Report of the 2nd IOTC Technical Committee on Management Procedures

Bangkok, Thailand, 18–19 May 2018

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Food and Agriculture Organization of the United Nations

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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
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 Indian Ocean Tuna Commission has established a dedicated Technical Committee of Management Procedures (TCMP) as a formal communication channel between science and management to enhance decision-making response of the commission in relation to Management Procedures (MPs). The second session of the TCMP of the Indian Ocean Tuna Commission was held in Bangkok, Thailand May 18–19, 2018. The TCMP provided a forum for identifying and evaluating Management Procedures for key IOTC species, including standardising the presentation of Management Strategy Evaluation (MSE) results to facilitate the exchange of information and views between fishery scientists and managers, and discussions on elements of Management Procedures that require a decision by the Commission.

- The TCMP **AGREED** that the definition of stock status is a complex issue and **RECOMMENDED** discussions on potential refinements to the KOBE plots and definitions of "overfished" and "overfishing" in relation to target and limit reference points to be conducted in collaboration with other t-RFMO, ideally through the KOBE process. The TCMP **RECOMMENDED** that this issue is also discussed within the SC.
- The TCMP **RECOMMENDED** that the longline CPUE data be available and joint standardization be conducted in the future to support the MP (CPUE-based and model based) for different stocks on which these data are critical (ALB, BET, YFT, SWO).
- For Albacore tuna, the TCMP **RECOMMENDED** that the MSE continue to investigate the technical issues identified during discussions.
- For Yellowfin tuna, the TCMP **RECOMMENDED** that the MSE retain tuning objective TY 5, as well as examine a number of alternative simulation/projection timeframe (to rebuilding targets at 2024, 2029 and 2034).
- The TCMP **RECOMMENDED** a revised set of tuning objectives based on TB2, TB3, TB4 that is calculated over 2030-2034.
- The TCMP **RECOMMENDED** that Commission considers reviewing the budget for 2019 adopted by SCAF to include the work of MSE provided that total budget approved by SCAF is not increased.
- The TCMP **RECOMMENDED** that SC identify the budget related to the progress on MP/MSE work for all species in its report so as SCAF can review to include in Commission regular budget to complete the workplan on MSE agreed by the Commission in 2017.

1. OPENING OF THE SESSION AND ARRANGEMENT

1. The second Technical Committee on Management Procedures meeting was held on the 18–19 May 2018, in Bangkok, Thailand.

2. Ms. Riley Jung-re Kim, the acting Chair of the IOTC, and Dr. Hilario Murua, the Chair of the Scientific Committee, opened the meeting and welcomed attendees. Dr. Hilario Murua 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 facilitated by Dr. Graham Pilling (SPC), who welcomed 76 delegates from 24 Contracting Parties of the Commission, 6 delegates from 2 Cooperating Non-Contracting Party and 4 Observers (including one 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 SC 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[1] and associated workplan agreed by the Commission.

5. The TCMP **NOTED** that in response to the request from the TCMP01, the agenda included a science related capacity building component which is designed to help delegates to improve their understanding of elements of MSE through a demonstration tool.

6. FRANCE-OT **NOTED** with concern that the information documents for TCMP were not translated to French and requested that for the next IOTC meetings measures are taken to translate all the papers to French. The Secretariat took due notice of this request and has **AGREED** to have the translations for future meetings. The statement is provided in Appendix VI.

7. 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

8. 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 (2014).

3.1. INTERGOVERNMENTAL ORGANISATIONS (IGO)

9. In accordance with Rule VI.1 and XIV.4 of the IOTC Rules of Procedure (2014), the TCMP **ADMITTED** the following Inter-governmental organisations (IGO) as observers to the 2nd Session of the TCMP.

   - Food and Agriculture Organization of the United Nations (FAO)

3.2. MEMBERS AND ASSOCIATE MEMBERS OF THE ORGANIZATION THAT ARE NOT MEMBERS OF THE COMMISSION

10. In accordance with Rule VI.2 and XIV.4 of the IOTC Rules of Procedure (2014), the TCMP **ADMITTED** the following Members and associated members of the organization that are not members of the commission as observers to the 2st Session of the TCMP

    - United States Of America

3.3. NON-GOVERNMENTAL ORGANISATIONS (NGO)

11. In accordance with Rule VI.1 and XIV.5 of the IOTC Rules of Procedure (2014), the TCMP **ADMITTED** the following Non-governmental organisations (NGO) as observers to the 1st Session of the TCMP.

    - International Seafood Sustainability Foundation (ISSF)
    - International Pole and Line Foundation (IPNLF)

[1] Resolution 15/10 *On Target and Limit Reference Points and a Decision Framework*

3.4. INVITED EXPERTS

12. In accordance with Rules VI.1 and XIV.9 of the IOTC Rules of Procedure (2014), 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 1st Session of the TCMP.

    - Taiwan, Province of China

4. DECISION OF THE COMMISSION RELATED TO THE WORK OF THE TECHNICAL COMMITTEE OF MANAGEMENT PROCEDURES

4.1. Resolution 16/09 – Terms of Reference

13. The TCMP **NOTED** paper IOTC–2018–TCMP02–INF03 which outlined the objectives, tasks and priorities of the Technical Committee on Management Procedures as established by the Commission through Resolution 16/09[2]. This Resolution calls for the TCMP to focus on the presentation of results and exchange of information, and to emphasize the aspects of the MSE process that require a decision by the Commission, when undertaking the evaluation and discussion of management procedures for the IOTC fisheries.

4.2. Outcomes of the 1st Technical Committee on Management Procedure

14. The TCMP **NOTED** paper IOTC–2018–TCMP02–INF04 which summarised the main outcomes of the 1st Technical Committee on Management Procedure. TCMP01 agreed on a preliminary set of tuning objectives on *albacore, yellowfin and bigeye* based on IOTC resolutions, which has been used in the current iteration of Management Procedure Evaluation for these species. The Chair Report of the 1st TCMP provided the recommendations as below:

    - *The TCMP01 RECOMMENDED that the WPDCS become involved in the MSE process through the design and evaluation of improved data collection systems to assist the implementation of MPs through the provision of good quality data.*
    - *The TCMP01 RECOMMENDED that the Commission considers establishing a procedure for implementing the results of application of the HCR contained in Resolution 16/02 as soon as the catch limit is estimated by the SC.*
    - *The TCMP01 RECOMMENDED that more science-related capacity building activities are conducted in future, especially to cover the concepts linked with the evaluation of MPs through MSE.*
    - *THE TCMP01 RECOMMENDED THAT A BUDGET IS DEVELOPED AND EXTRA-BUDGETARY FUNDING IS SOUGHT.*
    - *The TCMP01 RECOMMENDED that the Commission consider the duration of the TCMP session in 2018 relative to the other activities of the Commission. More than one day would help to improve the science-management communication.*

4.3. Outcomes of the 21st Session of the Commission

15. The TCMP **NOTED** paper IOTC–2018–TCMP02–INF05 which outlined the main outcomes of previous sessions 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,.

4.4. Outcomes of the 20th Session of the Scientific Committee

16. The TCMP **NOTED** paper IOTC–2018– TCMP02–INF06 which outlined the main outcomes of 20th Sessions of the Scientific Committee that specifically related to the work of the TCMP.

[2] Resolution 16/09 *On establishing a Technical Committee on Management Procedures*

5. OVERVIEW OF THE EVALUATION OF MANAGEMENT PROCEDURE IN THE IOTC

5.1. The IOTC process on adoption of management procedures (Including the Resolution 15/10 on a Management Framework)

17. The Chair of the SC provided a review of the Management Procedures process in IOTC as well as different resolutions adopted by IOTC in relation to Management Procedures.

5.2. Management Procedures and Management Strategy Evaluation

5.2.1. Basic principles

18. The TCMP **NOTED** that the presentations where the timeline of actions to date, the basic principles and concepts of MSE were described in detail including the objectives, timeframes, and probabilities, and the presentation for MSE results.

19. TCMP **NOTED** the complexity of the issues discussed and **AGREED** that this review helped the TCMP to clarify the key issues in the Management Strategy Evaluation (MSE) process, and to guide the selection of the best performing Management Procedure (MP) for IOTC stocks.

20. The TCMP **NOTED** that data accuracy and data quality used in the assessment and simulation testing is key for MSE, and thus **REQUESTED** IOTC Commission and CPCs to improve data monitoring programs and data collection and reporting to IOTC. The TCMP **NOTED** that the key data elements which the MPs depend upon are species specific and that the basic fishery data for ALB, YFT, BET and SWO are considered relatively reliable. However, the TCMP **AGREED** that fundamental issues regarding data collection and reporting remain for many other IOTC species and that the uncertainty of data quality should be incorporated into the MP evaluation, where relevant.

21. The TCMP **NOTED** that abundance indicators include the joint (JPN, KOR, China-Taiwan, and others) longline CPUE data. These data are critically important for the development of the MPs and the SC has recommended that such joint analyses continue in support of MPs.

22. The TCMP **AGREED** that MSE is an iterative process, requiring feedback to be undertaken in each step. The TCMP **AGREED** that the commission needs to provide advice on management objectives to assist the tuning process and to decide on the specifics of the risks and probabilities of achieving management objectives.

23. The TCMP **NOTED** the importance of establishing a mechanism for identifying exceptional circumstances that are outside the conditions under which the MP was tested. The TCMP **AGREED** that circumstances outside the range of simulation tests for the selected MP should be identified and noted.

5.3. SC proposal for the standard presentation of MSE results

24. The TCMP **NOTED** that further development and revisions were made on the standard format for presenting the MSE results. The TCMP **AGREED** that consistent communication of MSE results through standardised terminology and presentation formats is effective to help decision makers to better understand the likely performance of different MPs or harvest control rules (HCR) against management objectives.

6. WORKSHOP – DEMONSTRATION OF MANAGEMENT PROCEDURE EVALUATION TOOL

25. Dr. Graham Pilling provided a web based MSE tutorial which is designed to introduce the key elements of HCR and MSE. The TCMP **NOTED** that this capacity building exercise helps commissioners and managers-advisors to better understand the process of MSE.

7. STATUS OF THE MANAGEMENT PROCEDURE EVALUATION/OPERATING MODEL

7.1. Albacore tuna

26. The TCMP **NOTED** that the current status of work of MSE for the albacore stock was presented. These results compared the performance of various MPs when tuned for objectives agreed in TCMP01 (Appendix V).

27. The TCMP **NOTED** that the implementation lag tested for this stock is two years but in reality it reaches 3 years because the assessment of this stock is carried out early in the year and usually the data for the last year is not available.

28. The TCMP **NOTED** that the performance of MPs is driven more by the tuning objectives than by the functional form of the MP (CPUE-based and model based).

29. The TCMP **NOTED** that some MPs were not achieving the specified tuning objectives and this needs to be further analyzed.

30. The TCMP **NOTED** that the MSE has examined CPUE-based and model-based MPs, with additional assumptions, including 3 year TAC setting, 15% TAC change constraint and a 2 year implementation lag, and tuning objectives following those agreed in TCMP01. The TCMP **REQUESTED** that future analyses assume the current 3 year implementation lag.

7.2. Yellowfin tuna

31. The TCMP **NOTED** that the operating model will be reviewed by the WPTT, WPM and SC in 2018.

32. The TCMP **NOTED** that the MSE has examined CPUE-based and model-based MPs, with additional assumptions, including 3 year TAC setting, 15% TAC change constraint and a 2 year implementation lag, and tuning objectives following those agreed in TCMP01 (Appendix V). The TCMP **AGREED** that the two year implementation lag of the MSE framework is feasible. The TCMP **NOTED** that a 25% TAC change constraint was necessary to reach the most aggressive tuning level

33. The TCMP **NOTED** the strong correlations amongst many performance indicators and the high variability due to uncertainty incorporated in the operating model. The TCMP **NOTED** that the tuning level is more important than the MP-Class (CPUE-based and model based) in determining the performance measures and the tuning levels examined covered a broad range of trade-off space.

34. The TCMP **RECALLED** the tuning objectives are based on Resolution 15/10.

7.3. Bigeye tuna

35. The TCMP **NOTED** progress on the BET MSE and that the current funding of this project expires in December 2018.

36. The TCMP **NOTED** that the operating model has been re-conditioned to the last stock assessment which will be reviewed by the WPTT, WPM and SC in 2018.

37. The TCMP **NOTED** that the MSE has examined CPUE-based and model-based MPs, with additional assumptions, including 3 year TAC setting, 15% TAC change constraint and a 2-year implementation lag, and tuning objectives following those agreed in TCMP01 (Appendix V). The TCMP **AGREED** that the two-year implementation lag of the MSE framework is feasible. The TCMP **NOTED** that a 25% TAC change constraint was necessary to reach the least conservative (TB1) tuning level.

38. The TCMP **NOTED** the correlations amongst many performance indicators, e.g., the negative correlation between the conservation and catch performance, that the tuning level is more important than the MP-Class in determining the performance measures.

39. The TCMP **NOTED** that the majority of tuning objectives led to the stock below SB(MSY) at the end of the simulation period because the current state is well above SB(MSY) and to achieve an average across the 20 years these tuning objectives required depleting the stock to well below SB(MSY) by the end of the projection period. Also, the catches required to achieve the tuning objectives were above the recent observed catch. An additional, more conservative tuning level was added in which catches were consistent with recent catches, which did not cause stock decline in the last years of the simulation. The TCMP **AGREED** that the management objective and performance measures may need to be dependent on the condition of the stock. The TCMP discussed options of preventing the stock to falling below SB(MSY) including alternative tuning objectives and associated performance statistics.

7.4. Skipjack tuna

40. The TCMP **NOTED** that the Scientific Committed calculated the overall Skipjack catch limit for Indian Ocean, based on the Harvest Control Rule as specified through Resolution 16/02. The Secretariat has informed the CPCs of the catch limit to be implemented for 2018–2020.

41. The TCMP **RECALLED** that the Resolution 16/02 requested the HCR, be reviewed through MSE no later than 2021.

42. The TCMP **NOTED** that the HCR is not a full MP, because the data and form of assessment are not pre-specified and simulation-tested and, therefore, further refinement of the HCR to move towards a full MP is desired in the future.

7.5. Swordfish

43. TCMP **NOTED** the MSE work on Swordfish started in 2017 under the supervision of Working Party on Methods, in accordance with the MSE work program endorsed at the 21st of the Commission, and is carried out by EC JRC in collaboration with IPMA and IOTC Secretariat. TCMP **NOTED** the MSE is currently at the initial phase of operating model development and condition, based on the latest stock assessment.

8. DISCUSSION OF THE ACTIONS NEEDED FOR NEXT ITERATION OF MANAGEMENT PROCEDURE DEVELOPMENT

44. The TCMP **NOTED** the request by the Commission and Recommendation by WPTT to discuss options to report stock status against limit reference points.

45. The TCMP **AGREED** that the definition of status is a complex issue and **RECOMMENDED** discussions on potential refinements to the KOBE plots and definitions of "overfished" and "overfishing" in relation to target and limit reference points to be conducted in collaboration with other t-RFMO, ideally through the KOBE process.

46. The TCMP **RECOMMENDED** that this issue is also discussed within the SC.

47. The TCMP **RECOMMENDED** that the longline CPUE data be available and joint standardization be conducted in the future to support the MP (CPUE-based and model based) for different stocks on which these data are critical (ALB, BET, YFT, SWO).

8.1. Albacore tuna

48. The TCMP **RECOMMENDED** that this MSE continue to investigate the technical issues identified during discussions.

8.2. Yellowfin

49. The TCMP **RECOMMENDED** to retain tuning objective TY 5, as well as to examine a number of alternative simulation/projection timeframe (to rebuilding targets at 2024, 2029 and 2034). The TCMP also AGREED to also investigate alternative TAC constraints.

8.3. Bigeye tuna

50. TCMP **NOTED** that simulations currently assume fixed allocation between fisheries based on recent catches. The TCMP **NOTED** that the MSE simulation could evaluate alternative scenarios that accounts for changes in fishery catch proportion (small vs big fish).

51. The TCMP **NOTED** that robustness scenarios could be explored where the fleets do not fully take the TAC (i.e. recent catches have been declining but the reason is unknown).

52. The TCMP **NOTED** that an MP (CPUE-based and model based) that increases TAC in the first few years and to reduce it later is not ideal for the fishing industry.

53. The TCMP **RECOMMENDED** a revised set of tuning objectives based on TB2, TB3, TB4 that is calculated over 2030-2034.

9. FUTURE DIRECTION OF THE TECHNICAL COMMITTEE ON MANAGEMENT PROCEDURES

9.1. WORK PLAN (Including new timelines/budget and resources needed)

54. TCMP **NOTED** that swordfish has been identified as a priority issue by the commissions and **AGREED** that additional resources (including staff time) would be needed in terms of funds and human resources for the work to progress according to the agreed schedule of work.

55. The TCMP **NOTED** the need for financial resources to review the skipjack MSE by 2021 as required by Resolution 16/02.

56. The TCMP **NOTED** that the ABNJ Common Oceans Tuna project has been extended and can continue its support to CSIRO on Management Procedure Development for YFT and BET through to June 2019, and will also continue to support the TCMP, and equivalent groups in other t-RFMOs, over the same period.

57. The TCMP **THANKED** FAO-ABNJ, EU and CSIRO for continuing to support the YFT, BET and ALB MSE work through to 2019.

58. TCMP **NOTED** the Commission commitment to the schedule of work for the implementation of management procedures operational and **REQUESTED** the Commission consider a budget allocation for this work.

59. The TCMP **NOTED** that the budget for progressing the work on MSE agreed by the Commission is not secured. Thus, the TCMP **RECOMMENDED** that Commission considers reviewing the budget for 2019 adopted by SCAF to include the work of MSE provided that total budget approved by SCAF is not increased.

60. Moreover, The TCMP **RECOMMENDED** that SC identify the budget related to the progress on MP/MSE work for all species in its report so as SCAF can review to include in Commission regular budget to complete the workplan on MSE agreed by the Commission in 2017.

61. The TCMP **NOTED** that some parties indicated supplemental funding may be available to support the MSE work identified under the schedule of work.

9.2. PROCESS AND FUTURE MEETINGS OF TCMP

62. The TCMP **AGREED** to maintain the current format of TCMP of two days including science related capacity building issues.

63. The TCMP **NOTED** that its mandate includes the exchange of information necessary for the Commission to consider possible adoption of management procedures

APPENDIX I
LIST OF PARTICIPANTS

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APPENDIX II
AGENDA FOR 1ST IOTC TECHNICAL COMMITTEE ON MANAGEMENT PROCEDURE

Date: 18–19 May 2018
Location: Bangkok
Venue: Hotel Windsor Suites & Convention, Bangkok, Thailand
Time: 09:00 – 17:00
Co-Chairs: Ms. Jung-re Riley Kim (Commission Chair); Hilario Murua (SC Chair)
Facilitator: Graham Pilling

1. **OPENING OF THE SESSION AND ARRANGEMENTS** (Co-Chairs)
2. **ADOPTION OF THE AGENDA AND ARRANGEMENTS FOR THE SESSION (**Chairperson**)**
3. **ADMISSION OF OBSERVERS**
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 1st Session of TCMP
   - 4.3. Outcomes of the of the 21st Session of the Commission
   - 4.4. Outcomes of the 20th Session of the Scientific Committee

5. **OVERVIEW OF THE EVALUATION OF MANAGEMENT PROCEDURES IN THE IOTC** (SC hairperson)
   - 5.1. The IOTC Process on adoption of management procedures (Including the Resolution 15/10 of the Management Framework) (SC Chair).
   - 5.2. Management Procedures and MSE:
     - 5.2.1. Basic principles
     - 5.2.2. Roles and responsibilities, dialogue tools and feedback mechanism
   - 5.3. SC proposal for the standard presentation of MSE results

6. **HANDS-ON WORKSHOP – DEMONSTRATION OF MSE TOOL (Facilitator)**
   - 6.1. Demonstration of MSE tool
   - 6.2. How to test different options on key inputs
   - 6.3. HCR – MP creation
   - 6.4. Discussion on trade-offs

7. **STATUS OF THE MANAGEMENT PROCEDURE EVALUATION/OPERATING MODELS (**Chairperson of WPM**)**
   - 7.1. Albacore tuna (Iago Mosqueira, Vice-Chairperson of the WPM).
   - 7.2. Bigeye tuna (Dale Kolody)
   - 7.3. Yellowfin and Bigeye tunas (Dale Kolody)
   - 7.4. Skipjack tuna (Hilario Murua, Chairperson of the SC)
   - 7.5. Swordfish (Iago Mosqueira, Vice-Chairperson of the WPM)

8. **DISCUSSION ON THE ACTIONS NEEDED FOR THE ADOPTION OF MANAGEMENT PROCEDURES** (Facilitator)

   8.1. Albacore tuna

   8.2. Yellowfin

   8.3. Bigeye tunas

   8.4. Skipjack tuna

   8.5. Swordfish

9. FUTURE DIRECTION OF THE TECHNICAL COMMITTEE ON MANAGEMENT PROCEDURES (Facilitators)

   9.1. Workplan (Including new timelines/budget and resources needed)

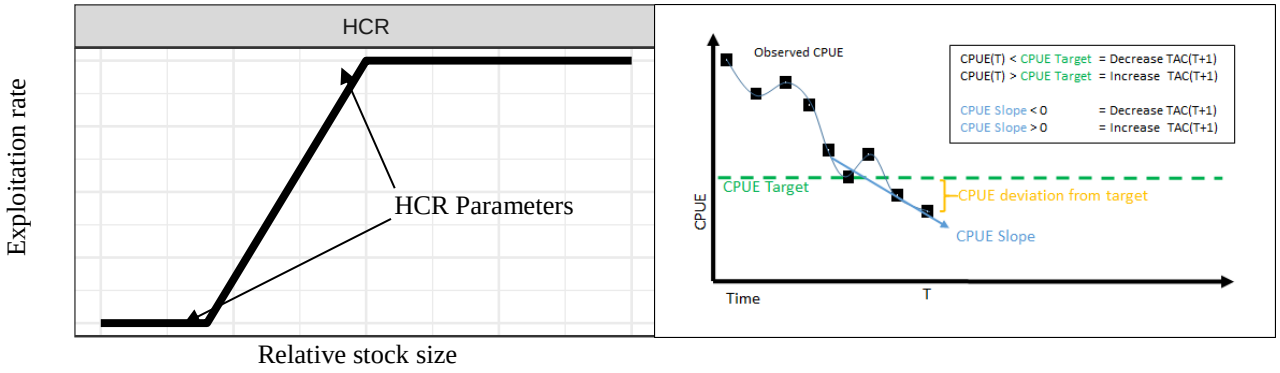
   9.2. Process and future meetings of TCMP

APPENDIX III
LIST OF DOCUMENTS

Document	Title
IOTC–2018– TCMP02–01a	Draft: Agenda of the 2nd Technical Committee on Management Procedure Meeting
IOTC–2018– TCMP02–01b	Draft: Annotated agenda of the 2nd Technical Committee on Management Procedure Meeting
IOTC–2018– TCMP02–02	Draft: List of documents of the 2nd Technical Committee on Management Procedure (TCMP02)
IOTC–2018– TCMP02–03	IOTC Resolution 16/09
IOTC–2018– TCMP02–04	Outcomes of the 1st Technical Committee On Management Procedure
IOTC–2018– TCMP02–05	Outcomes of the 21th Session of the Commission
IOTC–2018– TCMP02–06	Outcomes of the 20th Session of the Scientific Committee
IOTC–2018– TCMP02–07	A Glossary of some terms referred to in presentations and discussion at the TCMP02
IOTC–2018– TCMP02–08	Presentation of Management Strategy Evaluation Results
IOTC–2018– TCMP02–09	IOTC Albacore Tuna Management Procedure Evaluation Update
IOTC–2018– TCMP02–10	IOTC Bigeye Tuna Management Procedure Evaluation Update
IOTC–2018– TCMP02–11	IOTC Yellowfin Tuna Management Procedure Evaluation Update
IOTC–2018– TCMP02–12	IOTC Swordfish Management Procedure Evaluation Update

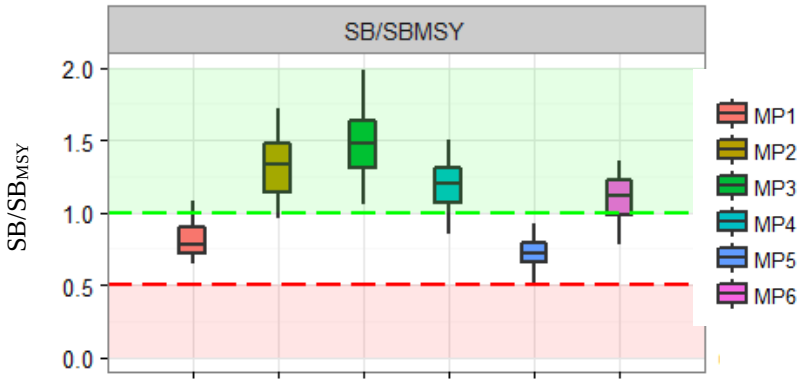
APPENDIX IV
PRESENTATION OF MANAGEMENT STRATEGY EVALUATION RESULTS

Figure 1. Harvest Control Rule (HCR)



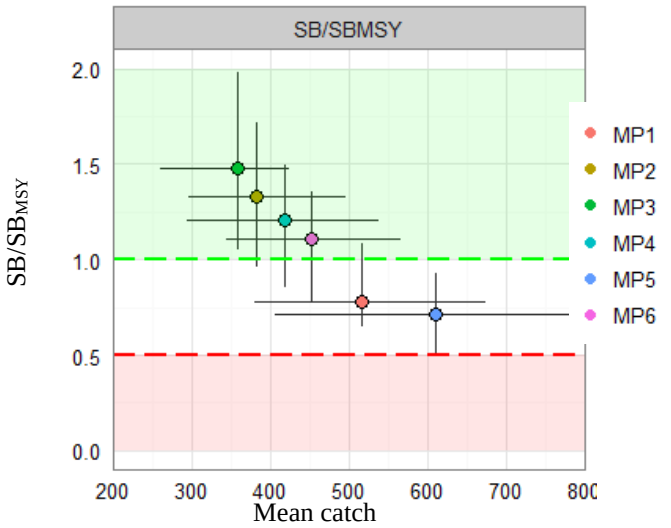
Examples of two different types of harvest control rules: Biomass-based HCR relating exploitation rate to relative stock size (left), and cpue-based HCR relating observed cpue to a target level cpue. (right).

Figure 2. Boxplot comparing performance of Management Procedures (MPs)



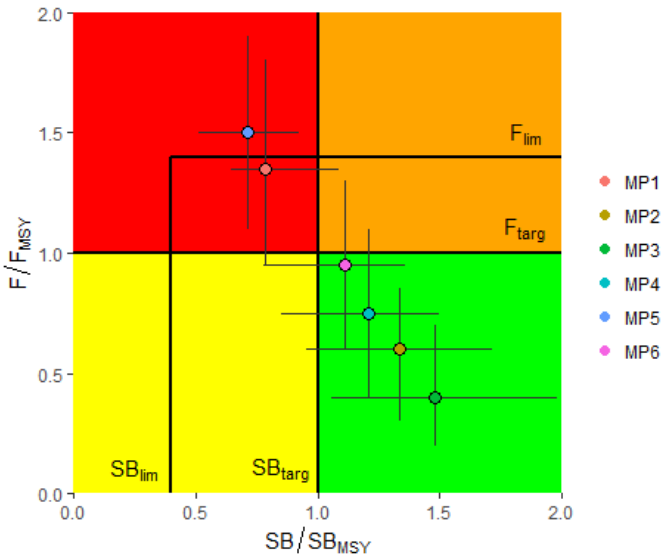
This example boxplot compares the performance of 6 MPs against SB/SB_{MSY}. Each data point represents the median over the last 20 years of the projection period as the horizontal line, 25th - 75th percentiles as coloured bars, and 5th -95th percentiles as thin lines. Limit and target reference points are indicated by red and green dashed lines respectively.

Figure 3. Trade-off plot comparing performance of Management Procedures (MPs)



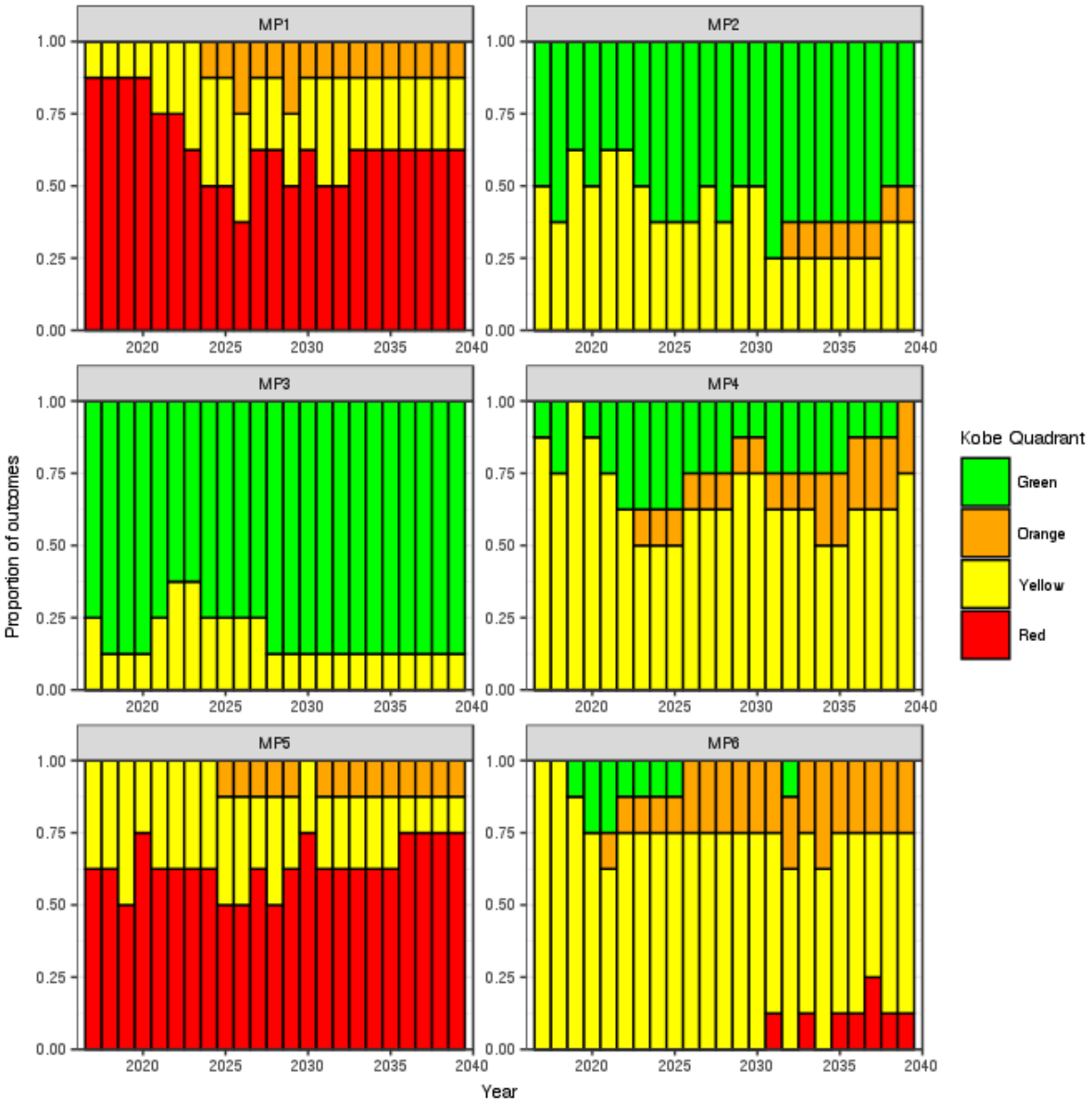
This example trade-off plot indicates the trade-offs in performance of 6 management procedures (MPs) between catch and SB/SB_{MSY}. Each data point represents the median over the last 20 years of the projection period and the errors bars represent 5th and 95th percentiles. Limit and target reference points are indicated by red and green dashed lines respectively.

Figure 4. Kobe plot comparing Management Procedures (MPs) against B_{MSY} and F_{MSY} reference points



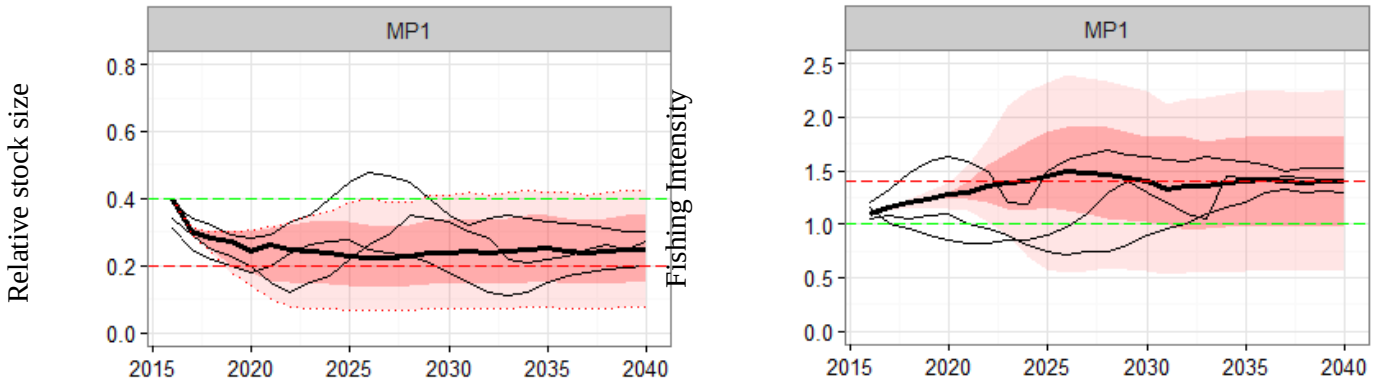
This example Kobe plot compares 6 management procedures (MPs) against performance measures for SB/SB_{MSY} and F/F_{MSY}. Each data point represents the median in the final year of the projection period and the error bars represent the 95th percentiles. Target (SB_{targ} and F_{targ}) and limit (SB_{lim} and F_{lim}) reference points are indicated by black lines.

Figure 5. Plot comparing Management Procedures (MPs) against proportion of runs in each of the Kobe quadrants over-time



This example plot compares six management procedures (MPs) against proportion of runs in each of the Kobe quadrants (green, orange, yellow and red) in each projection year over from 2016 to 2040.

Figure 4. Time series projections for the performance of Management Procedures (MPs)



These example time series plots indicate the performance of 1 MP against the stock size (left) and fishing intensity (right) performance measures projected over the years 2016-2040. The median is represented by the bold black lines, a dark ribbon shades the 25th - 75th percentile region and a light ribbon shades the 10th - 90th percentile region. Three additional thin black lines show individual realizations.

Table 1. Summary table of performance of Management Procedures (MPs). Performance of 6 MPs against 5 performance measures averaged over the last 20 years of the projection period. Shading indicates the relative performance for each MP (dark = better, light = worse).

Management Procedure	**Performance Measure**				
	SB/SB_{MSY}	Probability(Green)	Probability(SB>limit)	Mean Catch	Catch variability
MP1	0.78	0.05	0.84	516	0.16
MP2	1.33	0.94	0.96	383	0.28
MP3	1.48	0.96	1	358	0.3
MP4	1.21	0.84	0.93	419	0.22
MP5	0.72	0	0.71	611	0.1
MP6	1.11	0.61	0.91	452	0.21

Table 2a. Hypothetical example of MSE outputs comparing the performance of 6 management procedures (MPs) against all IOTC performance measures for in the first projection year.

Status : maximize stock status		1 year					
		MP1	MP2	MP3	MP4	MP5	MP6
1. Mean spawner biomass relative to pristine	SB/SB_0	0.5	0.8	0.9	0.7	0.4	0.6
2. Minimum spawner biomass relative to pristine	SB/SB_0	0.3	0.6	0.6	0.5	0.2	0.4
3. Mean spawner biomass relative to SB_{MSY}	SB/SB_{MSY}	0.8	1.3	1.4	1.2	0.7	1.1
4. Mean fishing mortality relative to target	F/F_{tar}	1.4	0.6	0.4	0.8	1.5	0.9
5. Mean fishing mortality relative to F_{MSY}	F/F_{MSY}	1.4	0.6	0.4	0.8	1.5	0.9
6. Probability of being in Kobe green quadrant	*SB*,*F*	0.5	0.9	1	0.8	0.3	0.7
7. Probability of being in Kobe red quadrant	*SB*,*F*	0.3	0.1	0	0.1	0.5	0.2
Safety : maximize the probability of remaining above low stock status (i.e. minimize risk)							
8. Probability of spawner biomass being above 20% of SB_0	*SB*	0.8	0.9	0.9	0.8	0.7	0.8
9. Probability of spawner biomass being above B_{Lim}	*SB*	0.8	1.0	1.0	0.9	0.7	0.9
Yield : maximize catches across regions and gears							
10. Mean catch (1'000 t)	*C*	520	390	350	430	600	460
11. Mean catch by region and/or gear (1'000 t)	*C*	250	200	180	210	310	220
12. Mean catch relative to MSY	*C/MSY*	1.1	0.7	0.6	0.8	1.2	0.9
Abundance: maximize catch rates to enhance fishery profitability							
13. Mean catch rates (by region and gear) (for fisheries with meaningful catch-effort relationship)	*I*	3.2	3.8	3.9	2.7	2.5	2.6
Stability: maximize stability in catches to reduce commercial uncertainty							
14. Mean absolute proportional change in catch	*C*	0.2	0.3	0.3	0.2	0.1	0.2
15. % Catch co-efficient of variation	*C*	20	25	24	18	12	21
16. Probability of shutdown	*C*	0.01	0.01	0.01	0.01	0.01	0.01

Table 2b. Hypothetical example of MSE outputs comparing the performance of 6 management procedures (MPs) against all IOTC performance measures for a 5-year projection period.

Status : maximize stock status		5 years					
		MP1	MP2	MP3	MP4	MP5	MP6
1. Mean spawner biomass relative to pristine	SB/SB_0	0.5	0.8	1.0	0.7	0.4	0.6
2. Minimum spawner biomass relative to pristine	SB/SB_0	0.3	0.5	0.6	0.5	0.2	0.4
3. Mean spawner biomass relative to SB_{MSY}	SB/SB_{MSY}	0.9	1.2	1.3	1.1	0.7	1.2
4. Mean fishing mortality relative to target	F/F_{tar}	1.4	0.6	0.4	0.8	1.5	0.9
5. Mean fishing mortality relative to F_{MSY}	F/F_{MSY}	1.5	0.5	0.4	0.8	1.6	0.9
6. Probability of being in Kobe green quadrant	SB,F	0.5	0.9	0.9	0.8	0.3	0.7
7. Probability of being in Kobe red quadrant	SB,F	0.3	0.1	0.0	0.1	0.5	0.2
Safety : maximize the probability of remaining above low stock status (i.e. minimize risk)							
8. Probability of spawner biomass being above 20% of SB_0	SB	0.8	0.8	0.9	0.8	0.7	0.8
9. Probability of spawner biomass being above B_{Lim}	SB	0.8	1.0	1.0	0.9	0.7	0.8
Yield : maximize catches across regions and gears							
10. Mean catch (1'000 t)	C	551	417	378	434	600	460
11. Mean catch by region and/or gear (1'000 t)	C	248	194	176	229	335	218
12. Mean catch relative to MSY	C/MSY	1.2	0.6	0.6	0.8	1.3	1.0
Abundance: maximize catch rates to enhance fishery profitability							
13. Mean catch rates (by region and gear) (for fisheries with meaningful catch-effort relationship)	I	3.0	3.8	4.0	2.6	2.3	2.8
Stability: maximize stability in catches to reduce commercial uncertainty							
14. Mean absolute proportional change in catch	C	0.2	0.3	0.3	0.2	0.1	0.2
15. % Catch co-efficient of variation	C	19.4	27.3	26.2	17.6	11.5	21.0
16. Probability of shutdown	C	0.01	0.01	0.01	0.01	0.01	0.01

Table 2c. Hypothetical example of MSE outputs comparing the performance of 6 management procedures (MPs) against all IOTC performance measures for a 10-year projection period.

Status : maximize stock status		10 years					
		MP1	MP2	MP3	MP4	MP5	MP6
1. Mean spawner biomass relative to pristine	SB/SB_0	0.5	0.8	0.9	0.7	0.4	0.6
2. Minimum spawner biomass relative to pristine	SB/SB_0	0.3	0.6	0.6	0.5	0.2	0.4
3. Mean spawner biomass relative to SB_{MSY}	SB/SB_{MSY}	0.8	1.3	1.4	1.2	0.7	1.1
4. Mean fishing mortality relative to target	F/F_{tar}	1.4	0.6	0.4	0.8	1.5	0.9
5. Mean fishing mortality relative to F_{MSY}	F/F_{MSY}	1.4	0.6	0.4	0.8	1.5	0.9
6. Probability of being in Kobe green quadrant	*SB*,*F*	0.5	0.9	1	0.8	0.3	0.7
7. Probability of being in Kobe red quadrant	*SB*,*F*	0.3	0.1	0	0.1	0.5	0.2
Safety : maximize the probability of remaining above low stock status (i.e. minimize risk)							
8. Probability of spawner biomass being above 20% of SB_0	*SB*	0.8	0.9	0.9	0.8	0.7	0.8
9. Probability of spawner biomass being above B_{Lim}	*SB*	0.8	1.0	1.0	0.9	0.7	0.9
Yield : maximize catches across regions and gears							
10. Mean catch (1'000 t)	*C*	520	390	350	430	600	460
11. Mean catch by region and/or gear (1'000 t)	*C*	250	200	180	210	310	220
12. Mean catch relative to MSY	*C/MSY*	1.1	0.7	0.6	0.8	1.2	0.9
Abundance: maximize catch rates to enhance fishery profitability							
13. Mean catch rates (by region and gear) (for fisheries with meaningful catch-effort relationship)	*I*	3.2	3.8	3.9	2.7	2.5	2.6
Stability: maximize stability in catches to reduce commercial uncertainty							
14. Mean absolute proportional change in catch	*C*	0.2	0.3	0.3	0.2	0.1	0.2
15. % Catch co-efficient of variation	*C*	20	25	24	18	12	21
16. Probability of shutdown	*C*	0.01	0.01	0.01	0.01	0.01	0.01

Table 2d. Hypothetical example of MSE outputs comparing the performance of 6 management procedures (MPs) against all IOTC performance measures for a 20-year projection period.

Status : maximize stock status		20 years					
		MP1	MP2	MP3	MP4	MP5	MP6
1. Mean spawner biomass relative to pristine	SB/SB_0	0.5	0.8	1.0	0.7	0.4	0.6
2. Minimum spawner biomass relative to pristine	SB/SB_0	0.3	0.5	0.6	0.5	0.2	0.4
3. Mean spawner biomass relative to SB_{MSY}	SB/SB_{MSY}	0.9	1.2	1.3	1.1	0.7	1.2
4. Mean fishing mortality relative to target	F/F_{tar}	1.4	0.6	0.4	0.8	1.5	0.9
5. Mean fishing mortality relative to F_{MSY}	F/F_{MSY}	1.5	0.5	0.4	0.8	1.6	0.9
6. Probability of being in Kobe green quadrant	SB,F	0.5	0.9	0.9	0.8	0.3	0.7
7. Probability of being in Kobe red quadrant	SB,F	0.3	0.1	0.0	0.1	0.5	0.2
Safety : maximize the probability of remaining above low stock status (i.e. minimize risk)							
8. Probability of spawner biomass being above 20% of SB_0	SB	0.8	0.8	0.9	0.8	0.7	0.8
9. Probability of spawner biomass being above B_{Lim}	SB	0.8	1.0	1.0	0.9	0.7	0.8
Yield : maximize catches across regions and gears							
10. Mean catch (1'000 t)	C	551	417	378	434	600	460
11. Mean catch by region and/or gear (1'000 t)	C	248	194	176	229	335	218
12. Mean catch relative to MSY	C/MSY	1.2	0.6	0.6	0.8	1.3	1.0
Abundance: maximize catch rates to enhance fishery profitability							
13. Mean catch rates (by region and gear) (for fisheries with meaningful catch-effort relationship)	I	3.0	3.8	4.0	2.6	2.3	2.8
Stability: maximize stability in catches to reduce commercial uncertainty							
14. Mean absolute proportional change in catch	C	0.2	0.3	0.3	0.2	0.1	0.2
15. % Catch co-efficient of variation	C	19.4	27.3	26.2	17.6	11.5	21.0
16. Probability of shutdown	C	0.01	0.01	0.01	0.01	0.01	0.01

APPENDIX V
TUNING OBJECTIVES USED FOR BIGEYE, YELLOWFIN, AND ALBACORE TUNA MSE

Bigeye tuna

- **TB1:** Pr(mean(SB(2019:2038))>=SB(MSY)) = 0.5. Average Spawning biomass (SB) over the period 2019-2038 exceeds SB_{MSY} in exactly 50% of the simulations).
- **TB2:** Pr(Kobe green zone 2019:2038) = 0.5. The stock status is in the Kobe green quadrant over the period 2019-2038 exactly 50% of the time (averaged over all simulations).
- **TB3:** Pr(Kobe green zone 2019:2038) = 0.6. The stock status is in the Kobe green quadrant over the period 2019-2038 exactly 60% of the time (averaged over all simulations).
- **TB4**: Pr(Kobe green zone 2019:2038) = 0.7. The stock status is in the Kobe green quadrant over the period 2019-2038 exactly 70% of the time (averaged over all simulations)
- **TB9**: Pr(mean(SB(2019:2038) >= 1.9 SB(MSY)) = 0.5.

Yellowfin

- **TY1**: Pr(mean(SB(2019:2038)>=SB(MSY)) = 0.5. Average Spawning Biomass (SB) over the period 2019-2038 exceeds SBMSY in exactly 50% of the simulations).
- **TY2**: Pr(Kobe green zone 2019:2038) = 0.5. The stock status is in the Kobe green quadrant over the period 2019-2038 exactly 50% of the time (averaged over all simulations).
- **TY3**: Pr(Kobe green zone 2019:2038) = 0.6. The stock status is in the Kobe green quadrant over the period 2019-2038 exactly 60% of the time (averaged over all simulations).
- **TY4**: Pr(Kobe green zone 2019:2038) = 0.7. The stock status is in the Kobe green quadrant over the period 2019-2038 exactly 70% of the time (averaged over all simulations).
- **TY5**: Pr(SB(2024)>=SB(MSY)) = 0.5. Average SB in 2024 exceeds SBMSY in exactly 50% of the simulations).

Albacore tuna

- **TA1:** Pr(mean(SB(2019:2038))>=SB(MSY)) = 0.5. Average Spawning biomass (SB) over the period 2019-2038 exceeds SB_{MSY} in exactly 50% of the simulations).
- **TA2:** Pr(Kobe green zone 2019:2038) = 0.5. The stock status is in the Kobe green quadrant over the period 2019-2038 exactly 50% of the time (averaged over all simulations).
- **TA3:** Pr(Kobe green zone 2019:2038) = 0.6. The stock status is in the Kobe green quadrant over the period 2019-2038 exactly 60% of the time (averaged over all simulations).
- **TA4**: Pr(Kobe green zone 2019:2038) = 0.7. The stock status is in the Kobe green quadrant over the period 2019-2038 exactly 70% of the time (averaged over all simulations)

APPENDIX VI
STATEMENT BY FRANCE OT

France recalls that Article XIX of the IOTC Agreement provides that the official languages of the Indian Ocean Tuna Commission are both English and French. Thus, France expects that all the documents needed for the decision-making process be translated into French. French-speaking countries are entitled to have access to these documents and the Secretariat is required to provide them. Although the untranslated documents for this Committee have been classified as information documents, these include reports included in the agenda and thus are not merely informative but form the basis for the decisions taken during this meeting, whose technicity requires a thorough preparation well before the meeting. Finally, the budget allocated to the translation has not been fully used and the missing documents are not due to a financial issue but to a lack of organization. Consequently, France requests that this kind of documents be available in French to French-speaking countries from the next meeting of this Committee to be able to endorse the subsequent reports.