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Key decisions for the WCPFC Commission and Scientific Committee under the harvest strategy approach for WCPO tuna stocks and fisheries
UPDATE to SC14-MI-WP-05

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1. ABSTRACT

SC14-MI-WP-05 highlighted areas of decision-making focus for managers and scientists during the development of harvest strategy approaches for WCPO fisheries and stocks. Following the developments and experiences gained by Commission members in the intervening four years, we update that paper to highlight key decision areas that i) regional fishery managers and stakeholders (through the Commission and Science Management Dialogue), and ii) scientists (through the Scientific Committee and Science Management Dialogue) will need to consider during the WCPFC's process. These represent the thoughts of SPC-OFP, and act as a discussion document for Commission members to refine as the harvest strategy development process continues. We also note that the roles of all WCPFC's subsidiary bodies in the process will need wider consideration.

As drivers of the harvest strategy process, fishery managers and the wider stakeholder group will need to define key aspects of the process through the Commission. Key areas where decisions have been taken or will need to be taken include the following, which are described within this paper:

- Definition of acceptable risk of exceeding Limit Reference Point (LRP) levels;
- Adoption of Target Reference Points (TRPs) that define desirable states of a stock and fishery;
- Definition of structural assumptions for harvest strategy frameworks (e.g. fisheries and fishery controls) and the mixed fishery framework;
- Definition of an agreed approach for selection of the 'best performing' management procedure;
- Critical performance features that a candidate management procedure would be required to achieve;
- Specification of information and presentational approaches to enhance decision making;
- Adoption of the 'best performing' management procedure that reflects the desired balance of management objectives;
- Review and approval of the monitoring strategy to check the management procedure performs as expected;
- Triggering of 'exceptional circumstances' and a process(s) to respond; and
- Adoption of the mixed fishery approach.

Key recommendations of the Scientific Committee have been covered in individual working papers over the last four years, focussing on operating models, performance indicators and development of harvest strategy elements. Key areas where recommendations or advice by the Scientific Committee have been given or will be needed include the following:

- Definition of LRP levels;
- Advice on options for TRP levels that meet the balance of management objectives;
- Review of the operating models (OM) used in Management Strategy Evaluations, and adoption of the OMs;
- Technical review of components of candidate management procedures;
- Review of performance indicators;
- Review of technical aspects of the MSE framework and mixed fishery framework;
- Advice on scientific aspects of the performance of candidate management procedures;
- Advice on monitoring strategy gaps, including economic indicators;
- Review performance of the adopted management procedure and underlying assumptions based on the latest information,
- Advice to the Commission on the potential occurrence of exceptional circumstances; and
- Advice on management procedure performance in the mixed fishery framework.

2. INTRODUCTION

Development of the harvest strategy approach for WCPO fisheries and stocks will require managers and scientists to provide advice and make decisions on specific harvest strategy elements and issues. In this paper, we update the 'key decisions' paper (SC14-MI-WP-05) to reflect the developments and progress within the WCPFC over the last four years. It again highlights advice and key decisions that scientists (through the Scientific Committee) and regional fishery managers and stakeholders (through the Commission) have, and will need to, consider. The consideration of key decision areas presented in this paper represents the thoughts of SPC-OFP, and act as a discussion document for Commission members to refine as the harvest strategy development process continues.

Throughout this document we note that Scientific Committee and other subsidiary bodies make recommendations to the Commission and that the WCPFC Annual Session is the body through which formal decisions on key matters are taken. The work of the Commission in 2022 will be supported by advice gained through the 'Science-Management Dialogue' process. SMD01 is a trial (the objectives of which are presented in SMD01-BP-01) and the role of any future SMDs will be discussed at that meeting.

3. FISHERY MANAGER/STAKEHOLDER CONSIDERATIONS

As drivers of the harvest strategy process, fishery managers and the wider stakeholder group will need to define key aspects of the process. Key areas and activities for decision making will include:

- **Definition of acceptable risk of breaching LRPs.** While the definition of the LRP stock level is a biological issue, the level of acceptable risk of the stock falling below that LRP level is a decision for managers and reflects precautionary considerations. At present, a condition has been agreed for the harvest strategy approach that to be considered, any evaluated management procedure must not exceed a 20% risk of breaching the LRP.
- **Adoption of Target Reference Points (TRPs) that define desirable states of a stock and fishery.** Managers will need to adopt a TRP for each stock within the harvest strategy framework. That TRP indicates the stock level that achieves an acceptable compromise between priority objectives (e.g. minimal stock risk, profitability, suitable catch) and hence can condense multiple objectives into a single performance indicator that can be used during the evaluation of candidate management procedures. The TRP may be identified through the evaluation of management procedures. Defining the TRP relative to e.g. specific time periods is useful.
- **Definition of assumptions for harvest strategy frameworks (e.g. fisheries and fishery controls) and the mixed fishery framework**. The management procedure evaluations require confirmation of the definitions of:
  - the duration of the management period;
  - what fisheries are controlled within the harvest strategy (e.g. all fisheries catching a stock; specific gear type combinations; gear types in a specific location);
  - how fisheries are controlled (e.g. through either catch or effort) and settings for underlying technical measures;
  - constraints, where necessary, on maximum and minimum catch or effort within the system and constraints on the change between management periods (e.g. maximum allowable change in the effort or catch).

  Definition of similar assumptions will be needed within the mixed fishery framework, including which fisheries are controlled by which stock's management procedure.
- **Definition of an agreed approach for selection of the 'best performing' management procedure (MP)**. Performance indicators are used to highlight how well a candidate management procedure achieves management objectives. The process through which they will be used to identify and select a preferred management procedure by the Commission should be agreed upon. This will involve:

- ***National consideration of management objectives, and related performance indicators, and their relative importance***. The development of harvest strategies is an iterative process through which managers refine and prioritise management objectives for the fishery and identify acceptable trade-offs to select a management procedure that balances the different objectives of members.
- ***Review, refine and prioritise corresponding performance indicators***. The performance indicators reflecting desired management objectives must be reviewed and, where necessary, modified to ensure they continue to provide appropriate information. Where new objectives are developed, or further information to select management procedures is desired, new performance indicators may need to be generated, where feasible.

- **Critical performance features that a candidate management procedure would be required to achieve.** Where the range of management procedures evaluated do not meet objectives, managers should request the evaluation of alternative management procedures, by indicating the type of outcomes (values of performance indicators) that are desirable.
- **Specification of information and presentational approaches to enhance decision making**. To enhance decision making it will be necessary to develop methods for the presentation and analysis of results, to allow managers to explore the relative performance of candidate management procedures using performance indicators. Feedback from managers is important to highlight issues and inform on preferred presentation options.
- **Adoption of the 'best performing' management procedure that reflects the desired balance of management objectives.** Following selection of the management procedure, the approach for its implementation, from development of CMMs that implement the MP and associated management controls to changes in how the business of the Commission and its subsidiary bodies is undertaken, will need to be defined.
  We note that the allocation framework for the management procedure output is not currently a part of the harvest strategy and will require separate consideration by managers.
- **Review and approval of the monitoring strategy to check the management procedure performs as expected.** The actual performance of the implemented management procedure must be monitored to determine whether outcomes achieved are consistent with the performance expected through the modelling work. This applies both for performance indicators evaluated within the evaluation framework, and for information on management objectives that could not be evaluated by that framework (e.g., economics, small scale fishery outcomes, livelihoods). Managers may need to prioritise and refine areas of data collection to ensure that certain objectives can be monitored.
- **Triggering of 'exceptional circumstances' and a process(s) to respond**. Exceptional circumstances include events that fall outside the range of assumptions over which the management procedure has been tested, or non-availability of important input data. For example, if biomass declines toward the limit reference point, or catches continually exceed some upper or lower threshold. Based on advice from the SC, managers can trigger 'exceptional circumstances'. Managers should also evaluate the wider performance of the management procedure and events that affect the fishery outside the control of the MP (which may include changes in the global or regional situation). These events may affect members' priorities and hence whether an adopted management procedure remains the 'best' one to achieve those revised objectives. These discussions and agreement of the process to be taken in response will require input from both managers and scientists (see also Section 4). For example, it may be necessary to re-evaluate the management procedure or, in severe cases where there is considered to be a risk to the stock, take remedial action.
- **Adoption of the mixed fishery approach.** Given the multi-species, multi-gear nature of WCPO tuna fisheries, managers will need to adopt the 'mixed fishery' approach to tuna fishery management, after reviewing the results of the framework tested across the fisheries controlled.

4. SCIENTIFIC COMMITTEE

Key recommendations have already been considered by SC in previous meetings. Here we detail these harvest strategy areas, as well as those that the SC will also need to consider at future meetings:

- **Definition of LRP levels.** SC has defined a biological limit reference point of 20%$SB_{F=0}$ for key tuna stocks, which was adopted by the Commission. LRPs for billfish and shark stocks still need to be defined.
- **Advice on options for TRP levels that meet the desired balance of management objectives**. Scientific analyses will be required to support the identification of candidate TRPs that appropriately meet and trade off manager's objectives. Managers may use the MSE process to identify management procedure(s) that satisfy their various objectives and based on this, SC can determine an appropriate TRP value. Consideration of how the TRP is used within the MSE process (e.g. as one of several performance indicators, or as the primary 'tuning' objective for MPs) and reported against within the monitoring strategy will be required with input from managers.
- **Review the operating models (OM) used in Management Strategy Evaluation and adopt the OMs**. Both the reference set and robustness set of operating models will need to be adopted by SC as the basis for the evaluation of candidate management procedures, with the reference set being the priority. In turn, SC will need to review whether these OMs need to be reconditioned based upon new information and knowledge gained, and in light of updated stock assessments.
- **Technical review of components of candidate management procedures**. SC will have a role in reviewing the technical components of management procedures (data collection framework, estimation method, harvest control rule). Through the MSE evaluation of candidate management procedures, SC will provide scientific advice to managers on their suitability based upon the performance indicators.
- **Review of performance indicators**. Through the iterative MSE process, existing performance indicators will be refined and reviewed by SC to ensure they are calculated appropriately and reflect objectives as far as practical, and new performance indicators will need to be developed where managers identify new fishery objectives. This will include review of the approaches used to display the information to ensure appropriate interpretation for manager's decision making (see Section 3).
- **Review of technical aspects of the MSE framework and mixed fishery framework**. SC should review the publicly available technical framework used for MSE testing to confirm its appropriateness (see SC18-MI-WP-02). SC will also need to provide input into the development of the mixed fishery MSE framework, to ensure the technical decisions made are appropriate.
- **Advice on scientific aspects of the performance of candidate management procedures.** SC will provide managers with advice on scientific aspects of candidate management procedure performance, including identifying any management procedures that should be rejected as they do not meet the specified criteria related to LRP risk.
- **Advice on monitoring strategy gaps, including economic indicators**. SC will need to review the data requirements underpinning the monitoring strategy for stocks/fisheries and provide advice to ensure data gaps can be addressed. Related to performance indicators and the monitoring strategy, SC will need to evaluate relevant economic indicators and advise on data requirements.
- **Review the performance of the adopted management procedure and underlying assumptions based on the latest information**. As part of the monitoring strategy, SC will need to verify the performance of the adopted management procedure and assumptions made in its evaluation, to confirm the management procedure is performing as expected.
- **Provide advice to the Commission on the potential occurrence of exceptional circumstances**. An element of the monitoring strategy is consideration of the potential occurrence of 'exceptional circumstances' (see also Section 3). SC will need to identify the occurrence of conditions considered to represent exceptional circumstances and highlight this to managers, who must then consider what action should be taken. Advice may include the nature

and considered severity of the exceptional circumstance, and potential action such as a) no action needed, b) a change to the implemented management procedure, and what that change might be, or c) whether the current management procedure should be reviewed.

- **Provide advice on MP performance in the mixed fishery framework**. Once the mixed fishery framework has been adopted by the Commission, SC should provide advice on the scientific aspects of the performance of individual stock MPs within the framework, highlighting the consequences of management procedures across the stocks and identifying issues of note for the Commission.

ANNEX

A selected glossary of key terms is provided in alphabetical order. A more complete list is available on the SPC Moodle site using a guest login available on request (https://spc.learnbook.com.au/login/index.php).

Estimation Method
Part of the management procedure, it uses the collected data to estimate stock status for use in the Harvest Control Rule. The estimation method can either be an 'empirical method' based on observed data (e.g., CPUE levels or trends), or model-based (e.g., a stock assessment that estimates biomass).

Exceptional Circumstances
These represent events and situations that fall outside the range of assumptions over which the adopted Management Procedure has been tested and are identified through the Monitoring strategy. They may include situations where the trajectory of the stock has not responded as expected to management action, for example if biomass or CPUE is continually tracking towards the Limit Reference Point, catches continually exceed some upper threshold. As noted in the main text, exceptional circumstances may be triggered by managers on the basis of events identified by SC, but may also be considered based upon wider events that affect the fishery and members' priorities (e.g. changes in the global or regional situation) and hence whether an adopted management procedure remains the 'best' one to achieve those revised objectives.

Harvest Control Rule (HCR)
Part of the management procedure, it is a rule for setting fishing opportunities, such as catch or effort limits, based on estimates of stock status (generated by the estimation method). HCRs, along with the other components of a MP, are agreed by members. HCR's can take many forms, but ultimately, they are selected based on their predicted ability to deliver stated management objectives.

Management objectives
The aims for fisheries at national and regional levels. The management objectives should answer the question: what do you want from the fishery? Under a harvest strategy approach the focus is on achieving longer-term objectives through sustainable management. Objectives can be broadly categorised as biological, economic, social or ecosystem based. It may not be possible to achieve all objectives simultaneously, resulting in trade-offs between them. It will be necessary to translate high-level and conceptual objectives into something that can be quantified and measured.

Management procedure
There are three components of an MP: the data collection process, estimation method that uses that data to estimate stock status, and the Harvest Control Rule that uses that estimate to set fishing opportunities. The three components are agreed together as a package within the harvest strategy. Before adopting an MP, candidates are tested using Management Strategy Evaluation (MSE) computer simulation. The preferred MP is the one most likely to achieve desired objectives.

Monitoring strategy
After adoption of a Management Procedure (MP), the monitoring strategy continually evaluates the performance of that MP and checks it is working as expected.

Operating Model (OM)
A model that simulates the dynamics of the biological stock and fishery, used in MSE to test the expected performance and robustness of a candidate MP. Multiple OMs are used, each with a different set of plausible assumptions and scenarios (e.g., different biological growth rates, assumptions about tagging), which together represent the uncertainty that exists in the real world. They can be divided into: the 'reference set', which includes scenarios considered to be most plausible and most influential; and the 'robustness set', which includes more extreme scenarios that are still considered to be plausible but perhaps less likely than those of the reference set. If considered for testing, the latter may identify differences in performance between candidate MPs under more extreme scenarios.