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Data and information requirements for management procedure implementation

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Executive Summary

The Extended Commission for the Conservation of Southern Bluefin Tuna (CCSBT) is seeking to implement a management procedure (MP) by 2011 to provide the basis for the rebuilding of the southern bluefin tuna (SBT) stock. In order for this implementation to be successful, and for the ongoing needs of the MP to be maintained, certain data and information requirements should be met. These requirements include the collection and verification of the key data inputs that drive the MP (i.e. global catches, longline CPUE, scientific aerial survey) and the resourcing necessary to acquire that data. Information that will further inform the MP includes a regular review process, such as an annual review of the fishery indicators and stock assessments conducted every three years, and routine model code updates and maintenance. Additional work associated with the MP implementation, such as development of an MP data implementation plan, should be considered once the Commission selects an MP and gives guidance on future activities.

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Introduction

At the 2009 meeting of the Commission for the Conservation of Southern Bluefin Tuna (CCSBT), the Extended Commission decided that a management procedure (MP) should be finalised in 2010 for agreement at the 2010 Extended Commission meeting. It was further decided that an agreed MP should be implemented in 2011 and used as the basis for setting the global total allowable catch (TAC) from 2012 and beyond. To date, significant work has occurred on the MP testing and selection process (see CCSBT 2010). Discussions also need to turn to issues associated with the actual implementation and ongoing maintenance of the MP, including data and information requirements, resourcing and administrative processes. This paper builds on the significant work and discussions that occurred previously in the initial MP development years (CCSBT 2002, 2003, 2004, 2005), focusing on implementation issues.

Data Considerations

A sound and robust MP is based on the underlying key data sources and model assumptions. Importantly, the data inputs need to be robust, transparent and verifiable. At the Third Management Procedure Workshop (2004), it was noted that "implementation issues primarily pertain to the data and other inputs required to run the decision rule [in the MP], and safeguards to avoid or minimise the chances of failure of the decision rule code". Furthermore, integrity and consistency of data inputs were considered critical with respect to the implementation of an MP (CCSBT 2004).

There are numerous data considerations, besides the key data inputs, that need to be factored into the implementation of an MP. Specifically, it was recommended at the Third Management Procedure Workshop (2004) that a data implementation plan be developed as part of the MP package to be adopted by the Commission. This plan should include:

- Specification of data input requirements
- Data verification and provision rules
- Review of indicators and metarules procedures
- Administrative framework and timelines.

This recommendation is still relevant for the new MP to be adopted in 2010, and should be considered to facilitate implementation of the MP in 2011. It is recommended that a dedicated working group be established to progress these issues, either through the Extended Scientific Committee or alternatively the Strategy and Fisheries Management Working Group. Notably, the Commission has already adopted administrative procedures for general data exchange and review of indicators, and has the administrative framework largely in place, that provides a basis for the development of a specific MP data implementation plan.

Data inputs & verification

In terms of data inputs, there are three main data sources that drive the Operating Model and proposed MPs: (1) global catches (and associated demographic characteristics, i.e. length/age structures), (2) longline catch per unit effort (CPUE, reflecting exploitable biomass), and (3) scientific aerial survey index (reflecting juvenile abundance). All data sources need to be readily verified and have appropriate mechanisms in place to allow verification. At the annual meeting of the Commission (2005), the Extended Commission noted the advice of the Scientific Committee that performance of the MP was dependent on the quality of input data and their request that appropriate mechanisms be put in place to collect and validate the required data. Furthermore, the Commission recognised the need for a commitment by all Members to the timely provision of accurate validated data to ensure the MP performed as expected.

Global catches

The time series of global catches is fundamental for the Operating Model and MP; depicting the historical dynamics and future projections of the fishery. In 2006, an MP that had been developed over several years was abandoned when it was determined that there had been substantial under-reporting of catches over the previous 10–20 years. In moving forward with a new MP, it is imperative that Members have greater confidence in the global catches being reported and used in the modelling framework. Improved monitoring, control and surveillance (MCS) measures that were introduced by the Commission in 2009, particularly the Catch Documentation Scheme (CDS), will go some way towards building greater confidence in

global catch data reporting. As specified in the draft CCSBT Strategic Plan, all Members need to continue to improve their catch reporting statistics and the monitoring programs that provide a means for data verification (e.g. commercial stereo-video trials in the surface fishery and more comprehensive observer coverage of longline fleets). At the Kobe II Fisheries Management Workshop (2010) it was noted that "RFMOs should, as a matter of urgency…establish strong requirements for the provision of accurate data and information so that the status of tuna stocks can be accurately assessed." In addition, at the Kobe II Science Workshop (2010) it was reported that "tuna RFMOs should ensure adequate sampling for catch, effort and size composition across all fleets and especially distant water longliners for which this information is becoming limited". Alternate data sources and approaches, such as market data and economic analyses, should also continue to be explored as independent means of assessment of global catches, trade and domestic consumption.

Longline CPUE

The validity of the longline CPUE data series is a key factor in the success of the MP, as it is the underlying index of exploitable biomass. For increased certainty in the outcomes and directives of the new MP, the CPUE data should be independently verified, so that all Members have confidence that the data are reflective of the stock biomass. One method by which the longline CPUE data can be verified is through the implementation of a regional observer program (ROP), as is used in other regional fisheries management organisations (RFMOs) (e.g. Western and Central Pacific Fisheries Commission). Recent initiatives in the CCSBT have re-iterated the importance of having an ROP, especially as a means to verify the key data inputs for the new MP (Kirby and Begg 2010). Given the low level of coverage achieved under the current observer program, a more comprehensive ROP is required to ensure that the information driving the MP is accurate. The ROP could build on current national observer programs by facilitating the international exchange of observers among the national programs, thereby providing an independent means for data verification. Resourcing for the ROP could potentially be offset by the resources required to fund the current national observer programs.

Scientific aerial survey

The aggregated juvenile abundance index derived from the scientific aerial survey in the Great Australian Bight is another key data source used in the MP. This data source is invaluable as it is the only fisheries-independent data going into the MP, and provides a relative index of recruitment to compare against model predictions. Ongoing resourcing of this survey will be necessary for its continued input in the MP. The survey methodology and index calculation should continue to be examined, particularly when methodological approaches change (such as the move to a single spotter – see Eveson et al. 2010).

Data exchange & provision

At the Kobe II Science Workshop (2010) it was emphasised that "fine scale operational data should be made available in a timely manner to support stock assessment work, and confidentiality concerns should be addressed through RFMO rules and procedures for access protection and security of data". The 'Rules and Procedures for the Protection, Access To, and Dissemination of Data compiled by the CCSBT' should govern the sharing, exchange and provision of the key data sources for the MP, including the global catches, CPUE, scientific aerial survey, and potential ROP data. A transparent and timely data exchange and provision policy and procedures will further promote confidence in the data and resultant outcomes of the MP among Members. Exchange of the raw data among Members, subject to meeting

appropriate data confidentiality provisions, will enable all Members to calculate the respective CPUE and scientific aerial survey indices used in the Operating Model and MP.

Information, Process & Administration

Metarules

The establishment, review and implementation of metarules are core elements of the CCSBT review process supporting an adopted MP (CCSBT 2004). Metarules specify what should happen in unexpected, exceptional circumstances or when circumstances change substantially. These circumstances include when observations in the monitoring series are outside the range initially tested in the Operating Model or MP, existence of new knowledge, a new stock assessment changes the range of uncertainty previously assumed, missing data, and clear exceptional circumstances such as recruitment failure or substantial unreported catches (Basson et al. 2004, Basson and Polacheck 2005).

At the Second Strategy and Fisheries Management Working Group meeting (2010) it was noted that metarules for exceptional circumstances had been considered by past Management Procedure Workshops and the Extended Scientific Committee, and that the draft CCSBT Management Procedure Specifications (Attachment 6 of the Report of the Tenth Meeting of the Scientific Committee) contained a "Metarule Process" (see Basson and Polacheck 2005). This is a process for determining whether exceptional circumstances exist and for providing advice to the Commission on the action to take (Appendix 1). The meeting agreed that this is an appropriate process for detecting and responding to exceptional circumstances and recommended that this process be adopted by the Commission when implementing the MP. However, at the Third Operating Model and Management Procedure Technical Meeting (2010) it was agreed that a more specific refinement that is particular to the current Operating Model, robustness trials and proposed MPs is required. An initial draft of these metarule refinements is presented in Davies et al. (2010) for consideration at the Extended Scientific Committee. Importantly, the need for invoking a metarule should only be evaluated at the Extended Scientific Committee based on the relevant data and identified process (CCSBT 2005).

Review process

In implementing the MP there is a clear need to develop a process for monitoring the MP performance, particularly with respect to an improved understanding of the uncertainties incorporated in the Operating Model (see Report of the ESC for the 10th Meeting of the Scientific Committee, 2005). At the Third Meeting of the Management Procedure Workshop (2004) it was agreed a hierarchy of reviews was needed to support the MP. These included:

- Review of fishery/stock indicators each year
- Stock assessment every 3 years
- MP review every 9 years

Furthermore, the workshop noted that at the end of each review the Extended Scientific Committee would provide advice to the Commission on the condition of the stock relative to expectations of the Operating Model, and whether exceptional circumstances existed that required immediate action to revise the MP and associated TAC. Where immediate action was not required, the existing MP could continue to be used (see Appendix 1).

The recommended review process is still applicable to the new MP and should be factored into the developments of the current MP implementation process. The timing of the MP

review, however, may need to be more frequent (i.e., every 6 years), particularly at the start of the process.

Fishery indicators

Fishery indicators provide another means by which information on the status of the SBT stock can be acquired. There are a broad range of both fishery-dependent and fishery-independent indicators that are reviewed each year at the Extended Scientific Committee. Although most of the fishery indicators will not directly feed into the MP (except for the key data inputs noted above), they can be used as a means to verify the results of the Operating Model and provide insights to when exceptional circumstances may trigger the activation of MP metarules (see Attachment 1). It is therefore important that the data exchange and collaborative analyses and data reviews of fishery indicators continue on an annual basis through the Extended Scientific Committee once the MP is implemented.

Stock assessment

A comprehensive stock assessment (i.e. Operating Model) should be conducted every three years to provide critical information about the performance of the MP and the status of the stock relative to the target. This will enable the Extended Scientific Committee to determine whether the results from the Operating Model are within the bounds of the MP (i.e. one of the metarule criteria for triggering exceptional circumstances). With the implementation of measures to validate catch and effort data, such as the ROP described above, the uncertainty in the stock assessment will decrease and Members will have greater confidence in the status of the stock and progress towards the rebuilding target.

Management procedure

The MP and associated decision rules for setting the TAC should be reviewed every 6 or 9 years, following every second or third stock assessment cycle (Basson and Polacheck 2005). This will enable Members to evaluate how the MP has operated and whether management objectives have changed. It is important that once the MP is implemented, it is allowed to function without ‘tinkering’ each year (unless a review is triggered by an exceptional circumstance). This will enable industry to have greater certainty about their future operating environment in the short- to medium-term.

Model code update & maintenance

All software used in the simulation testing of the MP, the Operating Model code, as well as the MP code itself, needs to be maintained subject to good programming practices in order to preserve the integrity of the recommendations made through using this code. This means ensuring the ongoing transparency of the code and the set up of a version control system to manage software changes. Owing to the longer development time and number of modifications made in the past, the Operating Model code and projection code require a greater initial effort to increase transparency. Subsequently, maintenance would require that the practices described below would be followed whenever a change to the code was made.

Improving transparency of code would include:

- Removing redundant code – code that is obsolete but has not been removed. This will include removing code that has been 'commented out', so not active but still present. With a version control system in place, there is no need to keep this code as changes will be saved automatically.
- Streamlining code, input and output files – this would mean changes in code and input need only be made in one place. Blocks of code that are repeated would be converted into functions useable throughout the code and there would not be redundancy in output going to files.
- Generalising code – removing hard-wired values in code and putting them in user input files when these values are likely to change in the future or may want to be changed in scenario testing.
- Error checking in code – for example, checking that the user-controlled input makes sense and the model is producing values within expected ranges, else halting execution or producing warning messages.
- Internal and external documentation – including more comments in code, ensuring clear variable and function names, and updating existing external documentation to reflect a more comprehensive description of the model, code and relevant files.

The advantages of a version control system to manage code would be:

- Automated record keeping or audit trail of what changes are made in the code between versions, who made the changes and when.
- Archiving of previous code versions.
- Ability to easily revert to older versions – this may be useful in scenario testing or development, and also facilitates easier debugging of code by stepping back through changes and working versions. Previous versions of model results would also be able to be reproduced if required.
- If Member scientists could access the code from the repository managed by the version control system, code changes could be made by any one of the scientists, as well as the Independent Scientific Advisory Panel, enabling changes to be a more shared responsibility.

Before a new version of the code is committed to being the 'master' copy of the code, testing of the code would be done and communication of changes to a developer/user email list (if not to all Member scientists) would be important in this process.

Equally, the above conditions and recommendations for model code update and maintenance apply to the code used to calculate the standardised CPUE series and scientific aerial survey series.

In the immediate term, it is recommended that the model code update for the Operating Model and adopted MP occurs either via an independent third party contractor or in collaboration with key Member scientists. In either situation, dedicated resources will be required.

Ultimately, the Secretariat should have responsibility for the final model codes, including the Operating Model, MP, CPUE and scientific aerial survey.

Resourcing & administration

Implementation of the MP will require dedicated resources to develop the data implementation plan, ensure the appropriate data inputs are collected, maintained and

verified, and the MP and associated model codes are updated and maintained. The Secretariat will play a critical role in these processes, and most likely will require additional resources and/or support from Members to finalise MP development and administer the implementation of the adopted MP.

Recommendations

The implementation and maintenance of an MP comes with certain ongoing data and information requirements. These requirements include the collection and verification of the input data that drives the MP and the resourcing necessary to acquire that data. It is also important that the Members have confidence in the data going into the MP, as well as having confidence in the MP (and Operating Model) code producing the TAC recommendations. Information that will further inform the MP includes a regular review process, such as stock assessments conducted every three years, and routine model code updates and maintenance. Additional work associated with the MP implementation, such as development of the MP data implementation plan, should be considered once the Commission selects an MP and gives guidance on future activities.

The following recommendations are made in support of the MP implementation and ongoing maintenance:

1. Develop a data implementation plan, including specification of data input requirements, data verification and provision rules, review processes, and administrative and resourcing framework.
2. Appropriate mechanisms are put in place to collect and validate the key data inputs.
3. All Members continue to improve their catch reporting statistics and the monitoring programs that provide a means for data verification, as well as exploring alternate data sources and approaches, such as market data and economic analyses.
4. Improve the data exchange policy to ensure that the process is transparent and timely for key data inputs that will promote confidence in the resultant outcomes of the MP.
5. Establishment, review and implementation of a metarule process for detecting and responding to exceptional circumstances.
6. Develop a process for monitoring the MP performance, such as through periodic reviews of fishery indicators, stock assessment and the MP itself.
7. Update, maintain and make the model codes (Operating Model, MP, standardised CPUE series, scientific aerial survey index) readily accessible to all Members, as well as implement a version control system either via an independent third party contractor or in collaboration with key Member scientists.
8. A dedicated working group be established to progress these issues, either through the Extended Scientific Committee or alternatively the Strategy and Fisheries Management Working Group.

References

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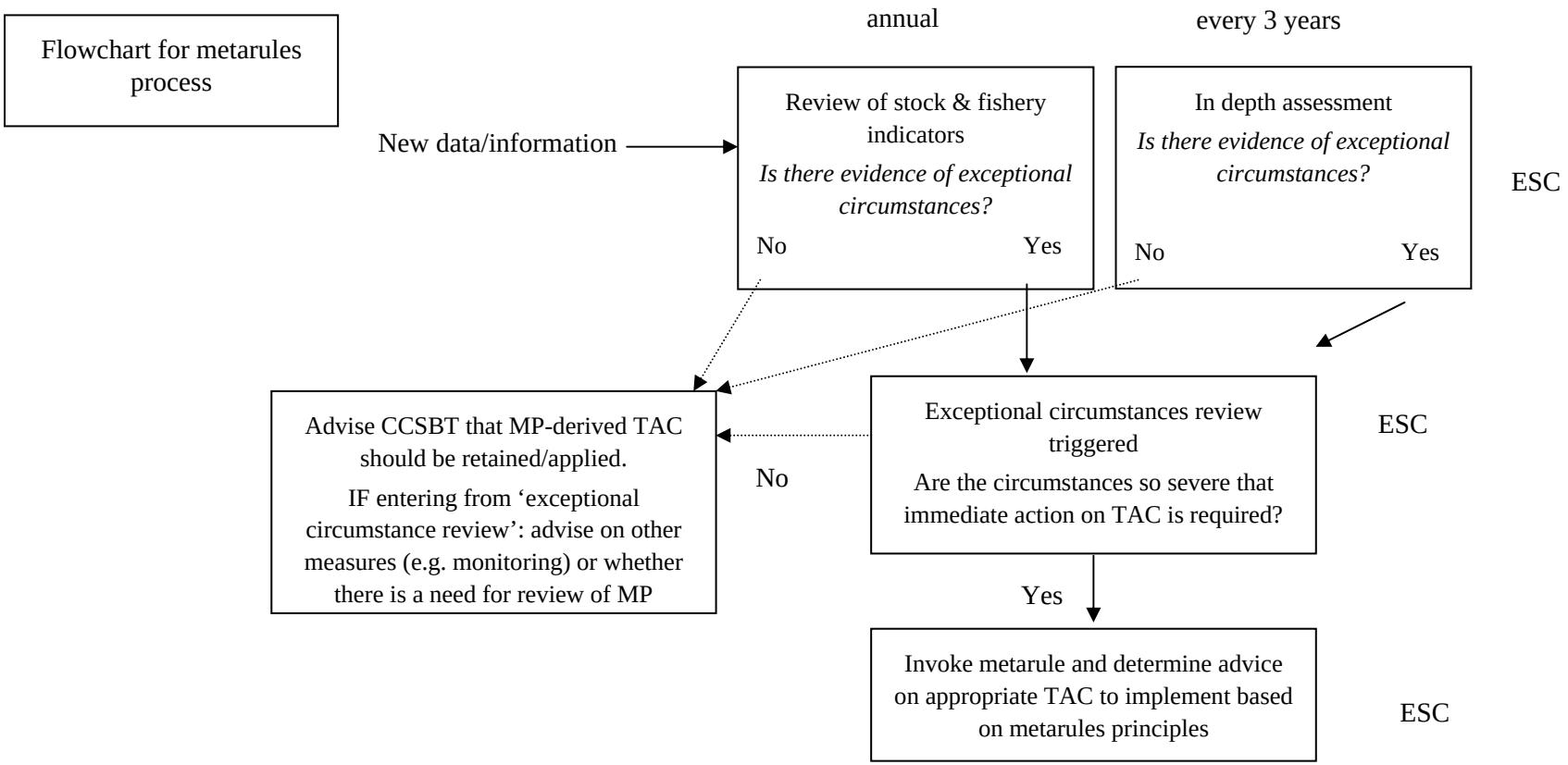
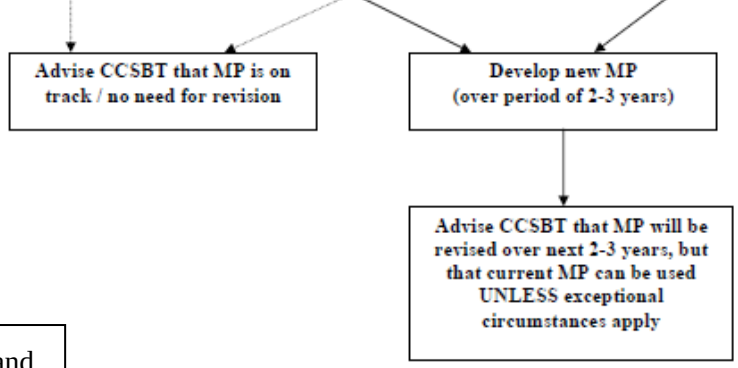
Appendix 1.

Source: Modified from Basson and Polacheck (2005)

Attachment 1



NB last box deleted as it says the same thing as "Invoke metarule and determine advice" only more explicitly



Flowchart for review and revision process