REPORT OF THE FOURTH MEETING OF THE STANDING WORKING GROUP TO ENHANCE DIALOGUE BETWEEN FISHERIES SCIENTISTS AND MANAGERS (SWGSM)
(Funchal, Portugal, 21-23 May 2018)

1. Opening of the meeting

Mr. Raul Delgado, Chair of the Commission and of the Standing Working Group to Enhance Dialogue Between Fisheries Scientists and Managers (SWGSM), welcomed all participants and introduced the SCRS Chair, Dr. David Die. Mr. José Sousa Vasconcelos (Regional Secretary of Agriculture and Fisheries) welcomed all delegations to Madeira and emphasized the importance of the work of this meeting, as fisheries are of critical importance to coastal communities in the region and throughout the Atlantic.

2. Adoption of Agenda and meeting arrangements

The Chair reminded everyone that the dialogue is intended to be an informal forum for discussions, with scientists and managers on equal footing. He also suggested that an updated road map would be an important product of this meeting, as it will help to improve communication and transparency and keep the focus on the key decision points.

The Agenda was adopted without changes and is attached as **Appendix 1**.

The Executive Secretary, Mr. Driss Meski, described the meeting arrangements and noted that the following 23 Contracting Parties were present: Algeria, Angola, Belize, Canada, Côte d'Ivoire, European Union, Gabon, Honduras, Japan, Liberia, Mauritania, Mexico, Namibia, Nicaragua, Norway, Panama, São Tomé e Príncipe, Senegal, South Africa, Tunisia, Turkey, United States and Uruguay. He also noted that one Cooperating Non-Contracting Party Entity and Fishing Entity Chinese Taipei was in attendance.

The following non-governmental organizations also attended the meeting: International Seafood Sustainability Foundation (ISSF), Marine Stewardship Council (MSC) and The Ocean Foundation.

The List of Participants is appended as **Appendix 2**.

3. Nomination of Rapporteur

The United States nominated Ms. Rachel O'Malley as Rapporteur.

4. SWGSM Terms of Reference (Rec. 14-13, Res. 16-21) and outcomes of previous SWGSM (Dialogue) meetings

The SCRS Chair, Dr. David Die, recalled that the first meeting of the ICCAT's SWGSM (or the Dialogue Group) took place in 2014. At its second meeting in 2015, the Dialogue Group considered issues related to the identification of reference points, development of harvest control rules (HCRs), and application of management strategy evaluation (MSE). This work was continued with a focus on northern albacore during a Panel 2 intersessional meeting in 2016. Much of the third SWGSM Meeting (2017) was focused on northern albacore, which the Commission established as the "pilot stock" in *Recommendation by ICCAT to Establish Harvest Control Rules for the North Atlantic Albacore Stock* [Rec. 15-04].

Dr. Die emphasized the importance of developing specific recommendations through the SWGSM dialogue for the SCRS and the Commission to consider. He acknowledged that southern stocks are not included among the current priorities for MSE work but noted that we can learn from experiences with northern stocks and apply that knowledge to work on additional stocks in the future.

It was agreed that the Terms of Reference should be reviewed under "Other Matters" and that it would be important to consider making clarifications to the mandate of the SWGSM.

5. Ongoing MSE initiatives

5.1 ICCAT training courses

The Secretariat reported that it had organized a series of three scientific workshops dedicated to MSE, with financial support from the European Union. Scientists from developing and non-developing CPCs have participated, and there has been positive feedback from participants who are learning software and techniques used to implement MSE simulations. Unfortunately, because of funding limitations, these workshops were being conducted only in English, which is the standard practice of the SCRS. It is the Secretariat's intention to hold similar workshops in Spanish and French, but funding for this effort needs to be identified.

The SCRS Chair gave a brief presentation in three languages with an overview of MSE basic concepts and terminology. These concepts are also reflected in the *Recommendation by ICCAT on the Development of Harvest Control Rules and Management Strategy Evaluation* [Rec. 15-07].

Dr. Die described three main components of the management procedures (MP). The first component is the selection of data to be used. The second main component is comprised of the operational management objectives and associated performance indicators. The third component is the set of candidate HCRs that are tested; all candidate HCRs are evaluated using the same performance indicators and through the same approach. The testing is accomplished with a simulation model that attempts to describe the dynamics of the stock. The model includes statistical uncertainty in the knowledge about system dynamics based on hypotheses relating to biological parameters, data collection, population processes, and how management measures will affect catch. The results of these simulations allow the Commission to evaluate the performance of the candidate HCRs by examining trade-offs among objectives related to stock status, safety, stability, and yield. This process provides managers with more information in advance to inform management and offers greater predictability in future TACs.

5.2 Kobe MSE Process

The Joint MSE Technical Working Group was created during the Third Joint Meeting of Tuna RFMOs (the "Kobe process") in 2011. Its work was conducted by correspondence until the first meeting hosted by ICCAT in 2016. The Kobe MSE Working Group's objectives are to: i) review current MSE practice, successes, failures and potential areas for collaboration; ii) discuss progress on MSE; and iii) identify future actions focusing on areas for collaboration. To date, the Group has focused on an albacore case study across t-RFMOs, providing an opportunity to test different approaches, and allowing rigorous, transparent, and replicable testing of methods and software. Funding from the GEF/ABNJ programme will support a second meeting of the Group in June 2018 in Seattle.

5.3 Other (MSE communicator, ABNJ)

The topic of MSE communication was deferred until later in the Agenda. The SCRS Chair noted that in his personal capacity he had participated in the last two of the workshops of the series of ABNJ-supported workshops, conducted in Spanish, English and French. These workshops provided participants with a hands-on opportunity to test the model simulations and practice the application of the basic concepts of HCR and MSE.

6. Status of the development of Harvest Control Rules (HCRs) and actions to be taken in:

6.1 N-ALB

The SCRS Chair reviewed the elements of Rec. 17-04, which established an interim HCR for northern albacore. It sets the reference points, the specific HCR formula, and the formula for setting the appropriate fishing mortality rate, resulting in the TAC for 2018-2020. The SCRS will continue to develop the MSE framework, and the Commission will review the interim HCR in 2020 with a view to adopting a long-term management procedure.

Peer review of MSE and HCRs adopted in 2017

The Dialogue Group was reminded that Rec. 17-04 calls for the SCRS to initiate a peer review of the northern albacore MSE. In April 2018, the Secretariat issued a Call for Tenders for the peer review with preliminary work to be presented to the SCRS this year. No applications have been received. Given the unique skill set required to carry out the terms of the contract, other options must be considered to accomplish the necessary tasks. There was general agreement on the following:

- the tasks should be split into a technical review of code and a high-level review of approach;
- the Call for Tenders should be reissued and limited to the technical review of code;
- CPCs should urge qualified scientists to consider responding to the Call for Tenders;
- the original team that produced the MSE will present new work to the SCRS in September 2018.

The Dialogue Group took note that the Kobe MSE Technical Working Group convening in June 2018 would be a gathering of experts who may have appropriate skills to evaluate the overall approach. While such a review was not specifically anticipated in the mandate of the Technical Working Group, these technical experts could be asked to provide a high-level review of the northern albacore MSE. If the Kobe Working Group is willing to undertake this work, the outputs will need to be reviewed and next steps considered. If the Kobe Working Group cannot conduct the review, other options for review will need to be considered.

It was also acknowledged that, given the lack of response to the Call for Tenders, it was unlikely that the technical aspects of the peer review could be completed in order to inform on a reconsideration of the interim HCR for northern albacore at the 2018 Commission meeting. Finally, it was noted that there are still some broader questions with regard to the optimum timing and process of independent reviews. The process that was followed for northern albacore may need to be modified with respect to other ICCAT MSEs.

Definition of exceptional circumstances

Dr. Die recalled that in Rec. 17-04, paragraphs 12-14, the Commission requested that the SCRS develop criteria for the identification of exceptional circumstances, taking into account, *inter alia*, the need for an appropriate balance between specificity versus flexibility in defining exceptional circumstances, and the appropriate level of robustness to ensure that exceptional circumstances are triggered only when necessary. The concept of "exceptional circumstances" has been an integral part of the process in establishing MPs adopted in other RFMOs, such as CCSBT and NAFO, as described in Arrizabalaga *et al*. (in press).

Generally speaking, "exceptional circumstances" are triggered when reality clearly diverges from what was simulated. In this case, the existing framework of the HCR is not adequate to allow managers to respond in a manner that is appropriate to the circumstances. Examples could include: stock trajectories out of the ranges tested by the MSE, an extreme environmental regime shift, or inability to update the stock status.

Dr. Die explained that the SCRS Working Group on Stock Assessment Methods (WGSAM) has developed a set of potential principles that could inform the development of criteria for exceptional circumstances. These were shared for the Dialogue Group's consideration. Dr. Die explained these principles are general in nature and could be modified for use with any stock. There was agreement among the Dialogue Group that the first two principles suggested at the WGSAM would signal the possibility of exceptional circumstances:

1. When there is evidence that the stock is in a state not previously considered to be plausible in the context of the MSE and/or
2. When there is evidence that the data required to apply the HCR are not available or are no longer appropriate.

Two other principles were discussed by the Dialogue Group but were not found to be acceptable criteria for exceptional circumstances in the case of North Atlantic albacore: (1) When management objectives have changed or new management objectives have been added, such that the performance indicators used in the MSE are not sufficient or appropriate for the new objectives and (2) The regular review process for MSE/HCR should include a review of the exceptional circumstances as a matter of course.

Following an extensive discussion, there was general agreement that the SCRS should define the criteria that will be used to determine what constitutes acceptable evidence for exceptional circumstances. These criteria should include the indicators to be used as evidence, the process for gathering such indicators, and the normal reference range for the indicators.

It was noted that sometimes there may be anomalies in the data; these could indicate either a temporary situation or a more significant shift. In such cases, it may be difficult to determine exactly what constitutes exceptional circumstances. There was general agreement that it would be difficult if not impossible to anticipate all such situations, and, therefore, the SCRS should use the established criteria while exercising professional judgment in making a determination.

It was acknowledged that it is the responsibility of the SCRS to determine the existence and severity of the exceptional circumstances and provide management advice to the Commission accordingly. It was noted that in cases where exceptional circumstances may be occurring, it may be valuable for the SCRS to have some input from the managers on the state of the system (e.g., change in regulations that may have affected the indices).

Some options were presented by the SCRS Chair in slide 10 of his presentation. This presentation is attached as **Appendix 3**. These could be used in combination depending on the nature and severity of the exceptional circumstances. It is then up to the Commission to take pre-agreed action based on the management advice provided by SCRS.

One CPC suggested that this exercise should be an immediate priority for stocks other than northern albacore. The SCRS Chair clarified that the need for exceptional circumstances to be specified does not arise until an HCR is in place.

6.2 BFT

Status update on MSE-related work by the SCRS

Rec. 17-06 established an interim conservation and management plan for western Atlantic bluefin tuna, setting a TAC for 2018-2020 with the goal to complete an MSE by 2020. Initial work on development of the bluefin tuna MSE has been conducted by the Core Modeling Group. Dr. Die explained that the SCRS has received periodic updates, but the Bluefin tuna Species Group had limited ability to engage until recently due to the work involved with concurrent preparation of the 2017 stock assessment.

At a bluefin and swordfish MSE meeting in April 2018, the Bluefin tuna Core Modeling Group presented their work and obtained feedback from the SCRS focusing on adjustments to the bluefin tuna operating models. Several initial candidate management procedures (MPs) were proposed and tested on a preliminary basis. The Bluefin MSE is designed to take into account mixing between western Atlantic and eastern Atlantic/Mediterranean stocks. It is spatially explicit with 10 geographic areas. There were separate candidate MPs for the eastern and western Atlantic areas; generally, the performance of these candidate MPs was tested in pairs.

All of the initial candidate MPs were based on an empirical approach (i.e., the total allowable catch is a function of abundance indices). This is different from the approach used for the NALB MSE, which was based on a population model. Several CPCs expressed concern about the limitations of relying solely on an empirical approach. Some of the surveys that the indices are based on have existed only for a short time period, and sometimes those indices produce inconsistent results making it difficult to test across a range of scenarios to account for uncertainties. These CPCs requested that the SCRS also conduct analyses of MPs that are based on modeling approaches. Dr. Die replied that it is possible for the modeling team from any CPCs to propose model-based approaches.

It was also noted that a serious limitation of the current bluefin tuna operating model was that it could not be used to evaluate the current management strategy of $F_{0.1}$. Several parties noted that it would be important for the Commission to be able to evaluate the $F_{0.1}$ management strategy through the MSE process and that this would help the Commission make the transition from the $F_{0.1}$ strategy to a set of management procedures. Toward that end, the SCRS Chair was asked to what extent the operating model could be modified to evaluate $F_{0.1}$ and inform the Commission about continuing the $F_{0.1}$ strategy. Dr. Die responded that efforts could be made to test the performance of the status quo management strategy despite the limitations of the current operating model.

Several CPCs noted that the April 2018 meeting resulted in many suggestions to improve the MSE process for bluefin. Scientists participating in the Bluefin/Swordfish MSE meeting identified priority actions including closer consideration of stock mixing, B_{MSY} calculations, future recruitment scenarios, abundance indices, and definition of key uncertainties. These issues were recognized as important considerations for revising the operating models. The Core Modeling Group will meet on 24 and 25 September 2018, which is open to any interested parties, and will provide an update on their work at the 2018 SCRS Bluefin tuna Species Group meeting and consult with other experts on the margins of that meeting.

An SCRS meeting focused solely on the Bluefin tuna MSE is planned for January 2019. The SCRS may need four such meetings to advance their work given the complexity of this MSE. Dr. Die noted that any time the modelers make substantial decisions, the SCRS should review those decisions before they are programmed into the software. It was recognized that the original road map adopted by the Commission was too ambitious and that the involvement of the Bluefin tuna Species Group is crucial at this stage. The estimated delay in the timeline for bluefin tuna is at least six months, which should allow ICCAT to remain on track to consider candidate MPs for possible adoption in 2020.

Consideration of Candidate Management Procedures

As explained in the update on MSE-related work underway within the SCRS, outputs from initial testing of candidate MPs for bluefin tuna were not ready for review and consideration at this meeting.

Canada presented a paper to open the discussion of management objectives for WBFT. The document is included as **Appendix 4**. A distinction was made between conceptual and operational management objectives. *Conceptual* management objectives are high-level goals, while *operational* objectives add a quantitative element, such as a measurable target, a specific probability of achieving or avoiding a reference point, and/or the desired timeframe (e.g., for rebuilding to the target biomass). The Working Group agreed to begin with consideration of conceptual management objectives as a basis for future determination of operational management objectives.

The Working Group discussed the five operational objectives contained in Canada's paper and the ways in which they might be used in combination. The objectives related to the concepts of *status, safety, stability,* and *yield*. Some of them are inter-related; this allows for a more nuanced approach to evaluating how different candidate MPs are successful at meeting particular goals. For example, two candidate MPs could have a similar probability of staying in the green zone of the Kobe plot (*status)* but different probabilities of avoiding B_{LIM} (*safety*). Avoiding the red zone of the Kobe plot and avoiding B_{LIM} are related, but different, as biomass below the level of B_{LIM} is a more severely depleted state that presents greater risk to the stock than being above it but still in the red zone of the Kobe plot. HCRs can be designed so that if the biomass falls within the red zone this can be quickly corrected by reducing catch, and thus avoiding falling below B_{LIM}.

One CPC asked that SCRS consider and provide advice on the relationship between the two different proposed Kobe plot-related management objectives, one that sets a probability of being in the green zone and the other that sets a probability of avoiding the red zone. Another CPC suggested that other objectives could be considered, such as economic benefits or economic stability. There was consensus that a limitation on the change in TAC from one management period to the next would be preferable to establishing a desired probability for stability. With regard to imposing limits on TAC change, it was noted that this can have substantial adverse impacts on stock safety and status, and on yield depending on how these limits are applied. In the case of northern albacore, TAC change limits were not imposed unless $B_{cur} \geq B_{thresh}$ (i.e., B_{MSY}).

A CPC suggested that the specification of a time period for the status and safety objectives in Canada's draft is not necessary but that it would be important to incorporate a time period into objectives relating to rebuilding an overfished stock. Canada explained that their intention was to convey that a temporal element could be considered for other objectives as well (e.g., the number of years a given MP is projected to maintain the stock in the green zone). Another CPC agreed that establishing a time period is most critical in situations when the stock requires rebuilding.

Canada explained that their proposal was developed from the western Atlantic bluefin tuna perspective but could be a basis for discussing eastern Atlantic objectives as well. The Working Group discussed whether there should be combined objectives for western and eastern Atlantic bluefin tuna, and whether levels of probability should be the same or different. One CPC noted that given the effects of stock mixing, it would make sense to have connections between objectives for the western and eastern Atlantic. When measurable targets are established, they might be consistent for both east and west, or they might be specific to an

individual stock, if appropriate, given differences in the fisheries. However, a CPC also highlighted that there is currently a lack of understanding about the impact that such an approach could have on the respective management frameworks for the western and eastern fisheries respectively, and that, at this stage, it is, therefore, paramount to also develop operating models without mixing being taken into account, and management procedures which can be applicable without adopting combined objectives for the two fisheries. The CPC highlighted that failing to acknowledge this could potentially result in significant challenges for the adoption of HCRs for bluefin tuna. Another CPC supported the view that SCRS should, therefore, develop Operating Models both with and without taking mixing into consideration.

The SCRS Chair noted that the first three objectives relate to the western stock, but objectives 4 and 5 refer to bluefin tuna *caught* in the western area. Dr. Doug Butterworth, current convenor of the bluefin tuna Core Modeling Group, explained that the operating model is designed to look at both kinds of statistics (those relating to stocks and to fisheries) and that this is critical because of mixing. It was noted that due to the much larger size of the eastern stock, catches in the east have relatively more of an impact on the western stock, and that this could be considered with respect to objectives related to all four concepts, *status*, *safety, stability, and yield*. It was also noted that MSE helps managers understand the tradeoffs when balancing conflicting objectives. There was general agreement that additional feedback from SCRS would be helpful to understand how a suite of management objectives would work together, so that the Commission has the information it needs to inform decisions about which objectives to evaluate in the MSE process.

Transparency and Communication of MSE results

Dr. Victor Restrepo of ISSF presented an information paper on "Improving Communication: The Key Requirement to Improve the Effectiveness of MSE Process." The summary of this information paper is included as **Appendix 5**. The paper described a January 2018 workshop attended by 22 experts and representatives from RFMOs and highlighted some general principles identified by that Group: build understanding and trust; target key individuals or groups; use analogies; maintain consistency in messaging and presentation; use two-way communication with true dialogue; and dedicate sufficient resources to the process. The paper identified two ways in which RFMOs can improve their MSE processes. The first is through the use of formally constituted dialogue groups as a forum for exchange at the management-science interface, and the second is through development of engaging visual communication tools for conveying key results to different audiences in a consistent way.

There was discussion about how ICCAT can improve the dialogue between scientists and managers, potentially through organizational changes, as well as through the communication tools that are used to share information related to decision making. Some of these improvements could be implemented through changes to the SWGSM Terms of Reference. It was agreed to return to this important issue later in the agenda.

Dr. Die highlighted some related recommendations from the SCRS WGSAM, which met in early May 2018:

- SCRS Species Group rapporteurs should attend all meetings on MSE;
- a trial specification document should be maintained for every MSE process;
- dedicated sources of funding for MSE should be identified by the Commission;
- a page focused on MSE should be created on the ICCAT web site.

These suggestions were well-received by the SWGSM. It was noted that the issues of transparency and communication are relevant to the MSE process for all stocks/fisheries and that greater consistency and harmonization among the RFMOs with respect to these matters could enhance understanding of the MSE process for all concerned.

6.3 North swordfish

Status update on MSE-related work by the SCRS

The SCRS Chair gave an overview of preliminary work that used a simplified MSE to compare the outcomes of actual management measures for North Atlantic swordfish with a theoretical application of harvest control rules during the same historical timeframe. The study looked at projected outcomes in 2019 and evaluated the performance of each approach (i.e., actual management during that timeframe and theoretical management under HCRs). This study was designed to be informative; it was not intended as a basis for future management.

The focus of scientific work in 2018 will be to establish the database to be used as a basis for development and conditioning of the operating model. A Call for Tenders was issued by the Secretariat in April 2018 and a contract is now in place for a technical expert to initiate this work. The MSE process is expected to take 2-3 years, which will require some adjustments to the roadmap. Next steps will be to develop an operating model framework, describe the uncertainties and determine which to account for in early stages of testing, and conduct initial conditioning of the alternative operating models. The SCRS Swordfish Species Group will be closely involved in the work of the contracted technical expert.

There was general agreement that the SCRS should consider an independent review at an early stage in the development of MSE for North Atlantic swordfish. The operating model could incorporate some assumptions about mixing for the North and South Atlantic stocks, although this will not be as complex as for bluefin tuna. One CPC pointed out that the overall HCR/MSE roadmap is focused on the northern hemisphere in the initial 5-year phase. For swordfish, in particular, there is a need for capacity building among scientists in the southern hemisphere so they can benefit from this experience and apply this knowledge to future work on ICCAT stocks in the southern hemisphere. The SCRS Chair agreed that this is an important aspect of the work.

Identification of operational management objectives (e.g., probability of achieving and/or maintaining the stock in the green zone of the Kobe plot and probability of avoiding the limit reference point)

Canada presented a paper to facilitate discussion of management objectives for North Atlantic swordfish. The paper is included as **Appendix 6**, and it was noted that many potential objectives were similar to those discussed for bluefin tuna. There was further discussion about the interconnection of objectives related to *status, safety, stability,* and *yield*.

One additional objective that was included for discussion purposes related to minimizing catch of juveniles. Canada explained that the idea for this came from the minimum size restriction in Rec. 16-03. One CPC suggested that increasing MSY with different size selectivity in the fisheries could be one option. Another CPC suggested that it could be challenging to make this particular objective operational.

One CPC noted that the fishing mortality rate is specified for the target species and asked how incidental catches and by-catch are considered. This was acknowledged as an important observation that could be explored further. Another CPC noted that it may be challenging to find sufficient data to evaluate this.

6.4 Tropical tunas

Management of individual stocks vs management of tropical tunas complex

The SCRS Chair recalled that this issue was discussed at the SWGSM meeting in 2017 and that there was some general consensus that a multispecies approach could be preferred for the MSE for tropical tunas. It was highlighted, however, that it would be practical and necessary to focus near-term management actions on bigeye, whose stock status is poor, rather than wait on development of a multispecies MSE. On that basis, a Call for Tenders was issued for the development of modeling approaches to support the tropical tunas MSE process. The contract was awarded to a consortium that will work directly with the Tropical Tunas Species Group and its rapporteurs, the SCRS Chair, and in consultation with the Secretariat to develop a detailed work plan. Initial tasks include establishing the database to be used as a basis for operating model development, as well as specifying the uncertainties, scenarios, and robustness tests to be considered as part of the MSE process. One CPC, however, highlighted that, due to the nature of some tropical tuna fisheries, a multispecies approach might not be appropriate because it could have disproportionate effects on the TAC set for some stocks, and that, in addition to the multispecies approach, HCRs should, therefore, also be developed on a single species basis. One CPC stressed that any multispecies MSE should be developed in a manner that avoids any such disproportionate effects.

Work outlined in the initial Call for Tenders is to be completed by December 2018, but it is anticipated that this work will continue for at least 2-3 years. The consortium will provide an update to the SCRS Tropical Tunas Species Group in September 2018. Dr. Die characterized this MSE as the most challenging of any that ICCAT is undertaking and emphasized that dedicated funding and scientific support will be needed. He agreed with interventions from several CPCs noting that with tropical tuna assessments scheduled in 2018, 2019, and 2020, there will be little time for the SCRS to devote to MSE-related work.

Identification and review of performance indicators as proposed by Rec. 16-01, Annex 9

Dr. Die recalled that Rec. 16-01 included a set of proposed performance indicators to be used in an MSE for tropical tunas, reflecting the concepts of *status, safety, stability,* and *yield*. The SCRS reviewed these performance indicators in 2017. Mr. Shep Helguile, Chair of Panel 1, summarized the Terms of Reference for the intersessional meeting of Panel 1 scheduled for July 2018. It was emphasized that CPCs need to start thinking about the candidate management procedures that the Commission would like the SCRS to begin testing through MSE. It will be important to have a robust discussion of the Commission's conceptual management objectives for tropical tunas, which will form the basis for determining operational objectives at a later stage. The performance indicators could also be further refined.

The SCRS Chair noted that there is currently no performance indicator related to juvenile catch of tropical tunas. He recalled that the Commission in Rec. 16-01 requested an analysis of different proportions of juvenile catch, and associated effects on MSY, and explained that some analysis related to this request is expected at the bigeye tuna stock assessment meeting in July. Several CPCs emphasized that by-catch of small tropical tunas is an issue that must be addressed in the near-term. Another CPC expressed concern that with a multispecies approach, it will be far more challenging to keep all three stocks in the green zone of the Kobe plot.

The observer from ISSF suggested that the Commission could consider managing stock complexes with an indicator species (typically, the species within the complex that is most vulnerable to fishing). The SCRS Chair recognized this as a good suggestion and indicated that he would follow up with the consortium and the Tropical Tunas Working Group to discuss this approach. The outcomes of the bigeye tuna stock assessment will also inform the consideration of this approach. It was generally agreed that the MSE process for tropical tunas will take more time than the others because of the multispecies aspect and that the Commission should adopt more immediate management actions to end overfishing, as needed, and begin stock recovery, in accordance with SCRS advice.

7. Review of the 5-year road map for the development of MSE/HCR for priority stocks. Possible need for extension based on complexity of outstanding species

The SWGSM recalled that on the basis of Rec. 15-07, the Commission adopted a 5-year road map in 2016 to guide future work on the development of HCRs and application of MSE for priority ICCAT stocks. This roadmap was originally based on estimates from the SCRS of the soonest possible dates that HCR/MSE related work could be completed.

Discussions resulted in a revised, more detailed road map through 2021, included as **Appendix 7**. The SCRS Chair characterized the road map as a "wish list" that would guide the SCRS, recognizing that the SCRS may not be able to accomplish everything within the timeframe requested by the Commission. Conducting stock assessments requires a major investment of the scientists' time, including for data preparatory work.

It was agreed that the updated road map would be referred to the SCRS for review and adjustment during its 2018 Species Group and Plenary meetings. Following input from the SCRS, the road map will be further discussed and, as needed, refined by the Commission at the 2018 Annual meeting.

8. Resourcing of MSE technical work, dialogue, capacity building and communication of MSE process

There was a discussion of current realities related to scarce resourcing and technical expertise, and the need for broad participation within the SCRS as well as independent reviews. Dr. Die recalled that the SCRS developed a comprehensive proposal that would integrate resource needs to conduct MSE for all priority stocks (Appendix 13 to the *Report for Biennial Period 2016-2017, Part II (2017), Vol. 2*), but this was not fully funded in the Commission's budget for 2018-2019. The Commission and the SCRS will need to work together so that sufficient time, funding, and specialized expertise are devoted to this important work.

The Chair emphasized that broad participation in this process is critical. This effort can be supported by continuing to improve the scientist-manager dialogue, strengthen communication, and support capacity building efforts. Several specific ideas were developed for inclusion in the recommendations under Agenda Item 10.

9. Feedback on road map to implement Ecosystem Based Fisheries Management: current status and the way forward

Dr. Maria Jose Juan Gordá presented an information paper. The summary to this document is attached as **Appendix 8**.

There was support for idea of a regional pilot project on EBFM that would build on existing initiatives and allow the SCRS to prioritize its efforts. The focus should be on integrating existing data and knowledge. It was noted that an ecosystem-based approach can pick up signals that productivity of the system is changing and anticipate potential implications for ICCAT stocks and stock complexes. However, the SCRS Chair cautioned that linking this work to single-species advice would be difficult. Instead, ICCAT should consider the resulting qualitative advice about the ecosystem to inform species-specific management.

10. Recommendations to the Commission

The Chair summarized discussions during earlier points of the Agenda, and there was agreement on the following:

North Atlantic albacore:

- Peer review tasks should be split into a technical review of code and a high-level review of approach;
- Call for Tenders should be reissued and limited to the technical review of code;
- Kobe MSE Technical Working Group should be asked to provide a high-level review of the northern albacore MSE.

Exceptional circumstances:

- The SCRS should define the criteria that will be used to determine what constitutes acceptable evidence for exceptional circumstances under a given MP;
- These criteria should include the indicators to be used as evidence, the process for gathering such indicators, and the normal reference range for the indicators;
- The Commission should identify a range of appropriate management responses to be taken when exceptional circumstances occur;
- The SCRS should determine when exceptional circumstances may be occurring, and the nature and severity of the exceptional circumstances, and provide management advice to the Commission accordingly;
- The Commission should implement a pre-agreed management action.

Bluefin tuna:

- Regarding conceptual management objectives, a specific formulation was not agreed, but these should relate to status, safety, stability, and yield;
- Acknowledging that the OM is designed to evaluate impacts on individual stocks (e.g., the western stock) and fisheries (e.g., fish caught in the western area), the Commission should continue to consider management objectives in this context;
- If the Commission has a preference on the interval or extent of the TAC changes, this should be notified to the SCRS;
- The SCRS should continue developing and refining the MSE, which may include the following:

    - Test a model-based approach, in addition to empirical approaches;
    - Evaluate status quo ($F_{0.1}$), if feasible;

- Advise on a B_{LIM} value as soon as possible;
- Test separate east and west candidate MPs jointly and separately.

North Atlantic swordfish:

- Regarding conceptual management objectives, a specific formulation was not agreed, but these should relate to status, safety, stability, and yield.
- An additional management objective related to minimizing catch of juveniles needs further consideration.

Tropical tunas:

- Regarding conceptual management objectives, a specific formulation was not agreed, but these should relate to status, safety, stability, and yield.
- The SCRS and the Commission should reconsider the road map for tropical tunas, given the complexity of this multispecies fishery and frequent stock assessments.
- An additional management objective related to minimizing catch of juveniles needs further consideration.
- The SCRS should provide advice on the benefits of a mixed stock MSE, one based on the most vulnerable stock (currently bigeye tuna), or multiple MSEs for individual stocks, and the extent to which this choice is driven by management objectives.

Communications and transparency:

- Establish a dedicated MSE page on the ICCAT website;
- Review the road map at each annual meeting of the Commission and update as necessary and appropriate, taking into account intersessional updates from subsidiary bodies of the Commission and the SCRS;
- Support efforts to harmonize approaches with those of other tRFMOs, to the extent practicable (e.g., by supporting efforts to develop a common glossary);
- Consider the ideal structure of an intermediary group(s) to foster dialogue and decision making, and review the SWGSM Terms of Reference at the 2018 annual meeting to modify as necessary;
- Continue capacity building efforts, including workshops in the three official ICCAT languages.

General

- In 2018, the SCRS should update its overall budget estimate for MSE work;
- In 2018, the Commission should consider options for short-term and long-term dedicated funding to meet identified resource needs;
- The road map should be adjusted as necessary by the Commission to maintain the integrity of the process and follow relevant advice from the SCRS.

11. Other matters

It was noted that under the current Terms of Reference, the SWGSM is attempting to carry out several very different functions, including capacity building, consideration of cross-cutting policy issues and technical work on specific MPs. There was discussion about the possibility of focusing the work of the SWGSM on cross-cutting policy issues, while the Panels (working sometimes through intersessional meetings) could play a more active role in reviewing the candidate MPs for relevant stocks and providing feedback, as this approach might help to ensure the participation of CPCs active in those particular fisheries. There was also discussion of a potential role for subgroups that might provide technical input on candidate MPs and guide the decision-making process. While the efficiency of this approach was acknowledged, several CPCs expressed concern about empowering a small group to make final decisions. It was generally agreed that any sub-group must have a clear mandate and that transparency would be essential.

In light of this discussion, several CPCs expressed a desire to consider and propose possible amendments to the SWGSM Terms of Reference at the 2018 annual meeting. Turkey recalled the recommendations of the Independent Performance Review Panel relating to Rec. 14-13 and proposed the following specific changes as a starting point for any future amendments:

- New paragraph 2 of Rec. 14-13

2. The objective of the SWGSM is to enhance communication and foster mutual understanding between fisheries managers and scientists, by establishing a forum to exchange views and to support the development and effective implementation of management and capacity building strategies, in particular through, inter alia:

- Addition of a new subparagraph to paragraph 2:

"The identification of the specific mechanisms to ensure that more scientists with knowledge of the fisheries and MSE process participate in stock assessment meetings and are directly involved in assessment teams."

It was recognized that other RFMOs could provide relevant examples that may suggest possible improvements to the SWGSM Terms of Reference. The organization and financing of the HCR/MSE process will be important considerations. These were acknowledged as critical concerns given the interrelationship between the MSE and stock assessment processes, and the limited capacity of national scientists to devote the necessary time to this growing workload.

Ad hoc capacity building course aiming to enhance participation of Managers in management Strategy Evaluation (MSE)

All were invited to participate in an interactive training exercise that demonstrated the basic concepts of MSE and the role of managers in this process. These simulations offered each delegate the opportunity to select and test candidate HCRs and observe the projected outputs of the process.

12. Adoption of Report and adjournment

The Chair thanked the participants for constructive discussions and the Secretariat and interpreters for their excellent support of the meeting. The meeting was adjourned.

The report was circulated by correspondence for review and adopted.

Reference

Arrizabalaga, H., Merino G., Murua H., and Santiago J. (in press). Characterizing exceptional circumstances in ICCAT: A summary of experience in other RFMOs. Document SCRS/2018/063: 5 p.

Appendix 1

Agenda

1. Opening of the meeting (Working Group Chair)
2. Adoption of agenda and meeting arrangements
3. Nomination of Rapporteur
4. SWGSM Terms of Reference (Rec. 14-13 and Res. 16-21) and outcomes of previous SWGSM meetings
5. Ongoing MSE initiatives
   - 5.1 ICCAT training courses
   - 5.2 Kobe MSE Process
   - 5.3 Other (MSE communicator, ABNJ)
6. Status of the development of Harvest Control Rules (HCRs) and actions to be taken in:
   - 6.1 N-ALB:
     - Peer review of MSE and HCRs adopted in 2017
     - Definition of exceptional circumstances
   - 6.2 BFT:
     - Status update on MSE-related work by the SCRS
     - Consideration of candidate management procedures
     - Transparency and communication of MSE results
   - 6.3 N-SWO:
     - Status update on MSE-related work by the SCRS
     - Identification of operational management objectives (e.g., probability of achieving and/or maintaining the stock in the green zone of the Kobe plot and probability of avoiding the limit reference point)
     - Identification of performance indicators
   - 6.4 Tropical tunas:
     - Management of individual stocks vs management of tropical tuna complex
     - Identification of operational management objectives (e.g. probability of achieving and/or maintaining the stock in the green zone of the Kobe plot and probability of avoiding the limit reference point)
     - Identification and review of performance indicators as proposed by Rec. 16-01, Annex 9
7. Review of the 5-year road map for the development of MSE/HCR for priority stocks. Possible need for extension based on complexity of outstanding species
8. Resourcing of MSE technical work, dialog, capacity building and communication of MSE process

9. Feedback on road map to implement Ecosystem Based Fisheries Management: current status and the way forward

10. Recommendations to the Commission on:

    - Possible review of terms of reference of SWGSM as per (Rec. 14-13 and Res. 16-21)
    - Resourcing of MSE work
    - For stocks referred to under point 6:
        - management objectives
        - performance indicators
        - candidate management procedures and HCRs

11. Other matters

    - *Ad hoc* capacity building course aiming to enhance participation of Managers in Management Strategy Evaluation (MSE)

        - Introduction to MSE: Basic Principles and concepts
        - The role of Managers in the MSE Process
        - A basic demonstration of how the MSE process functions

12. Adoption of Report and adjournment

Appendix 2

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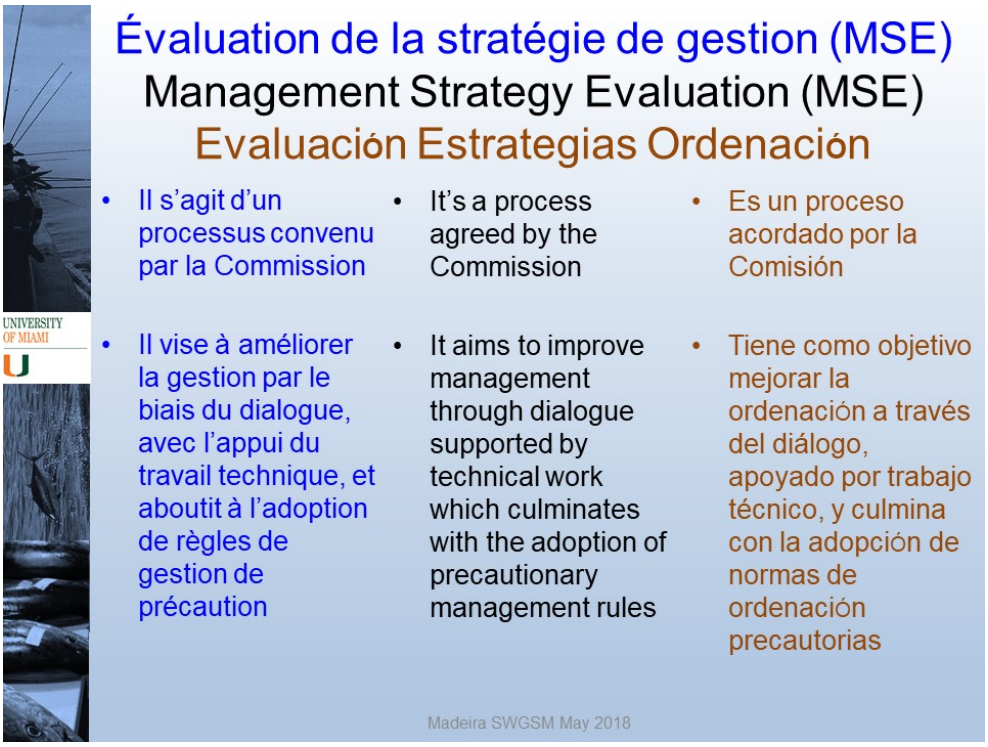
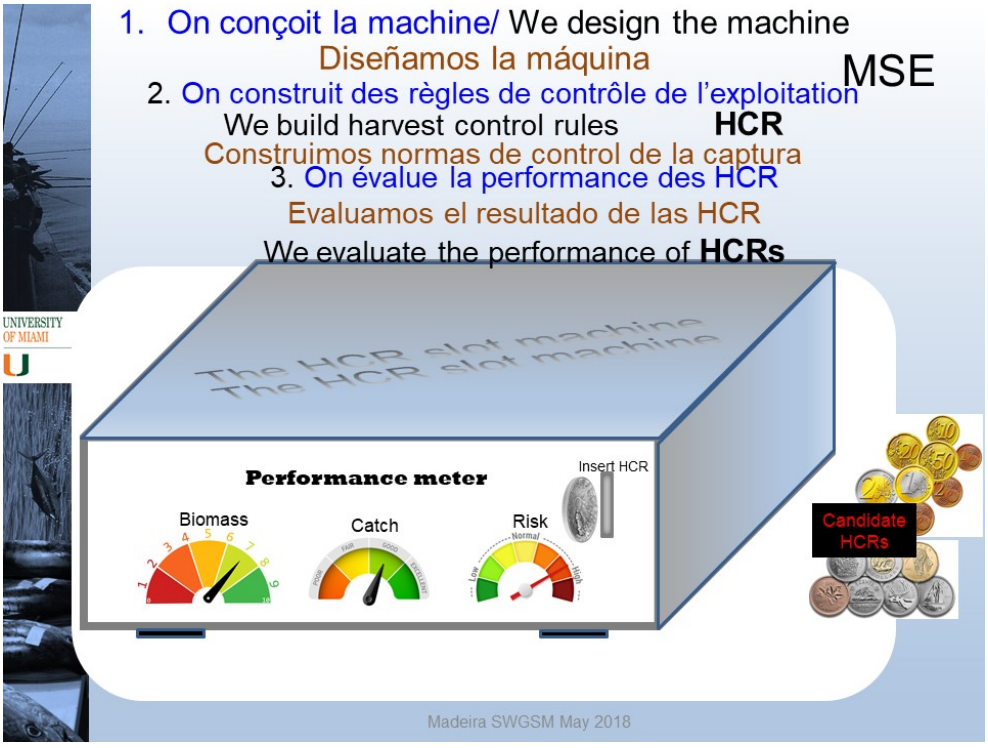
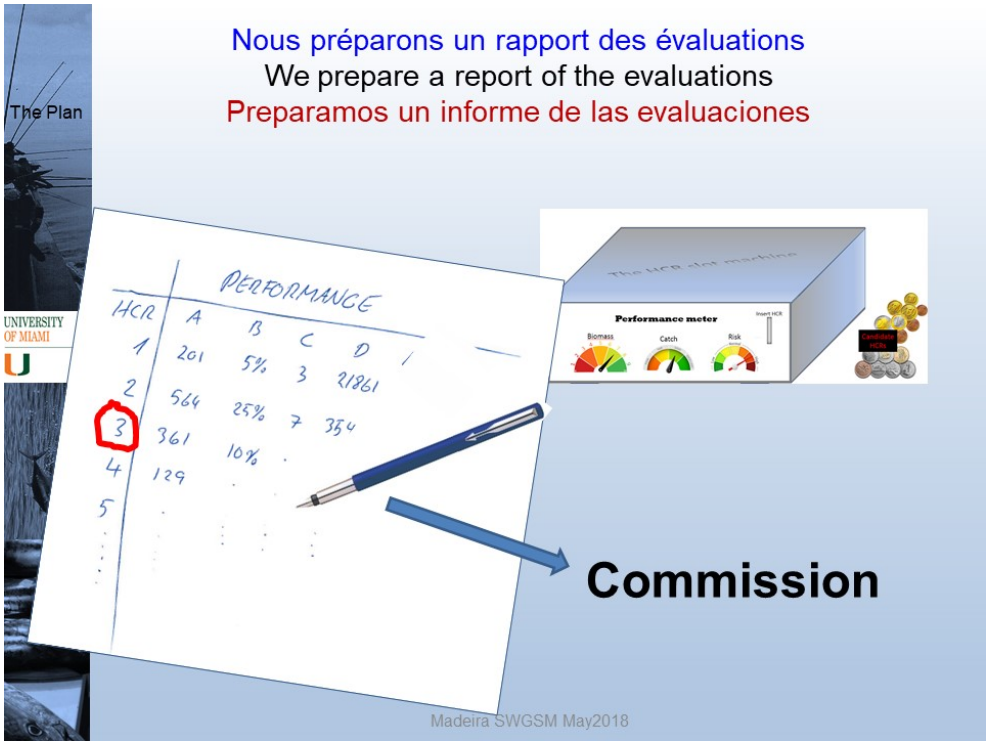
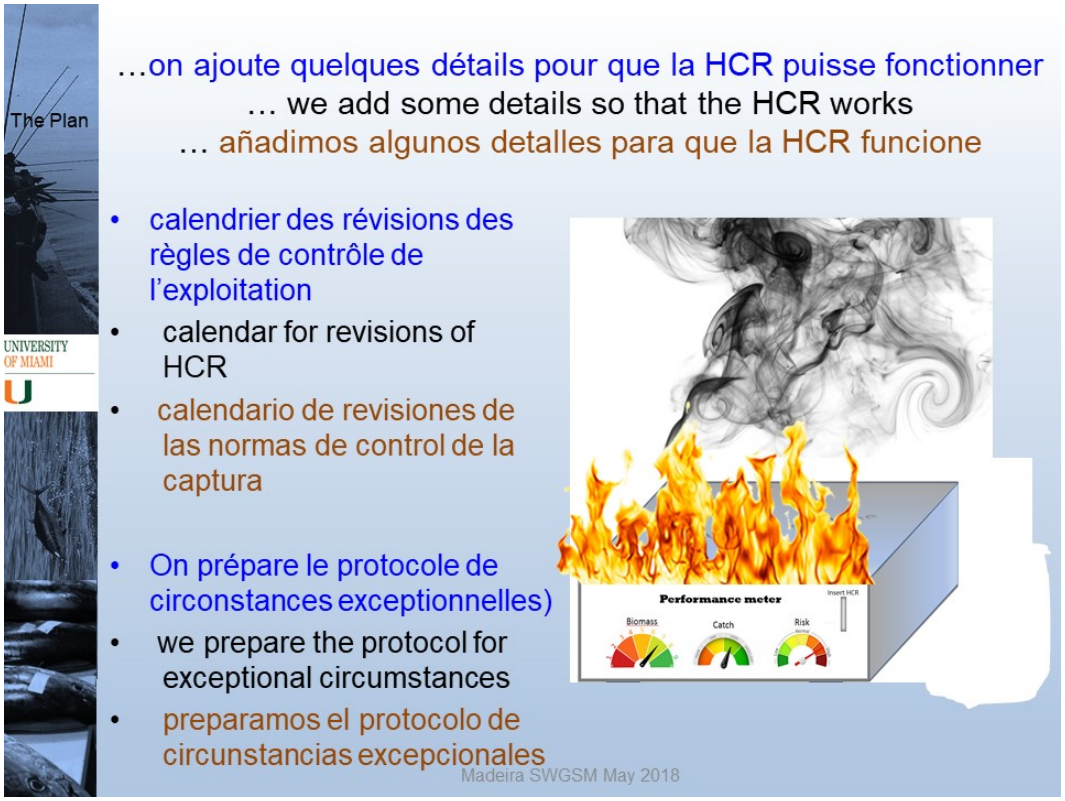
Appendix 3

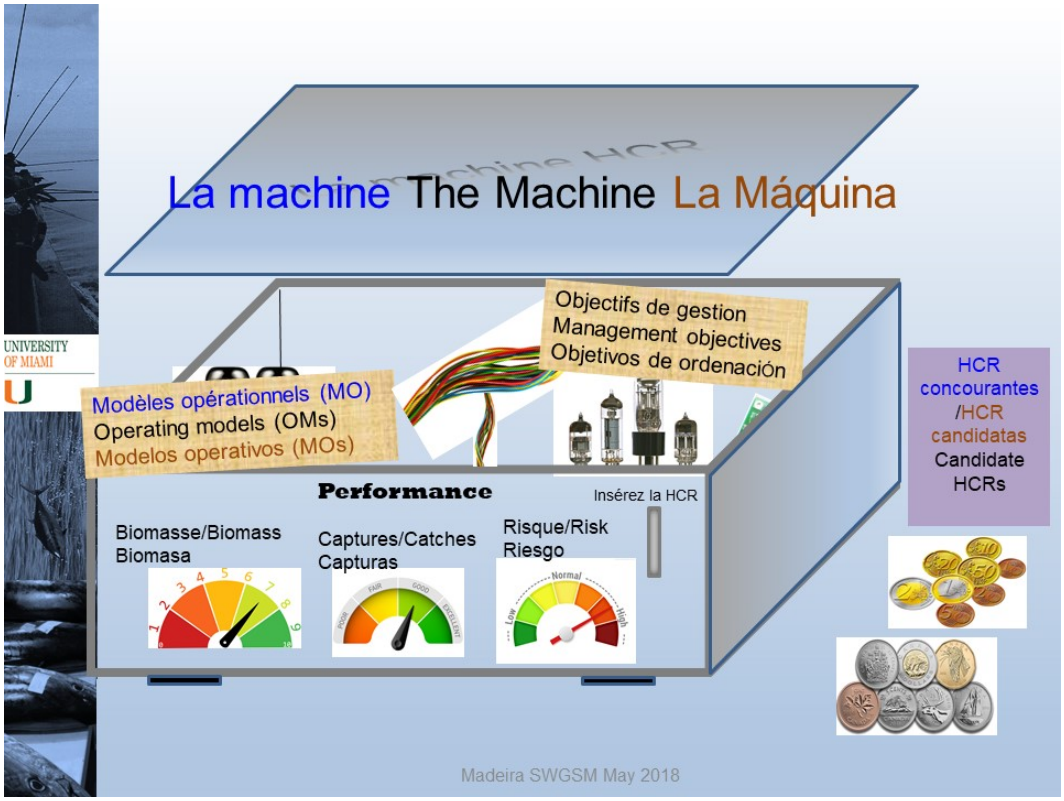
Presentation of the SCRS Chairman

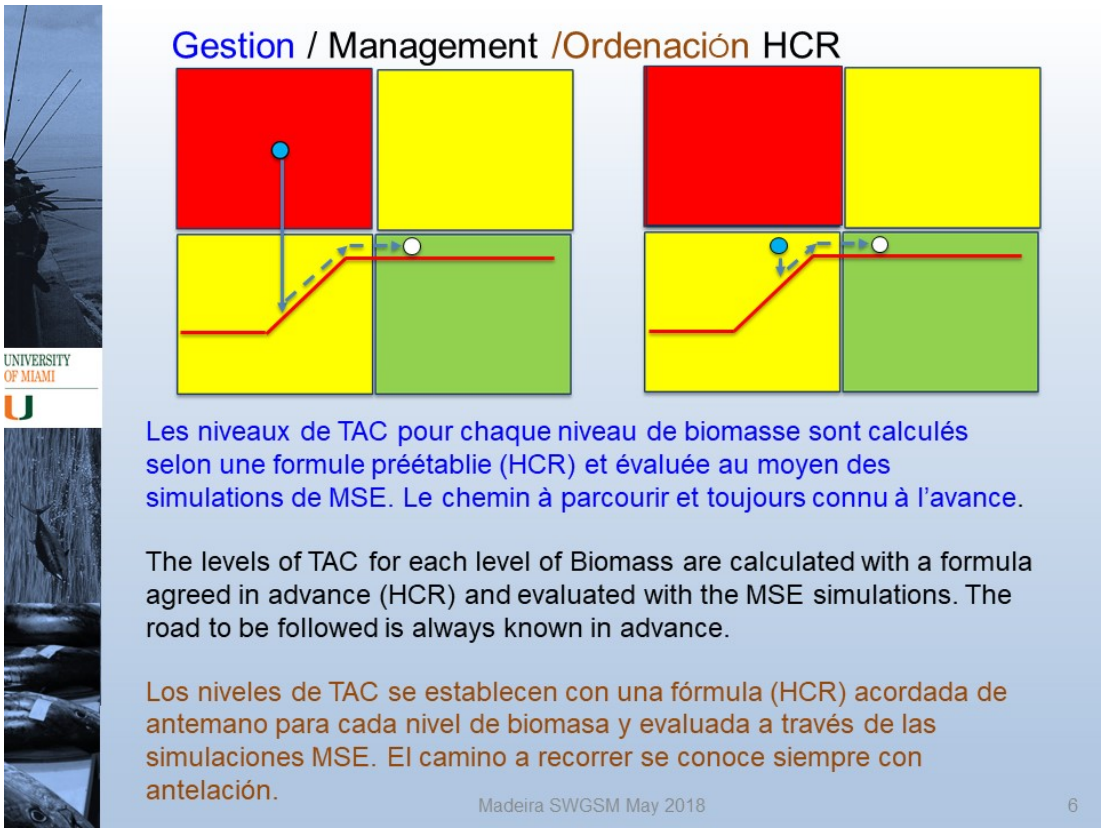





The Plan
UNIVERSITY OF MIAMI
Nous préparons un rapport des évaluations
We prepare a report of the evaluations
Preparamos un informe de las evaluaciones
PERFORMANCE
HCR
A
B
C
D
1
201
5%
3
21861
2
564
25%
7
354
3
361
10%
4
129
5
Performance meter
Biomass
Catch
Risk
Commission
Madeira SWGSM May2018


The Plan
UNIVERSITY OF MIAMI
…on ajoute quelques détails pour que la HCR puisse fonctionner
… we add some details so that the HCR works
… añadimos algunos detalles para que la HCR funcione
• calendrier des révisions des règles de contrôle de l'exploitation
• calendar for revisions of HCR
• calendario de revisiones de las normas de control de la captura
• On prépare le protocole de circonstances exceptionnelles)
• we prepare the protocol for exceptional circumstances
• preparamos el protocolo de circunstancias excepcionales
Performance meter
Biomass
Catch
Risk
Madeira SWGSM May 2018


La machine The Machine La Máquina
Objectifs de gestion
Management objectives
Objetivos de ordenación
Modèles opérationnels (MO)
Operating models (OMs)
Modelos operativos (MOs)
Performance
Insérez la HCR
Biomasse/Biomass
Biomasa
Captures/Catches
Capturas
Risque/Risk
Riesgo
HCR concourantes /HCR candidatas
Candidate HCRs
Madeira SWGSM May 2018


Gestion / Management /Ordenación HCR
Les niveaux de TAC pour chaque niveau de biomasse sont calculés selon une formule préétablie (HCR) et évaluée au moyen des simulations de MSE. Le chemin à parcourir et toujours connu à l'avance.
The levels of TAC for each level of Biomass are calculated with a formula agreed in advance (HCR) and evaluated with the MSE simulations. The road to be followed is always known in advance.
Los niveles de TAC se establecen con una fórmula (HCR) acordada de antemano para cada nivel de biomasa y evaluada a través de las simulaciones MSE. El camino a recorrer se conoce siempre con antelación.
Madeira SWGSM May 2018
6

Procédure de gestion (PG) / Management Procedure (MP)
Procedimiento de ordenación (PO)

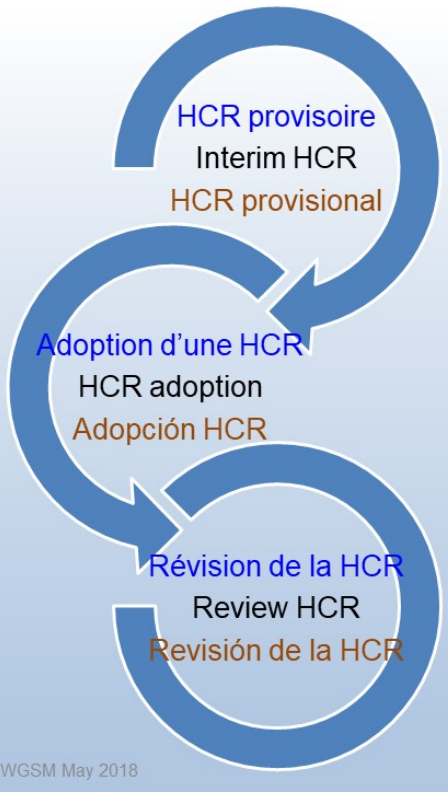
- Données/ Data / Datos
  - Campagne scientifique/Scientific campaign /Campaña científica
  - Prises, CPUE/Catches, CPUE/Capturas CPUE
  - Prise par âge/Catch at age/Capturas por edad
- Indicateurs de l'état du stock /Stock status indicators/ Indicadores del estado del stock
  - Valeur de référence/Reference value/Valor de referencia
  - Calculés à partir du modèle de production/Derived from production model/Derivados del modelo de producción
  - Calculés à partir de APV/Derived from APV/Derivados del APV
- Règle de contrôle de l'exploitation / Harvest Control Rule (HCR)/ Norma de control de la captura
  - Proportion simple/Simple proportion/Proporción simple
  - "Bâton de hockey" avec des points de référence/Hockey stick with reference points/Hockey stick con puntos de referencia
  - Mortalité constante/Constant mortality/Mortalidad constante

Madeira SWGSM May 2018 7

La MSE est un processus de rétroaction continue.

MSE is a continuous feedback process

MSE es un proceso con feedback continuo



Madeira SWGSM May 2018 8


UNIVERSITY
OF MIAMI
Adoption de HCR par le biais de la MSE
Adoption of HCR through MSE
Adopción de HCR mediante MSE
Cela demande du travail, de la patience et de la confiance.
Requires work, trust and patience
Requiere trabajo, confianza y paciencia
Merci, Thanks, Gracias
Madeira SWGSM May 2018
9

Appendix 4

Management Objectives - Western Atlantic Bluefin Tuna*

Proposal presented by Canada

Introduction

The intention of this paper is to introduce, for the purposes of discussion, management objectives for western Atlantic bluefin tuna (WBFT). These objectives are presented as qualitative to serve as the basis for initial discussions. It is hoped that these initial discussions can help to establish a framework for continued refinement of objectives that, ultimately, include quantitative elements and performance indicators.

Fisheries management objectives can be framed in two ways: (1) conceptual objectives; or (2) operational objectives (Punt *et al.* 2016). Conceptual objectives are high-level aspirational objectives that verbalize a desired generic goal without including any specifics on a measurable target or timeframe for achievement. Operational objectives are more refined and more specific about measureable targets and associated likelihood of achieving those targets over determined timeframes. Operational objectives are the key foundational component of any Management Strategy Evaluation (MSE) and they should be developed in a clear, transparent, and inclusive manner.

To constitute an effective operational objective for a MSE, the objective must include the following three aspects: (1) a measureable target (e.g. B_{MSY}, B_{LIM}, F_{MSY}, or a quadrant of the Kobe plot); (2) a probability of achieving that target; and, (3) a desired timeframe for measuring the target. Performance indicators then need to be developed for operational objectives, including the articulation of how the indicator will be calculated.

Considerations

In developing objectives and performance indicators for BFTW, a number of key factors must be considered. Included among these are ICCAT's principal management goals, alignment with Kobe principles, the role of ICCAT in regulating fisheries, and the desire for stability in fishing opportunities.

The International Convention for the Conservation of Atlantic Tunas (ICCAT) commits Contracting Parties (CPCs) to exploitation at the maximum sustainable levels. It is, therefore, considered appropriate to measure success relative to a policy of ensuring stock biomass remains near, or moves toward, B_{MSY} (or an appropriate proxy). The Kobe Process has built upon this objective by integrating fishing mortality through the Kobe Matrix, where stocks are evaluated relative to B_{MSY} and F_{MSY}. The current management objectives for BFTW, expressed in interim conservation and management measure Rec. 17-06, reflect this broader approach, which further supports using the Kobe Matrix as a basis for operational objectives related to stock status and safety.

Limit reference points (LRP or B_{LIM}) are often used in fisheries management as a threshold to avoid, which protects stocks from reaching low biomass levels that may lead to irreparable harm. The B_{LIM} is often a point when fishing activity (F) is heavily curtailed, if not reduced to zero. The avoidance of B_{LIM} is, therefore, an important consideration in establishing objectives for a fishery.

Stability in the fishery is often considered desirable and has also been included in the harvest control rules for North Atlantic albacore tuna. It is therefore felt that the bluefin MSE would benefit from the consideration of stability as a potential objective.

The following objectives are presented for discussion in the context of the BFTW stock. However, a key consideration that must be taken into account as management objectives are developed for both the western and eastern stocks is the intermixing of these stocks. The stock dynamics of both BFTW and BFTE are reflected in each operating model that the SCRS has developed for the bluefin tuna MSE, meaning that achieving the objectives for one stock is dependent on policies set for the other. Therefore, conceptual and operational objectives for these two stocks should be considered together at some point and the following objectives may be informative for the BFTE stock, or perhaps for Atlantic bluefin as a whole.

*The complete document is available at the Secretariat upon request.

Objectives

Five candidate operational objectives have been developed that could be incorporated into the BFTW MSE, individually or as a suite. Currently, the candidate objectives only include the measurable target, while the probability of, and timeframe for, achieving that target have been left deliberately blank with the intention that these be informed by discussion among CPCs.

The five operational objectives for discussion are:

1. Ensure that the BFTW stock has a greater than ___% probability of occurring in the green quadrant of the Kobe matrix for (*period*).

2. Ensure that the BFTW stock has a less than ___% probability of entering the red quadrant of the Kobe matrix for (*period*).

3. Ensure that there is a less than ___% probability of the BFTW stock falling below B_{LIM} (*to be defined)* for (*period*).

4. Maximize catch levels, while achieving B_{MSY} (or an appropriate proxy) by (*time*).

5. Ensure that TAC changes of greater than ___%, between management periods, have less than ___% probability of occurring for (*period*).

Appendix 5

Improving communication: the key requirement to improve the effectiveness of MSE processes[1]

Shana Miller[2], Alejandro Anganuzzi[3] and Victor Restrepo[4]

SUMMARY

The use of management strategy evaluation (MSE) to design and test candidate fisheries management approaches is expanding globally, including for ICCAT stocks. Participation of managers, scientists and stakeholders should be an integral component of the MSE process. Open and effective communication among these groups is essential for the success of the MSE and the adoption of the management approach based on it (e.g. as envisaged by the *Recommendation by ICCAT on the Development of Harvest Control Rules and of Management Strategy Evaluation* [15-07]). The highly technical nature of MSE and newness of the approach to many audiences present considerable communication challenges and have, unfortunately, slowed progress in some cases.

A workshop sponsored by FAO's Common Oceans/ABNJ Tuna Project, The Pew Charitable Trusts, the International Seafood Sustainability Foundation, The Ocean Foundation, and CSIRO, was held in San Diego, California, USA in January 2018, to focus on key requirements to improve the effectiveness of MSE processes. The workshop was attended by 22 participants, including experts who have been part of successful MSE work in other RFMOs.

Drawing on diverse experiences with MSE, the workshop identified two areas in which the implementation of MSE in multilateral fora may be improved:

a) the use of formally constituted "dialogue groups" as a forum for exchange at the management-science interface, and

b) development of engaging, yet uncomplicated, visual communication tools for conveying key results to different audiences at each stage.

The attached presentation summarizes the key findings and recommendations from the workshop.

[1] The complete document is available at the Secretariat upon request.
[2] The Ocean Foundation.
[3] FAO's Common Oceans/ABNJ Tuna Project.
[4] International Seafood Sustainability Foundation.

Appendix 6

Management Objectives - North Atlantic Swordfish*

Proposal presented by Canada

Introduction

The intention of this paper is to introduce, for the purposes of discussion, management objectives for North Atlantic swordfish (NSWO). These objectives are presented as qualitative to serve as the basis for initial discussions. It is hoped that these initial discussions can help to establish a framework for continued refinement of objectives that, ultimately, include quantitative elements and performance indicators.

Fisheries management objectives can be framed in two ways: (1) conceptual objectives; or (2) operational objectives (Punt *et al.* 2016). Conceptual objectives are high-level aspirational objectives that verbalize a desired generic goal without including any specifics on a measurable target or timeframe for achievement. Operational objectives are more refined and more specific about measureable targets and associated likelihood of achieving those targets over determined timeframes. Operational objectives are the key foundational component of any Management Strategy Evaluation (MSE) and they should be developed in a clear, transparent, and inclusive manner.

To constitute an effective operational objective for a MSE, the objective must include the following three aspects: (1) a measureable target (e.g. B_{MSY}, B_{LIM}, F_{MSY}, or a quadrant of the Kobe plot); (2) a probability of achieving that target; and, (3) a desired timeframe for measuring the target. Performance indicators then need to be developed for operational objectives, including the articulation of how the indicator will be calculated.

Considerations

In developing objectives and performance indicators for NSWO, a number of key factors must be considered. Included among these are ICCAT's principal management goals, alignment with Kobe principles, the commitments of ICCAT in regulating fisheries, the high percentage of juvenile catches relative to total catch, and the desire for stability in the fishery.

The International Convention for the Conservation of Atlantic Tunas (ICCAT) commits Contracting Parties (CPCs) to exploitation at the maximum sustainable levels. It is, therefore, considered appropriate to measure success relative to a policy of ensuring stock biomass remains near, or moves toward, B_{MSY} (or an appropriate proxy).

For NSWO, ICCAT has not included in its objectives the goal of managing fishing mortality so that it remains at, or below, F_{MSY}. The introduction of F_{MSY} (or an appropriate proxy) as a NSWO objective would be consistent with the Kobe Process, where the green quadrant of the Kobe matrix is characterized by stocks for which $B \geq B_{MSY}$ and $F \leq F_{MSY}$. The current objective for NSWO stocks, to achieve B_{MSY} with a 50% probability, is rooted in rebuilding plans that predate the Kobe Process. The MSE for NSWO would seem an opportune time to introduce objectives that more fully integrate the Kobe approach, namely by incorporating fishing mortality.

The current management measure for NSWO (CMM 17-02) includes a minimum size restriction, suggesting an objective to minimise juvenile catch. The MSE could be an opportunity to examine the use of size limits in SWO fisheries and whether these are achieving their purposes or exacerbating existing challenges.

Stability in the fishery is often considered desirable and has been therefore included for discussion purposes. Stability is also reflected by relative constant total allowable catches and little variation in ICCAT management decisions under the NSWO rebuilding plan.

* The complete document is available at the Secretariat upon request.

Objectives

Six candidate operational objectives have been developed that could be incorporated into the NSWO MSE, individually or as a suite. Currently, the candidate objectives only include the measurable target, while the probability of, and timeframe for, achieving that target have been left deliberately blank with the intention that these be informed by discussion among CPCs.

The six operational objectives for discussion are:

1. Ensure that the NSWO stock has a greater than ___% probability of occurring in the green quadrant of the Kobe matrix for (*period*).

2. Ensure that the NSWO stock has a less than ___% probability of entering the red quadrant of the Kobe matrix for (*period*).

3. Ensure that there is a less than ___% probability of the NSWO stock falling below B_{LIM} (*to be defined)* for (*period*).

4. Maximize catch levels, while achieving B_{MSY} (or an appropriate proxy) by (*period*).

5. Limit change in TAC to ___% between management periods.

6. Ensure that fishing mortality of juveniles is below ___ for (*period*).

Appendix 7

Road Map for the Development of Management Strategy Evaluation (MSE) and harvest control rules (HCR)

This schedule is intended to guide the development of harvest strategies for priority stocks identified in Rec. 15-07 (North Atlantic albacore, North Atlantic swordfish, eastern and western Atlantic bluefin tuna, and tropical tunas). It provides an aspirational timeline that is subject to revision by the SCRS and the Commission, and should be considered in conjunction with the stock assessment schedule that is revised annually by the SCRS.

	NALB	*BFT*	*NSWO*	*Tropicals*
2015	- Commission established management objectives in Rec. 15-04			
2016	- SCRS evaluated a range of candidate HCRs through MSE - PA2 identified performance indicators			- Commission identified performance indicators [Rec. 16-01]
2017	- SCRS evaluated the performance of candidate HCRs through MSE, using the performance indicators developed by PA2 - SWGSM narrowed the candidate HCRs and referred to Commission - Commission selected and adopted an HCR with associated TAC at the Annual Meeting [Rec. 17-04]	- SCRS conducted stock assessment - Core modeling group completed development of modeling framework	- SCRS conducted stock assessment	- SCRS reviewed performance indicators for YFT, SKJ, and BET - SWGSM recommended a multispecies approach for development of MSE framework

	NALB	*BFT*	*NSWO*	*Tropicals*
2018	- Call for Tenders issued for peer review - SCRS to develop criteria for the identification of exceptional circumstances - SCRS to continue testing variations of the HCR, as requested by 17-04	- SCRS conducted joint meeting on BFT/SWO MSE - SCRS reviewed reference set of operating models - SCRS begins testing candidate management procedures - SWGSM consider qualitative management objectives	- SCRS conducted joint meeting on BFT/SWO MSE - Contract with MSE technical expert: develop OM framework; define initial set of OMs; initial conditioning of OMs - SWGSM to consider qualitative management objectives	- Contract with technical experts: start development of MSE framework - [SCRS to conduct stock assessment for bigeye tuna] - SWGSM/Panel 1* to consider qualitative management objectives
2019	- Independent expert to complete peer review - ALB WG meeting - Commission may refine the interim HCR - Commission (through SWGSM/Panel 2) to develop guidance on a range of appropriate management responses should exceptional circumstances occur	- BFT WG intersessional meeting - Initiate independent peer review of MSE - SCRS to test additional management procedures - BFT WG to focus on MSE - SWGSM/Panel 2* to develop operational management objectives and performance indicators for adoption by the Commission	- SWO WG intersessional meeting - SCRS to begin testing candidate management procedures - Initiate independent peer review of MSE -SWGSM/Panel 4* to develop operational management objectives and performance indicators for adoption by the Commission	- [SCRS to conduct stock assessment for skipjack] -SWGSM/Panel 1* to develop operational management objectives for adoption by the Commission - Continue development of MSE framework, and start development of candidate management procedures - Initiate independent peer review of MSE
2020	- [SCRS to conduct stock assessment for northern albacore] -Commission to adopt a long-term management procedure	- BFT WG intersessional meeting - [SCRS to conduct stock assessment for bluefin tuna] - Commission to adopt an interim management procedure	- SWO WG intersessional meeting - Commission to adopt an interim management procedure	- [SCRS to conduct stock assessment for yellowfin] - SCRS to begin testing candidate management procedures
2021			- SCRS to conduct stock assessment for North Atlantic swordfish	- Commission to adopt interim HCR(s) or management procedures

* Panels may meet intersessionally, as appropriate.

Appendix 8

Selecting Ecosystem Indicators for Fisheries Targeting Highly Migratory Species[1]

Maria José Juan-Jordá[2] on behalf of Consortium members[3, 4, 5, 6, 7, 8]

SUMMARY

Several international instruments have set the minimum standards and key principles to guide the implementation of an ecosystem approach for the management and conservation of marine living resources. The ICCAT resolution 15-11 and the 2015-2020 SCRS Science Strategic Plan have also established the main objective of advancing the Ecosystem Approach to Fisheries Management (EAFM) to provide advice to the Commission. Yet these aspirations have not provided practical guidance on how to make operational an EAFM within ICCAT. The Specific Contract N⁰ 2 under the Framework Contract - EASME/EMFF/2016/008 provisions of Scientific Advice for Fisheries Beyond EU Waters- addresses current scientific impediments and provides solutions that shall support the implementation of an EAFM through collaboration and consultation with ICCAT. This Specific Contract has three main objectives: (1) Provide a list of ecosystem indicators (and guidance for associated reference points) to monitor the broader impacts of fisheries targeting Highly Migratory Species (HMS) on the pelagic ecosystem,; (2) Propose area-based assessment units or ecoregions with meaningful ecological boundaries for HMS and its fisheries to guide the development of ecosystem plans and assessments; and (3) Develop a pilot ecosystem plan for one chosen ecoregion within the ICCAT Convention Area. Ultimately, the products created throughout this contract will aim to facilitate the linkage between ecosystem science and fisheries management as well as facilitate the process to operationalize an EAFM in ICCAT.

[1] The complete document is available at the Secretariat upon request.
[2] AZTI, Spain
[3] Centre for Environment, Fisheries and Aquaculture Science (CEFAS), UK
[4] Instituto Español de Oceanografía, Spain
[5] Wegeningen Marine Research (WMR), The Netherlands
[6] Instituto Português do Mar e da Atmosfera (IPMA), Portugal
[7] Institut de recherche pour le développement (IRD), France
[8] MRAG Ltd., UK.