION: Any conclusion or request for an action to be undertaken, from a subsidiary body of the Commission (Committee or Working Party), which is to be formally provided to the next level in the structure of the Commission for its consideration/endorsement (e.g. from a Working Party to the Scientific Committee; from a Committee to the Commission). The intention is that the higher body will consider the recommended action for endorsement under its own mandate, if the subsidiary body does not already have the required mandate. Ideally this should be task specific and contain a timeframe for completion.

Level 2: From a subsidiary body of the Commission to a CPC, the IOTC Secretariat, or other body (not the Commission) to carry out a specified task:

REQUESTED: This term should only be used by a subsidiary body of the Commission if it does not wish to have the request formally adopted/endorsed by the next level in the structure of the Commission. For example, if a Committee wishes to seek additional input from a CPC on a particular topic, but does not wish to formalise the request beyond the mandate of the Committee, it may request that a set action be undertaken. Ideally this should be task specific and contain a timeframe for the completion.

Level 3: General terms to be used for consistency:

AGREED: Any point of discussion from a meeting which the IOTC body considers to be an agreed course of action covered by its mandate, which has not already been dealt with under Level 1 or level 2 above; a general point of agreement among delegations/participants of a meeting which does not need to be considered/adopted by the next level in the Commission's structure.

NOTED/NOTING: Any point of discussion from a meeting which the IOTC body considers to be important enough to record in a meeting report for future reference.

Any other term: Any other term may be used in addition to the Level 3 terms to highlight to the reader of and IOTC report, the importance of the relevant paragraph. However, other terms used are considered for explanatory/informational purposes only and shall have no higher rating within the reporting terminology hierarchy than Level 3, described above (e.g. **CONSIDERED; URGED; ACKNOWLEDGED**).

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EXECUTIVE SUMMARY

The sixth Technical Committee on Management Procedures meeting was held on the 5–6 May 2023. The meeting was held in a hybrid format, with several delegations present physically in the meeting room, and other participants attending by videoconference. Dr. Toshihide Kitakado, the Chair of the Scientific Committee, opened the meeting and welcomed attendees. Dr. Kitakado emphasized the importance of a formal forum for engaging both scientists and decision makers in the process of developing Management Procedures for key IOTC species. The meeting was co-chaired by Ms Jung-re Riley Kim (chair of the IOTC Commission). The Chairs welcomed 88 delegates from 27 Contracting Parties of the Commission and 10 Observers (including 3 invited experts) to the session. The list of participants is provided in [Appendix I](#).

TCMP.Rec.01 (Para. 79) The TCMP **NOTED** the recommendation by the SC that it is advisable to have focused dialogue with managers on those MSEs which are more advanced such as that for SKJ and SWO. The TCMP therefore **RECOMMENDED** that a virtual TCMP is convened early in 2024 with a special focus on the MSEs for SKJ and SWO and that it be held back-to-back with the WPM(MSE) meeting.

1. OPENING OF THE SESSION AND ARRANGEMENTS

1. The sixth Technical Committee on Management Procedures meeting was held on the 5–6 May 2023. The meeting was held in a hybrid format, with several delegations present physically in the meeting room, and other participants attending by videoconference.
2. Dr. Toshihide Kitakado, the Chair of the Scientific Committee, opened the meeting and welcomed attendees. Dr. Kitakado emphasized the importance of a formal forum for engaging both scientists and decision makers in the process of developing Management Procedures for key IOTC species.
3. The meeting was co-chaired by Ms Jung-re Riley Kim (chair of the IOTC Commission). The Chairs welcomed 88 delegates from 27 Contracting Parties of the Commission and 10 Observers (including 3 invited experts) to the session. The list of participants is provided in [Appendix I](#).

2. ADOPTION OF THE AGENDA AND ARRANGEMENTS FOR THE SESSION

4. The Scientific Committee Chair **NOTED** that the TCMP was established to enhance the effective communication and mutual understanding between science and management, and to facilitate decision-making response of the commission on matters related to management procedures. To this aim, scientists presented progress in developing and evaluating management procedures for the key tuna stocks in the Indian Ocean, in accordance with the decision framework as prescribed in Resolution 15/10 and associated workplan agreed by the Commission.
5. The adopted agenda for the meeting is presented in [Appendix II](#). The documents presented to the TCMP are listed in [Appendix III](#).

3. ADMISSION OF OBSERVERS

6. The TCMP **NOTED** that the applications by new Observers should continue to follow the procedure as outlined in Rule XIV of the IOTC Rules of Procedure (2022).

Non-governmental Organisations (NGO)

7. In accordance with Rule VI.1 and XIV.5 of the IOTC Rules of Procedure (2022), the TCMP **ADMITTED** the following Non-governmental organisations (NGO) as observers to the 6th Session of the TCMP.
 - International Pole-and-line Foundation
 - International Seafood Sustainability Foundation
 - Invited Experts
 - PEW Charitable Trusts
 - Sustainable Fisheries and Communities Trust
 - The Ocean Foundation
 - United States of America
 - World Wide Fund for Nature

Invited experts

8. In accordance with Rules VI.1 and XIV.9 of the IOTC Rules of Procedure (2022), the Commission may invite consultants or experts, in their individual capacity, to attend the meetings or participate in the work of the Commission as well as the Scientific Committee and the other subsidiary bodies of the Commission. The TCMP **ADMITTED** the following invited experts as observers to the 6th Session of the TCMP.

- Taiwan, Province of China

4. DECISIONS OF THE COMMISSION RELATED TO THE WORK OF THE TCMP

4.1 RESOLUTION 16/09 – TERMS OF REFERENCE

9. The TCMP **NOTED** paper IOTC–2023–TCMP06–06 which outlined the objectives, tasks and priorities of the Technical Committee on Management Procedures as established by the Commission through Resolution 16/09. This Resolution calls for the TCMP to focus on the presentation of results and exchange of information, and to emphasize the aspects of the Management Strategy Evaluation process that require a decision by the Commission, when undertaking the evaluation and discussion of management procedures for the IOTC fisheries.
10. The TCMP **RECALLED** that the Resolution required that the “(Para. 9) *The need for a continuation of the Technical Committee on Management Procedures shall be reviewed no later than at the Annual Session of the Commission in 2019*” and that this had been done and approval for the continuation of the TCMP was given by the Commission at its 23rd session.

4.2 OUTCOMES OF THE 5TH SESSION OF TCMP

11. The TCMP **NOTED** paper IOTC–2023–TCMP06–03 which summarised the main outcomes of the 5th Technical Committee on Management Procedures. The Report of the 5th TCMP provided the recommendations as below:

Bigeye Tuna

- (Para. 58) *The next technical issue discussed by the TCMP related to the choice of MP. Two distinct MPs were included in the proposal for discussion, namely the Model-based hockey stick (PT-HS, MP1_Harvest) and the Model-based Catch and CPUE projection (PT-PROJ, MP2_Target). The TCMP NOTED that both MPs have very similar results with subtle differences in the outputs (e.g. catch stability, short term catch levels, population status at the end of the reference years) that require consideration by the Commission and no consensus was reached on which MP was preferable for the TCMP. The TCMP NOTED that both candidate MPs for BET, reviewed by the SC, are acceptable and meet the management objectives for the stock. As such the TCMP **RECOMMENDED** that the Commission discuss them both and consider selecting one MP for adoption.*

Process and Future Meetings of the TCMP

- (Para. 77) *The TCMP **NOTED** that CPCs require time to process the outputs of the SC in order to fully explore and understand the advice provided using the MSE process. To facilitate this, the TCMP **RECOMMENDED** that the Commission endorse holding a virtual TCMP meeting early each year with a view to discuss or narrow down the alternative candidate MPs proposed by the SC, providing sufficient time for CPCs to discuss the outputs of the SC and consider developing proposals based on them. The TCMP would then meet again physically prior to the Commission.*

12. The TCMP **NOTED** that important issues were discussed by the TCMP and included in the paragraphs below:

Skipjack Tuna

- (Para 47) *The TCMP NOTED the depletion-based target (40% B₀) reference lines in Kobe plot and discussed whether the MSY-based reference points should be displayed at the green-zone border instead. The reason is the stock is fluctuating around the 40% B₀, there is little risk of violating the MSY biomass threshold/target. However, specifying a depletion-based target on the Kobe plot can be misleading as it can be misunderstood as equivalent to B_{msy}. The TCMP RECALLED that it was agreed that MP should be tuned to the depletion-based target. However, the TCMP NOTED there has been ongoing discussion at the WPM and SC on the stock status definition (in the context of defining overfishing or overfished status) for skipjack tuna in relation to*

different reference points measured/presented (e.g., the depletion-based reference points as per 16/02 and the MSY based reference points as per 15/10).

- *(Para 68) The TCMP NOTED that the Kobe quadrants for skipjack tuna are currently delineated based on the depletion-based reference points outlined in Resolution 16/02. However, there was a suggestion that the Kobe quadrant should be based on MSY-based reference points, with the stock status in relation to depletion-based target reference points clearly laid out on the Kobe plot. The SC chair clarified that the current Res 16/02 clearly specifies depletion-based reference points for the SKJ stock and so this will continue to be the default presentation of the results, but that the possibility of including MSY based point will be explored also in relation to portraying the green-zone.*
- *(Para 69) The TCMP NOTED there were technical issues in calculating MSY-related reference points for SKJ in the early assessments for this species, but recent assessments have been able to estimate and report on estimated MSY reference points. However, it is not clear whether these estimated MSY quantities are robust enough to be established as reference points for skipjack tuna. The TCMP SUGGESTED this issue be further discussed by the relevant working parties (WPM and WPTT).*

13. The TCMP **NOTED** the outcomes from the previous session of the TCMP.

4.3 OUTCOMES OF THE 26TH SESSION OF THE COMMISSION

14. The TCMP **NOTED** paper IOTC–2023–TCMP06–04 which outlined the main outcomes of previous session of the Commission, specifically related to the work of the TCMP and **AGREED** to consider, throughout the course of the current meeting, how best to provide the Scientific Committee with the information it needs in order to satisfy the Commission’s requests. The Report of the 26th Session of the Commission provided the following feedback:

- *(Para. 46) The Commission NOTED that the report from the 5th meeting of the Technical Committee on Management Procedures (TCMP) had not yet been adopted and will be done so by correspondence. The Commission NOTED, however, that several Recommendations had been reviewed and agreed during the meeting and these were presented to the Commission by the SC Chair who co-chaired the meeting. The Recommendations were as follows:*
 - *The TCMP NOTED that both candidate MPs for BET, reviewed by the SC, are acceptable and meet the management objectives for the stock. As such the TCMP RECOMMENDED that the Commission discuss them both and consider selecting one MP for adoption.*
 - *The TCMP NOTED that CPCs require time to process the outputs of the SC in order to fully explore and understand the advice provided using the MSE process. To facilitate this, the TCMP RECOMMENDED that the Commission endorse holding a virtual TCMP meeting early each year with a view to discuss or narrow down the alternative candidate MPs proposed by the SC, providing sufficient time for CPCs to discuss the outputs of the SC and consider developing proposals based on them. The TCMP would then meet again physically prior to the Commission.*
- *(Para. 47) The Commission SUPPORTED the important work conducted by the TCMP and ENDORSED the Recommendation to hold a virtual meeting early in the year. This would be included in the schedule of meetings from 2023.*
- *(Para. 48) The Commission URGED the TCMP to continue with capacity building initiatives to facilitate understanding of the process and increase participation by all parties to facilitate smooth implementation of the MSE process.*
- *(Para. 49) The Commission ACKNOWLEDGED an offer by the PEW Charitable Trusts to support capacity building workshops and activities for MSE. The Commission REQUESTED the Secretariat to liaise with PEW to coordinate these activities.*

15. The TCMP **NOTED** paper IOTC–2023–TCMP06–07 which outlined the adopted Management Procedure (MP) for

Bigeye tuna.

16. The TCMP **NOTED** the Secretariats presentation on the outcomes of the 26th Session of the Commission and **AGREED** that any necessary issues would be discussed during the current session of the TCMP.

17. The TCMP **NOTED** that the virtual session of the TCMP scheduled to be held early in the year, did not take place (*see para 19 below*). The Secretariat informed the TCMP that this had no impact on the functioning of the TCMP as there had not been sufficient progress on an MP to warrant holding the additional meeting and all progress on the MSE work was made available to the current session of the TCMP.

4.4 OUTCOMES OF THE 25TH SESSION OF THE SCIENTIFIC COMMITTEE

18. The TCMP **NOTED** paper IOTC–2023–TCMP06–05 which outlined the main outcomes of 25th Session of the Scientific Committee that specifically related to the work of the TCMP.

19. The TCMP **NOTED** the feedback provided by the SC on MSE issues including the following recommendations:

- *(Para 122): The SC **QUERIED** whether it would be necessary to hold a virtual TCMP meeting early in the year if no MPs are considered ready for presentation to the TCMP that particular year. The SC **RECOMMENDED** that there is no need to organize a virtual TCMP as no candidate MPs will be ready for consideration for adoption in 2023.*
- *(Para 123): The SC however **CONSIDERED** that it is advisable to have focused dialogue with managers on those MSE which are more advanced such as that for SKJ. The SC **RECOMMENDED** that a virtual TCMP is tentatively convened early in 2024 with a special focus on MSE for SKJ.*

20. The TCMP **NOTED** the Secretariats presentation on the outcomes of the 25th Session of the Scientific Committee and **AGREED** that these issues would be discussed during the current session of the TCMP.

5. INTRODUCTION TO MSE

5.1 MANAGEMENT PROCEDURES AND MSE:

5.1.1 Basic principles, Roles and responsibilities, dialogue tools and feedback mechanism

21. The TCMP **NOTED** a presentation by the SC Chair which provided an introduction to the basic principles of the MSE process. The presentation also highlighted several important aspects of the MSE processes, such as 1) the difference between “projections based on stock assessments” and “projections in an MSE process”; 2) the important roles of tuning criteria (eg. the 50% probability of stock status being in the Kobe green quadrant represents substantially higher risk of exceeding biomass reference points in the case of bigeye tuna).

22. The TCMP **NOTED** that the tropical tuna fisheries in the Indian Ocean are multi-species by nature and as such discussed whether it would be possible to consider multi-species MSE in the future. The SC chair indicated that at a technical level, this had been discussed by the SC, but it is very complex, and the SC felt it was more appropriate to finalise the single species MPs first and then proceed to consider multi-species options.

23. The TCMP **NOTED** that it could be useful to categorise the various management objectives (such as status and safety of the stock, yield, catch stability etc) as this would facilitate the understanding by the managers of these different objectives. The various performance indicators could then be also presented under each general category.

24. The TCMP **NOTED** that the Educational Tools for MSE Capacity Building, funded by an Australian grant, had been completed and added to the IOTC webpage at <https://iotc.org/educational-tools>. Several participants commented that they had problems accessing this page and asked the Secretariat to investigate this problem.

5.2 CAPACITY BUILDING INITIATIVES

25. The TCMP **NOTED** that in response to the request by the Commission in 2022 (*IOTC-2022-S26-R, Para 48*), a Capacity Building course on MSE aimed at managers has been planned for late September 2023.

5.3 CAPACITY BUILDING UNDER THE COMMON OCEANS TUNA FISHERIES PROJECT

26. The TCMP **NOTED** a presentation on a new harvest strategy outreach and education project funded by the Global Environment Facility through FAO's Common Oceans Tuna Fisheries Project. Communications materials to be produced include an e-learning course, animations, factsheets, infographics, and interactive digital tools. The TCMP were **INFORMED** that all resources will be hosted on www.harveststrategies.org, an online clearinghouse for topics related to harvest strategies and management procedures, with a focus on the tRFMOs. Materials will be produced in English, French, and Spanish. To maximize the utility of the project outputs to RFMOs, IOTC participants were **ENCOURAGED** to get involved in the project by submitting project ideas, helping to review materials via focus groups, and engaging in the project's quarterly webinar series.

27. The TCMP **NOTED** that the project aimed to have many of the tools available within a year with development continuing over the next two years. The TCMP were further **INFORMED** that e-learning courses could be provided regionally upon request.

6. STATUS OF THE MANAGEMENT PROCEDURE EVALUATION/OPERATING MODELS

6.1 SKIPJACK TUNA.

28. The TCMP **NOTED** paper IOTC-2023-TCMP06-08 which provided an update on the progress of Indian Ocean skipjack tuna MSE. The work, which has been on going since early 2019, seeks to design a full MP, noting that the current HCR of SKJ (Res 16/02) is not a full MP, which assumes that a stock assessment is available to provide input for the HCR to calculate the catch limit.

29. The TCMP **NOTED** that:

- a. MPs were tuned using the probability that $B_y > B_{40\%}$ and $E_y < E_{40\%}$ when averaged across projection years; T
- b. the terminology "Target quadrant" is used to distinguish from the Kobe quadrants that are defined using BMSY and EMSY. Three tuning criteria were used, corresponding to the probability of being in the Target quadrant of 50%, 60% and 70%. The tuning period is 11 -15 years in the projection which was requested by TCMP03 and is consistent with the bigeye tuna MP evaluation;
- c. there is a 2-year data lag.

30. The TCMP **NOTED** that the inclusion MSY-based reference points in the diagnostics is very helpful. The TCMP agreed that it is important to make the distinction and clarification between the MSY-based and depletion-based reference points (the former is for stock status quantification within the MSE framework and the latter is used for tuning). The TCMP **NOTED** that historically there had been issues with the calculation of MSY for skipjack tuna, which seemed to be related to a mistake in the specification of selectivity. Given that MSY-based reference points can now be estimated, it could be investigated and explore to use them as target and limit thresholds in the MP.

31. The TCMP **NOTED** that the proposed MP is an empirical, data-based MP based on standardised catch rates, and it has the same form (hockey stick) as the current skipjack HCR (Res 16/02) but differs in both inputs and outputs. The current HCR requires estimated stock depletion as input which needs to be provided via an external stock assessment. The developer was of the opinion that this process cannot be simulation-tested and was therefore viewed as a key weakness. On the other hand, the reference points required by the currently tested empirical MP for calculating the TAC are estimated from the OM, which can be simulation tested.

32. The TCMP **NOTED** that the input parameters a_T and a_X , the catch rates (in log scale) corresponding %10B0 and %40B0, respectively, are derived externally from the relationship between CPUE and depletion estimated from the

skipjack assessment. It is possible to tune these values in the MSE, but this may require significant additional computational resources. The TCMP further **NOTED** that the choice of these values may be more relevant if the time lag of the CPUE becomes an issue.

33. The TCMP further **NOTED** that %10B0 and %40B0 are the safety and target reference points from the current HCR that has been simulation tested.
34. The TCMP **NOTED** that the TAC output of the MP is bounded between C_{min} and C_{max} . This indicates that when the stock is healthy catches will be restricted; and when the stock is depleted catches will be permitted (through a minimum). However, it was noted that maintaining a constant catch when the biomass is below the limit will increase fishing mortality rather than decrease it, which seems contrary to what should be done. The TCMP discussed whether exploitation rate as an output might be preferred. However, converting the exploitation rate to catch would require abundance estimates from an external assessment, or a biomass dynamic model which often calculates abundance less accurately than depletion and therefore would introduce additional uncertainty.
35. The TCMP **NOTED** that when the project began in early 2019, a model-based MP utilizing a biomass dynamic model (BDM) was initially considered and performed well. However, the BDM did poorly when the CPUE was later updated and revised (mostly because the contrast between catch and CPUE, which is the signal needed for a biomass dynamic model, is lacking). As a result, the current work is focusing on the data-based MP. The TCMP **NOTED** that a new CPUE index will be produced this year and requested the developer to investigate the viability and effectiveness of any potential model-based MP based on the new CPUE as id done with several other MSEs in IOTC.
36. The TCMP **NOTED** that four implementation error values were tested, corresponding to a positive overcatch of 10%, 20%, 30% and 40%. The TCMP **NOTED** the implementation error was not included in the tuning process but examined in the projection as robustness trials. The TCMP **NOTED** that the actual difference between catch and current TAC (about 20-30%) can be used to determine a reasonable bound for the implementation error.
37. The TCMP **NOTED** that the skipjack tuna population trend is impacted by rapid environmental variability and that there is some evidence linking recruitment variability to ocean productivity. The TCMP suggested that future MSE research consider scenarios that include environmental effect as part of robustness trials.
38. The TCMP **NOTED** that the output catch is on a scale similar to spawning biomass. This is because mature fish are one year and older (>50 cm?) whereas much smaller fish are caught in the fishery. The TCMP suggested that future figures for the summary of performance also include total biomass.
39. The TCMP **NOTED** that the MP testing included a maximum change of 15% in TAC setting, and further **NOTED** that it would be useful to consult with CPCs when discussing what is the appropriate level of the TAC change in light of that the catch for skipjack is quite variable. The TCMP **AGREED** to consider four scenarios for the maximum TAC change: (1) a symmetric 15% (2) a symmetric 25% (3) asymmetric 25% (upward) and 15% (downward) (4) asymmetric 15% (upward) and 10% (downward). The TCMP also **AGREED** to consider stability clauses that are disabled when biomass falls below certain safety values (e.g. Blim).

6.2 SWORDFISH

40. The TCMP **NOTED** paper IOTC-2023-TCMP06-09 which provided information on an Indian Ocean Swordfish Management Procedure.
41. The TCMP **NOTED** the significant progress made in the SWO MSE and the work is now at an advanced stage where the consideration for its adoption might be possible. The TCMP **NOTED** that the MSE explored both a data-based and a model-based MPs and compared in great detail each one's performance and trade-off in terms of stock biomass, catch, and stability.
42. The TCMP **NOTED** the different catch trends produced by the model-based and data-based MP. The main cause of the difference is due to the current stock status being quite far above the target (B_{msy}), and the two types of MP are setting TAC very differently in this situation (the changes by the data-based rule are more incremental, where

- as the model-based rule has less constraint and is able to set high initial catches).
43. The TCMP **NOTED** that the reactivity parameters, namely the slope and distance (to target) factors, are what largely determine how the data-based MP behaves. The effectiveness and trade-off of various parameterizations of these factors have been extensively explored and it has been demonstrated that faster reactivity configuration is predicted to result in behaviour that is closer to the model-based MP.
44. The merits of catch-based or F-based output were further discussed by the TCMP. The TCMP **NOTED** that F-based rules are in fact fairly common in many fisheries (such as ICES). F-based rules, however, assume that the model would be able to accurately estimate stock size. Further, the TCMP **NOTED** that the catch histories or TAC typically contain a wealth of information on stock productivity, and their usefulness to guide future TAC setting is often undervalued.
45. The TCMP **NOTED** that the MPs are tuned under three criteria corresponding to the probability of being in the Kobe quadrant of 50%, 60% and 70% in 2034-2038. The TCMP **NOTED** that several MSE experiences indicate that use of a 50% probability can lead to subpar stock performance immediately after the tuning period, and therefore suggested that only the tuning criteria of 60% and 70% be considered. The TCMP further suggested the work focus on just one type of MP to free up more time (i.e., the model-based MP which provides better catch stability stock status).
46. The TCMP **ENCOURAGED** the developer to consider MSY-based target and limit points in the MP. It was highlighted that while the MSY-based target is usually more aggressive than the depletion-based target (i.e., 40%B0), this doesn't guarantee that it will perform better as the tradeoff amongst management objectives needs to be taken into considerations. Usually, 40% B0 is a proxy for MSY but this is not the case of swordfish.
47. The TCMP suggested the following maximum change in TAC setting be included in the MP testing for swordfish (1) symmetric 15% change (2) symmetric 10% change (3) asymmetric change of 15% (upward) and 10% (downward). The TCMP again **REQUESTED** to consider stability clauses that are disabled when biomass falls below certain safety values (e.g. Blim).
48. The TCMP **NOTED** that the data-based MP considered for skipjack and swordfish MSE are considerably different. The slope-based data MP for swordfish has a long history in IOTC whereas the hockey-stick data MP tested for skipjack is a novelty. The TCMP **AGREED** that using similar MP or a common approach will help the managers to better understand the MSE process. However, the consideration of MP should also take into account the differences in biological characteristics of species resulting in different approaches being more appropriate for some species. TCMP suggested that consistency would be preferable in MP design, but it may also be species specific when appropriate.
- ### 6.3 ALBACORE TUNA
49. The TCMP **NOTED** paper IOTC-2023-TCMP06-10 which provided an update on the progress made with the albacore MSE process.
50. The TCMP **NOTED** that the next steps for the albacore MSE is the presentation of the continued work on the OM to the WPM where the technical aspects will be discussed in more detail. Based on these technical discussions, the developers will continue to make improvements to the MSE before presenting it to the TCMP next year.
51. The TCMP **NOTED** that the MP evaluation toolset is the same as for the swordfish MP and include both a JABBA surplus production MP and a CPUE-based MP. The TCMP **NOTED** that using a framework of Bayesian surplus production is a new approach to OM conditioning which is being trialed for the albacore tuna MP. The TCMP **NOTED** that the surplus production-based models appear to be much better at estimating depletion than CPUE-based models but that currently the OM is based on MSY and is used to compute depletion. This is thought to be a promising approach for improving the IOTC MSE work.
52. The TCMP discussed and **AGREED** that there was no need to continuously recondition an operating model, unless

the most recent stock assessment showed that the stock currently falls outside the range of plausible scenarios estimated within the MSE.

53. The TCMP **NOTED** the need to be aware of the danger of trying to overfit the model and further **NOTED** that the developers try to avoid this by keeping the OM structure as simple as possible and by using cross-validating performance diagnostics. The TCMP **NOTED** that this cross-validation takes a long time so running the model using this approach can be quite slow.
54. The TCMP **NOTED** that there were significantly differing scientific views on the use of MSY and depletion-based reference points and approaches in MSE testing and MP development (in general across species) and noted some of the technical challenges and uncertainties associated with estimating MSY. The TCMP **REQUESTED** that the WPM(MSE) continue to discuss and consider this issue in the further progression of its work. The TCMP also noted CPCs views both for and against the idea of seeking that future MSE testing of MPs for each species should explore utilization of multiple operating models approaches.
55. However, the TCMP **NOTED** that using two different sets of reference points across different MPs could lead to confusion for managers and the TCMP were not able to agree on which would be most suitable, so the TCMP **REQUESTED** that the WPM(MSE) continue to discuss the use of the two reference points for the outputs of the MPs for all species.

6.4 YELLOWFIN TUNA

56. The TCMP **NOTED** that the MSE process has been put on hold for yellowfin tuna as the stock assessment is currently undergoing a peer review. A peer review workshop was held in February this year with a range of experts who reviewed the outcomes of the last stock assessment from 2021 as well as the data inputs and the assumptions used in the assessment. The TCMP **NOTED** that the report from this workshop has not yet been finalised, but it will be presented to the WPTT for thorough discussion. The outcomes of both discussions will then be presented to the SC and any critical points for improvement will be incorporated into the stock assessment.
57. The TCMP **NOTED** that while there is the option to use the stock assessment as a basis for the OM, an attempt has been made to condition the OM for yellowfin using the alternative approach (Approximate Bayesian Computation; ABC) already presented for albacore and preliminary results look promising.

6.5 GENERAL ISSUES

6.5.1 EXCEPTIONAL CIRCUMSTANCES

58. The TCMP **RECALLED** that exceptional circumstances have been defined in the context of the IOTC MSE as “circumstances when overriding of the recommended TAC from an MP should be considered”, including substantial changes about the biology and dynamics of the stock, changes in fisheries or fishing operations, changes to the input data to the MP or missing data, and inconsistent implementation of the MP advice.
59. The TCMP further **RECALLED** that the three-stage process dealing with exceptional circumstances consists of (i) determining whether exceptional circumstances exist, (ii) determining the severity and impact of the exceptional circumstances on achieving the objectives of the MP, and (iii) if necessary, identifying the research or management actions that could be taken by the IOTC.
60. The TCMP **NOTED** that the guidelines for the provision of exceptional circumstances for IOTC species MPs are available from Appendix 6A of IOTC-2021-SC24-R_Rev1 and **AGREED** to continue with this approach for future MP development and implementation. The management actions by the Commission have yet to be specified.
61. The TCMP **NOTED** that exceptional circumstances in relation to catch exceeding the MP recommended TAC for bigeye tuna will be considered from 2024 when the first TAC is implemented.
62. The TCMP **NOTED** that although some robustness tests performed as part of the MSE may show that the MP performance is not affected by a 10 percent implementation error in the TAC, any catch level above the TAC will be

defined as a case of exceptional circumstance and trigger a review by the SC who will provide advice to the Commission on any actions that may be required.

63. The TCMP further **NOTED** that the action of triggering exceptional circumstances provides transparency on Commission decisions on MP recommended TACs.

6.5.2 MP IMPLEMENTATION, ACTIONS AND REGULAR IMPLEMENTATION REVIEW

64. The TCMP **NOTED** the implementation schedule of the MSE for bigeye tuna throughout the period 2022-2029 and the main contents of the Terms of Reference (TORs) for a consultancy on a peer-review of the bigeye tuna MSE which was endorsed by the SC in 2021. The TCMP **NOTED** that an expert has been identified and contacted and that the contract is expected to start in the second semester of 2023 for the report to be presented at the next sessions of the WPM and WPTT.

65. The TCMP **NOTED** that the TORs of the review make reference to the evaluation of the candidate MPs while an MP has been selected for bigeye tuna by the Commission as defined in IOTC Res. 22/03. The TCMP **ACKNOWLEDGED** the interest to review all candidate MPs that were tested as some of them could be considered in future rounds of the MSE.

66. The TCMP **QUERIED** on the need to perform a review in 2023, not even one year after the MP has been implemented and when Res. 22/03 specifically includes a reference to a performance review of the MP to be conducted in 2030. The TCMP **NOTED** that the review process planned for 2023 aims to review the technical aspects of the MSE development including reviewing the OM, the HCRs, robustness scenarios and performance of the MPs against the performance metrics in order to provide advice on the adequacy of communication of MSE results, the trade-offs between various management procedures, and the ranking of management procedures as well as advice and future recommendations for the next bigeye MSE analysis. The review planned for 2030 corresponds to a performance review that would follow five years of MP implementation and aims to assess the potential need for reconditioning the OMs, retuning the existing MP, consideration of alternate candidate MPs and a new full MSE.

7. ACTION REQUIRED FOR RESOLUTION 22/03 ON A MANAGEMENT PROCEDURE FOR BIGEYE TUNA

67. The TCMP **NOTED** a presentation by the SC Chair on the running of the BET MP as required by the Res 22/03. The TCMP **NOTED** that the application of the bigeye management procedure resulted in a recommended TAC of 80,583 t per year for 2024 and 2025, which is limited to a maximum of 15% catch reduction from the 2021 catch level as per the BET MP provisions. The TCMP **ENDORSED** the calculated TAC for 2024 and 2025.

68. The TCMP **NOTED** that the SC had taken into consideration the provisions for exceptional circumstances for the Bigeye Tuna MP in 2022 and that this was discussed extensively at both the meetings of the WPM and WPTT. The evidence reviewed included new biological parameters and fishery operations, input data, and a comparison of the estimated population trend in the assessment with operating models.

69. The TCMP **NOTED** that the review of evidence for exceptional circumstances did not identify any reasons to change the advice on the TAC.

70. The TCMP **NOTED** that when presenting the parameters of the MP, sufficient decimal places should be provided to facilitate replication of the TAC estimations.

8. FUTURE DIRECTION OF THE TECHNICAL COMMITTEE ON MANAGEMENT PROCEDURES

8.1 WORKPLAN

8.1.1 New timelines

71. The TCMP **NOTED** that the current timeline agreed for MP development only runs until 2024. In addition, there have been delays in the development of MPs for YFT and ALB and advancement in that for SWO. As such the TCMP **AGREED** that a revision of the current timeline is required.

72.The TCMP **REQUESTED** that the SC via its WPM review the current timeline and provide an update to the TCMP in 2024 for endorsement.

8.1.2 Budget and resources needed for technical developments

73.The TCMP **ACKNOWLEDGED** the importance of extra-budgetary contributions from the European Union and Australia in accelerating the MSE work since 2016 as well as the ongoing resources provided through the IOTC main budget.

8.1.3 External review

74.The TCMP **NOTED** an update provided by the Secretariat on the process to contract a consultant to conduct the BET MP peer review. The Terms of Reference for the peer review are provided in document [IOTC-2021-SC24-INF06](#). The TCMP **NOTED** these terms of reference were endorsed by the SC in 2021. The Secretariat stated that an expert had been identified and the process of developing a contract had begun with an aim to have the expert review presented to the WPTT in 2023.

8.2 PRIORITIES

75.The TCMP **NOTED** that simultaneous work is being conducted on several species and that prioritising one species over another is difficult. The TCMP **ACKNOWLEDGED** that both the skipjack and swordfish MPs are close to completion and consideration by the SC, TCMP and Commission. There is a great deal of interest in the completion of the yellowfin tuna and albacore MSE as well.

8.3 PROCESS AND FUTURE MEETINGS OF TCMP

76.The TCMP **NOTED** that the presentations provided to the TCMP in 2023 were highly technical and **RECALLED** that the purpose of the TCMP is to facilitate improved dialogue between scientists and managers for the advancement of MP development and adoption. However, the importance for managers to have a better understanding of the MSE in order to relieve scientists of the responsibility of making choices with managerial implications was also highlighted.

77.The TCMP **REQUESTED** that the developers should reduce the technical details in their presentations to the TCMP and limit these details to the appropriate forums such as the WPM(MSE).

78.The TCMP **REQUESTED** that the Commission, at S27, consider ways to further improve the TCMP functioning.

79.The TCMP **NOTED** the recommendation by the SC that it is advisable to have focused dialogue with managers on those MSEs which are more advanced such as that for SKJ and SWO. The TCMP therefore **RECOMMENDED** that a virtual TCMP is convened early in 2024 with a special focus on the MSEs for SKJ and SWO and that it be held back-to-back with the WPM(MSE) meeting.

9. ADOPTION OF REPORT

80.The Meeting was closed by the chair who informed the participants that the report would be adopted by correspondence.

APPENDIX I
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APPENDIX II
AGENDA FOR 6TH IOTC TECHNICAL COMMITTEE ON MANAGEMENT PROCEDURE

Date: 5-6 May 2023

Location: InterContinental Mauritius Resort Balaclava, Mauritius (Hybrid)

Co-Chairs: Ms. Riley Kim Jung-re (Commission Chair) and Dr. Toshihide Kitakado (SC Chair)

- 1. OPENING OF THE SESSION AND ARRANGEMENTS (Co-Chairs)**
- 2. ADOPTION OF THE AGENDA AND ARRANGEMENTS FOR THE SESSION (Co-Chairs)**
- 3. ADMISSION OF OBSERVERS (Co-Chairs)**
- 4. DECISIONS OF THE COMMISSION RELATED TO THE WORK OF THE TECHNICAL COMMITTEE ON MANAGEMENT PROCEDURES (IOTC Secretariat)**
 - 4.1 Resolution 16/09 – Terms of Reference
 - 4.2 Outcomes of the 5th Session of TCMP
 - 4.3 Outcomes of the 26th Session of the Commission
 - 4.4 Outcomes of the 25th Session of the Scientific Committee
- 5. INTRODUCTION TO MSE**
 - 5.1 Management Procedures and MSE
 - 5.1.1 Basic principles, Roles and responsibilities, dialogue tools and feedback mechanism
 - 5.2 Capacity Building Initiatives
 - 5.3 Capacity Building Under the Common Oceans Tuna Fisheries Project
- 6. STATUS OF THE MANAGEMENT STRATEGY EVALUATION/OPERATING MODELS AND ACTIONS NEEDED FOR ADOPTION (Developers)**
 - 6.1 Skipjack tuna (Charlie Edwards)
 - 6.2 Swordfish (Thomas Brunel)
 - 6.3 Albacore tuna (Iago Mosqueira)
 - 6.4 Yellowfin tunas (Rich Hillary)
 - 6.5 General Issues
 - 6.5.1 Exceptional circumstances
 - 6.5.2 MP implementation, actions and regular implementation review
- 7. ACTION REQUIRED FOR RESOLUTION 22/03 *On a Management Procedure for bigeye tuna***
- 8. FUTURE DIRECTION OF THE TECHNICAL COMMITTEE ON MANAGEMENT PROCEDURES (Co-Chairs)**
 - 8.1 Workplan
 - 8.1.1 New timelines
 - 8.1.2 Budget and resources needed for technical developments
 - 8.1.3 External review
 - 8.2 Priorities
 - 8.3 Process and future meetings of TCMP
- 9. ADOPTION OF REPORT (Co-chairs)**

APPENDIX III
LIST OF DOCUMENTS

Document	Title
IOTC-2023- TCMP06-01a	Draft: Agenda of the 6 th Technical Committee on Management Procedure Meeting
IOTC-2023- TCMP06-01b	Draft: Annotated agenda of the 6 th Technical Committee on Management Procedure Meeting
IOTC-2023- TCMP06-02	Draft: List of documents of the 6 th Technical Committee on Management Procedure Meeting
IOTC-2023- TCMP06-03	Outcomes of the 5 th Technical Committee On Management Procedure
IOTC-2023- TCMP06-04	Outcomes of the 26 th Session of the Commission
IOTC-2023- TCMP06-05	Outcomes of the 25 th Session of the Scientific Committee
IOTC-2023- TCMP06-06	Resolution 16/09 ON ESTABLISHING A TECHNICAL COMMITTEE ON MANAGEMENT PROCEDURES
IOTC-2023- TCMP06-07	Resolution 22/03 ON A MANAGEMENT PROCEDURE FOR BIGEYE TUNA IN THE IOTC AREA OF COMPETENCE
IOTC-2023- TCMP06-08	Candidate empirical MPs for Indian Ocean skipjack tuna (Edwards C)
IOTC-2023- TCMP06-09	IOTC Swordfish Management Strategy Evaluation Update (Brunel T, Mosqueira I)
IOTC-2023- TCMP06-10	Updates on development of MSE analyses for Indian Ocean albacore tuna (Mosqueira I, Hillary R)