



# INDIAN OCEAN COASTAL STATES WORKSHOP ON HARVEST CONTROL RULES

3-4 February 2016

Paradise Island Resort, Maldives, K. Atoll

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Dr Shiham Adam

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Delegates at the Indian Ocean Coastal States workshop

## Meeting Summary

Representatives from 18 developing coastal states participated in the 2016 Indian Ocean Coastal States Meeting on Harvest Control Rules. The workshop's overarching objective was to ensure the shared tuna resources, which are critical to economies, communities, and cultures throughout the Indian Ocean, can continue to provide jobs, food, and development opportunities for many generations to come. To achieve this, the workshop aimed to advance the understanding of Management Strategy Evaluations (MSE) as a tool to develop harvest strategies for tuna stocks under the jurisdiction of the Indian Ocean Tuna Commission (IOTC). In recent years, there have been a number of workshops and IOTC-supported Management Procedure Dialogues on this topic. This workshop built on the momentum already generated; further advanced the understanding of these concepts; and generated collective support towards the eventual adoption of harvest strategies for key tuna fisheries at the IOTC.

During the two-day meeting, hosted by the Government of the Maldives, experts delivered presentations on the key concepts, followed by discussions among participants on the elements of fisheries management with an emphasis on the need to ensure effective management strategies of the shared tuna stocks in the Indian Ocean.



Experts led participants through a range of issues covering the precautionary approach, MSE and harvest strategies for tuna fisheries, with a focus on the Indian Ocean skipjack fishery using interactive software designed to compare the stability and risk associated with different levels of fishing and other control parameters. Through these exercises, the group worked together towards the draft of a joint proposal on a harvest strategy for skipjack tuna, which outlines how managers will respond should the stock fall below desired levels. Participants were confident that an appropriate harvest control rule (HCR) would allow all those with fishing interests in the IOTC to maximise their benefits from the skipjack tuna fisheries in a sustainable way.

By the end of the workshop, participants were more conversant on the range of topics covered and better equipped to participate at the Commission and Scientific Committee meetings on these topics. As a result of the joint work towards the skipjack HCR, it is expected that several coastal states will co-sponsor the joint proposal at the upcoming IOTC Annual Session in La Réunion in May.

The workshop for Indian Ocean developing coastal states was led by the Government of the Maldives and the International Pole & Line Foundation (IPNLF), with support and co-sponsorship from the International Seafood Sustainability Foundation (ISSF), WWF and the Marine Stewardship Council (MSC), as well as three IPNLF Members – Sainsbury's, Marks & Spencer (M&S) and World Wide Foods. The list of participants in attendance is included in Appendix I. The following summary provides a brief overview of presentations and the group's discussions over the course of the workshop.



Over 50 participants working in break out groups

## Introductory Addresses

Dr Shiham Adam, Chair of the IOTC's Working Party on Tropical Tuna and Vice Chair of the IOTC's Scientific Committee, stressed the importance of this gathering as a key step forward in the management of the shared Indian Ocean tuna stocks. From the Maldives perspective, tuna fisheries are one of the largest sources of local jobs and make a vital contribution to food security; some 150-180 kg of tuna are consumed per person per year in the country. He reiterated that the meeting will help to build the capabilities among developing coastal states to understand the tools that are available to IOTC member states to manage their fisheries in a precautionary fashion. Dr Adam recognised the value in having pre-agreed actions in place should stocks fall below expected levels, allowing all stakeholders to make the most of the fishery while minimising risk.

Dr Mohamed Shainee, Minister of Fisheries and Agriculture for the Maldives, warmly welcomed participants and emphasised the importance of having a harvest strategy formally adopted by the IOTC in his opening address. Approximately one-third of the catch of the Maldives is consumed locally with the balance being exported to earn much-needed foreign exchange for the country – the second most important sector in dollar income after tourism. For these reasons and for the collective good, the Maldives is committed to ensuring sustainability of the Indian Ocean tuna stock.



Dr Shiham Adam gave an introductory address

## Presentation on the state of play on HCRs at other RFMOs - *Gerry Scott*

Harvest strategies are being developed for several tuna species across multiple regional fisheries management organisations (RFMOs). Overall, these harvest strategies should reduce the amount of negotiations by establishing pre-agreed responses to avoid overfishing or for rebuilding an overfished stock. The performance of any harvest strategy should be explored by simulation (MSE) and scored against different performance indicators chosen by managers.

Currently, few tuna RFMOs have “implementable HCRs” in place, except for the Commission for the Conservation of Southern Bluefin Tuna (CCSBT). In recent years, limit and target reference points have been adopted as “interim” in some RFMOs, while last year ICCAT, IOTC, and WCPFC took steps on developing harvest strategies.

Within the IOTC, several positive steps have been taken, including last year’s proposal to establish limit reference points at 20% unfished levels in situations where MSY-based reference points cannot be robustly estimated. IOTC Resolution 15/10 also supports work towards HCRs by setting guidelines to avoid biomass levels below the limit reference points (LRP) and maintaining them at or above the target reference point (TRP). Work shall be completed for albacore and skipjack for presentation to the Commission in 2016.

There are many pathways of formulating HCRs that will achieve the objectives depending on time frames, risk levels, and other conflicting objectives. Examples of North Atlantic albacore at ICCAT, and WCPFC skipjack were presented. An important concept to understand when establishing overall objectives is the role of trade-offs. For instance, high catch is in conflict with overfishing. The aim of MSE is to find a strategy that meets priority objectives, and is sufficiently robust to changes in the operating model (stock status). Examples of primary objectives include: biological sustainability, economic and social benefits, ecosystem strengthening. These objectives can be evaluated using indicators, such as stock status, catch stability, and employment.

## Stock Status of Tropical Tuna Species in the Indian Ocean - *Hilario Murua*

In the Indian Ocean, recent catches of tropical tunas are around 1 million tonnes. Of this, 44% is skipjack, 44% is yellowfin and 12% is bigeye.

**Bigeye tuna** (last assessed in 2013): Currently, the Indian Ocean bigeye tuna stock is not overfished, nor subject to overfishing. If the catch remains below the estimated MSY levels then immediate management measures are not required. However, continued monitoring and improvement in data collection, reporting and analysis is required to reduce the uncertainty in assessments.

**Skipjack tuna** (last assessed in 2014): Based on the latest assessment, the Indian Ocean skipjack tuna stock is not overfished, nor subject to overfishing. If the catch remains below the estimated MSY levels, then immediate management measures are not required. However, continued monitoring and improvement in data collection, reporting and analysis is required to reduce the uncertainty in assessments.

**Yellowfin tuna** (last assessed in 2015): Based on the latest assessment, the Indian Ocean yellowfin tuna stock is considered overfished and subject to overfishing. The stock status determination changed in 2015 as a direct result of the large and unsustainable catches of yellowfin tuna taken over the last three years, and the relatively low recruitment levels estimated by the model in recent years. If the Commission wishes to recover the stock to levels above the interim target reference points with 50% probability by 2024, the Scientific Committee recommends that catches be reduced by 20% of current levels.



## Status of Indian Ocean Tuna Commission Management Strategy Evaluation Works Program - *David Wilson, IOTC Secretariat*

Many species are in a different state of the MSE process at IOTC. The process at IOTC started in earnest in 2012 when commissioners took initiative to implement the precautionary approach, recognising the Law of the Sea, the UN Fish Stock Agreement, and FAO Code of Conduct, as well as market pressures that can be brought to bear via certifications schemes. All of these encouraged the application of the Precautionary Approach, including the adoption of reference points and HCRs. In 2012, the Commission agreed to move in this direction and to adopt stock specific RPs and HCRs, and the Commission instructed the Scientific Committee (SC) to undertake MSE for four species (skipjack, albacore, yellowfin, and bigeye) and swordfish. Since then, the Commission has adopted interim TRPs and LRPs, and also adopted a programme of work in Resolution 15/10 for the development and assessment of reference points and HCRs through MSE.

The initial assessments of MSEs for skipjack and albacore are due to the Commission in 2016, and the SC will evaluate bigeye and yellowfin in 2017, for the Commission to consider in 2018. The SC and subsidiary bodies will continue to work on elements of MSE and feed those into the Management Procedures Dialogue as well as the Commission in the years ahead. All participants were asked to take time over the next days to understand the MSE process, and seek to apply discussions around skipjack to other IOTC species in the future.



**Nokome Bentley working with participants from Kenya and Tanzania on skipjack modelling**

## The Skipjack Operating Model – Structure & Conditioning - *Nokome Bentley*

The most recent version of the operating model (OM) for Indian Ocean skipjack tuna was introduced noting that overall it tracks the fishery well. It was stressed that the OM should not be used to predict future catches; rather it should be utilised to compare alternative management procedures from the simulated data using the operating model.

Also, the model allows managers to monitor how the overall size of the stock will fluctuate from year to year, and how much can be removed sustainably. The OM does not consider how catches are distributed; rather, it provides users with an understanding of how and why the size of the stock will fluctuate from year to year at different catch levels.

## Management Procedures for the Indian Ocean Skipjack Fishery

This session focused on hands-on exercises working with simple evaluations. Two terms were clearly defined for participants for these exercises:

1. Management procedure (MP) = harvest control rule (HCR) = a pre-defined set of rules for managing the fishery
2. Management strategy evaluation (MSE) = simulation-based evaluation of MP/HCR to select the best based on objectives

Management procedures take data as input (e.g. CPUE and size data) and produce management decisions as an output (e.g. catch limit). Management procedures can be tuned to suit both the objectives of stakeholders as well as the dynamics of the fish stock.

Three classes of management procedures, each with different inputs and outputs, were introduced as alternative possibilities:

1. B-Rule: model-based (assessment), recommends changes in fishing mortality or total catch
2. F-Range: model-based (assessment) or model free (tagging), recommends changes in fishing effort
3. I-Rate: model-free (CPUE), recommends a total allowable catch



All can be effective, but are closely linked to the level of information available for a specific fishery. When choosing an MP, it is important to consider what is feasible with the given level of information so that the MP can be effectively implemented. It is also important to understand that all MPs are “interim”, and will be evaluated and improved as more information about the stock and fishery becomes available. However, an MP, once adopted, should be in place for a predefined period of time (3 to 5 years) in order to be effective.

Participants tested various MPs using software that used the current skipjack operating model. Participants were able to test different classes of MPs, and discussed trade-offs related to risk (stock falling below thresholds), catch levels, and stability in small groups. Through facilitated small-group exercises, the workshop generated robust discussions around the suitability of the different classes of MPs, and there was general agreement that the B-Rule approach would be the most appropriate to apply in the case of Indian Ocean skipjack given the lack of robust CPUE and effort data.

Some participants raised the fact that skipjack is caught in a mixed fishery, which can complicate the MP. It was stressed that the interactions between tropical tunas must be incorporated, but that it should be implemented at a later stage. Similarly, future MPs could look to link environmental parameters once they are better understood. For now, environmental information would be subsumed in MSE uncertainty.

Several participants suggested that the MP process needs to start somewhere, and that it would be much easier to adopt an MP for a stock that is not overfished or subject to overfishing. It was also suggested that any MP that is agreed must be implementable. There was general acknowledgement that any MP for Indian Ocean skipjack should be approached from the most simple way, especially considering that this is the first iteration of the MP and participants are trying to maintain the stock, not rebuild it. It was suggested that the simplest approach would be use the B-Rule and relate the MP to biomass levels relative to unfished levels. Once the stock is found to be below a certain threshold, then each CPC could be required to implement reductions, and they can decide how to do that.

## Discussions on an Indian Ocean Skipjack HCR Proposal - *Dr Shiham Adam*

As a final exercise, participants worked together on a proposal that would establish an HCR for Indian Ocean skipjack tuna. Since a Maldives proposal on a skipjack HCR was deferred from the 2015 IOTC Annual Session to the upcoming 2016 Annual Session, the HCR contained in this proposal was used as a basis for discussions and revision.

Walking through the proposal allowed participants to provide feedback into the key elements of an MP, relating back to the presentations and discussions from the first day and a half. Through this exercise, several key elements for an Indian Ocean skipjack HCR were broadly supported by the group, including:

### **The objectives**

- To maintain the IOTC skipjack tuna stock in perpetuity, at levels not less than those capable of producing MSY as qualified by relevant environmental and economic factors
- To use a pre-agreed HCR to maintain the skipjack tuna stock at, or above, the interim TRP and well above the LRP

### **Target and Limit Reference Points, consistent with IOTC Resolution 15/10**

- A biomass limit reference point of 20% of unfished biomass levels (i.e.  $0.2B_0$ )
- A biomass target reference point of 40% of unfished biomass levels (i.e.  $0.4B_0$ ). This TRP takes into account difficulties involved in estimating  $B_{MSY}$  accurately for skipjack tuna
- The HCR will seek to maintain the skipjack tuna stock biomass at, or above, the TRP while avoiding the LRP

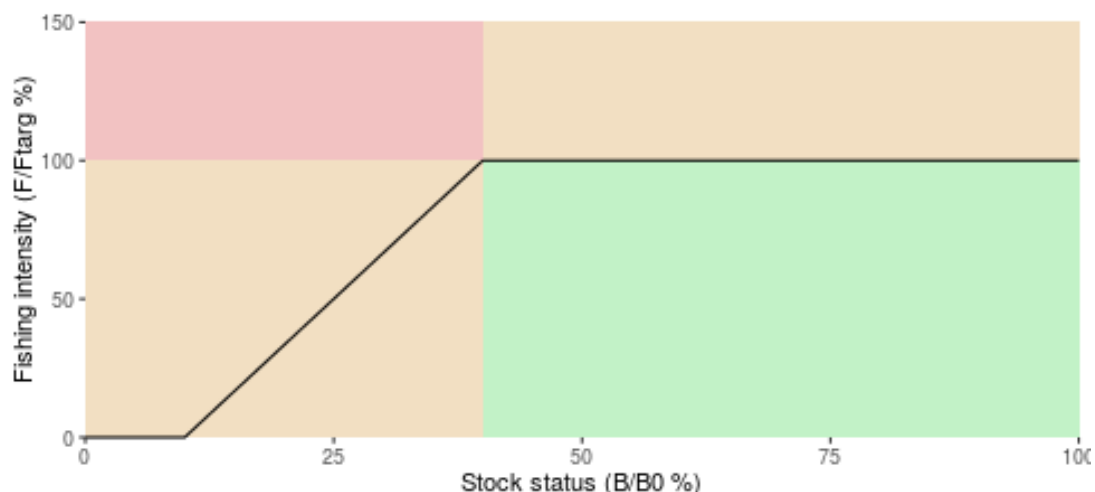
### **The class of HCR: B-Rule**

- The model-based B-Rule HCR is the most appropriate at this time because it makes use of the best available information as integrated in stock assessments. Alternative model-free HCRs, whilst potentially being appropriate in the future, are not appropriate at this time due to the high uncertainty associated with individual data series, in particular CPUE-based indices of stock abundance

### Reference case parameter values

- The HCR has three control parameters (fishing intensity, threshold level, and closure level) that can be tuned to provide better management performance with respect to the Commission's management objectives and the underlying dynamics of the stock. The values proposed for the control parameters should be considered as "reference" values which may be changed following the 3<sup>rd</sup> Management Procedures Dialogue meeting which will be held prior to the 2016 Commission meeting
- The results of evaluations of a wide range of control parameters will be presented to the 3<sup>rd</sup> Management Procedures Dialogue. After consideration of the performance statistics arising from these evaluations, the reference values may be replaced with alternative values that the Commission considers more appropriate

### Graphic Representation of the HCR



### Ongoing need for evaluation and improvement

- It is important to note that this proposal does not seek to define a permanent HCR for the Indian Ocean skipjack tuna fishery. Rather, it will be necessary to continue work on the development of alternative, potentially better performing, HCRs as more data, improved analysis methodologies, and better scientific understanding of the stock are developed

## Conclusion

While the agenda covered a wide range of topics, participants rose to the challenge over the course of the workshop. Thanks to the energetic and thoughtful engagement, the in-depth presentations on management procedures and hands-on experimentation with the skipjack-operating model, participants gained a very good understanding of HCRs and how MSE can be used to evaluate various management options.

Participants expressed a willingness to continue to work together through various IOTC meetings to progress the development of HCRs for all tuna species in the Indian Ocean, and many were hopeful that the work completed on the skipjack HCR would lead to the adoption of a proposal at the 2016 Annual Session of the IOTC.

The hosts and sponsors of the workshop expressed their gratitude to the resource professionals who guided much of the conversation, and in particular to Nokome Bentley for his development of the operating model software.



## Appendix I: List of Participants

Country/Organisation	Participant Name
Australia	Dr Ashley Williams
India	Dr Sijo Verghese
Indonesia	Dr Fayakun Satria, Mr Yayan Hernuryadin
Iran	Mr Javad Mahdavi Rosha, Mr Masoud Barani
Kenya	Dr Harrison Charo, Ms. Gladys Okemwa
Malaysia	Mr Mohd Noor bin Noordin, Mr Hj. Samsudin bin Basir
Madagascar	Mr Jean Jacques Rasamoel, Ms Fanazava Rijaso
Maldives	Dr M Shiham Adam, Mr Hussain Sinan, Mr Adam Ziyad
Mauritius	Mr Joseph Ramsamy, Mr Ravi Deendayalsing Chooreshwar Mohit
Mozambique	Ms Claudia Tomas, Avelino Munwane
Oman	Dr Ahmed Al-Mazroui, Mr Tarik Al Ma'Mari
Pakistan	Mr Maratab Ali, Mr Israr Ahmed
Seychelles	Mr Rodney Govinden, Mr Roy Clarisse
Sri Lanka	Mr M C L Fernando, Dr Chinttha Perera
Sudan	H.E prof Musa Tibin Musa, Dr Hassan Ali Osman
Tanzania	Mr Zahor El Kharousy, Mr Rashid B Hoza
Thailand	Mrs Pattira Lirdwitayaprasit, Mr Pavarote Noranarttragoon
South Africa	Qayiso Mketsu, Dr Sven Kerwath
Resource Person - SWIOFC	Daroomalingum Mauree
Resource Person - Trophia	Nokome Bentley
Resource Person - International Seafood Sustainability Foundation	Gerry P Scott
Resource Person - AZTI	Hilario Murua
International Pole & Line Foundation	Mr John Burton, Mr Adam Baske, Mr Martin Purves
Indian Ocean Tuna Commission	Mr David Wilson
WWF	Mr Wetjens Dimmlich, Mr Daniel Suddaby
ABNJ	Mr Richard Lincoln
MIFCO	Aishath Riyaz
Horizon Fisheries PVT Ltd	Mr Adnan Ali
Marine Research Centre, Maldives	Ahmed Riyaz Jauharee, Mohamed Ahusan, Mariyam Nazeefa