Indian Ocean Swordfish Management Procedure - Status Report. *

IOTC Technical Committee on Management Procedures – 4-5 June 2021

IOTC-2021-TCMP04-10

Summary of MSE work status

- The base case Operating Model (OM) for swordfish is being developed with inputs of the Working Party on Methods (WPM) and the Working Party on Billfish (WPB). The current OM is being reconditioned and has yet to be finalized and fully reviewed by either WP.
- Further developments on the swordfish MSE include an evaluation of candidate Management Procedures (MPs).
- The analysis is set to simulation-test a full MP, consisting on data collection, an agreed evaluation of stock status, and a decision rule.

Current Operating Model development

The swordfish OM has been updated to be based on the latest population and fishery models used for the assessment of the stock status of Indian Ocean swordfish, presented at the 2020 session of the Working Party on Billfish (WPB). The stock assessment explored the uncertainty with respect to various structural uncertainty assumptions and all of these elements have been incorporated in the current OM, with some other added elements. The time series plot of the operating model shows values for recruitment and abundance to be widely distributed, and enveloping assessment estimates, however with a tendency for the OM estimates of SSB to be lower and fishing mortality to be higher than the assessment estimates (Figure 1).

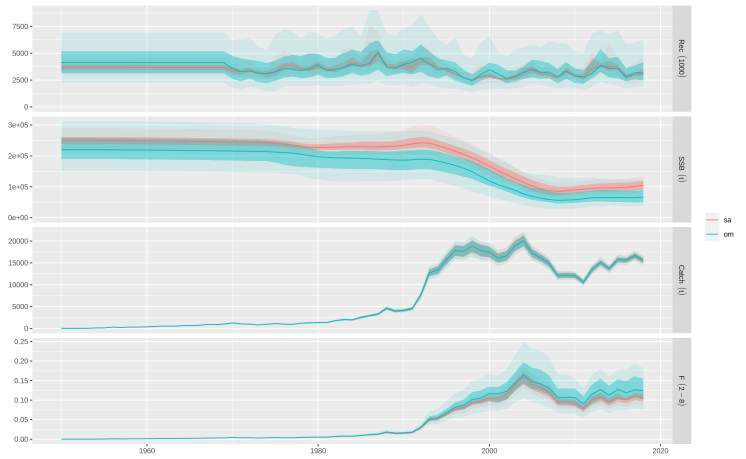

Figure 1: Population trajectories (recruitment, SSB, catch and F) estimated by the operating model grid (in blue) and the stock assessment grid (in red) for Indian Ocean swordfish. The line shows the median value, while the darker and lighter ribbons show the 33% and 90% quantiles, respectively.

*Daniela Rosa. Instituto Português do Mar e da Atmosfera (IPMA), Av. 5 de Outubro, 8700-305 Olhão, Portugal. Iago Mosqueira. Wageningen Marine Research. Haringkade 1, Postbus 68, 1976CP, IJmuiden, The Netherlands. Dan Fu. Indian Ocean Tuna Commission Secretariat, Le Chantier Mall (2nd floor), PO Box 1011, Victoria Mahé, Seychelles. Rui Coelho. Instituto Português do Mar e da Atmosfera (IPMA), Av. 5 de Outubro, 8700-305 Olhão, Portugal.

Swordfish MPs development guidance from TCMP03 (2019)

The tuning objective refers to a key management objective that the MPs can achieve precisely (e.g. achieving SB $\geq$ SB(MSY) with a 50% probability by 2024). The tuning objective normally relates to a desirable biomass (in terms of the risk of exceeding reference points and/or a rebuilding timeframe), and has a very strong influence on the obtainable yield (because biomass risk and attainable catch are closely related). Tuning ensures that candidate MPs are identical with respect to this high priority objective, making it easier to select among MPs on the basis of performance with respect to secondary management objectives (e.g. yield and catch stability). Ideally the Commission will have narrowed down the tuning objectives to 1 or 2 before selection, allowing for more focus on MP development. The TCMP03 (2018) defined 3 interim tuning objectives for exploration for swordfish:

- TS1: Pr(Kobe green zone 2030:2034) = 0.5. The stock status is in the Kobe green quadrant over the period 2030-2034 exactly 50% of the time (averaged over all simulations).
- TS2: Pr(Kobe green zone 2030:2034) = 0.6. The stock status is in the Kobe green quadrant over the period 2030-2034 exactly 60% of the time (averaged over all simulations).
- TS3: Pr(Kobe green zone 2030:2034) = 0.7. The stock status is in the Kobe green quadrant over the period 2030-2034 exactly 70% of the time (averaged over all simulations).

Further guidance on MP constraints was provided:

- Total Allowable Catch (TAC) is to be set every 3 years.
- A maximum of 15% change to the TAC (increase or decrease) relative to the previous TAC.
- A 3 year lag between data and TAC implementation.

Candidate Management Procedures

Evaluation of candidate Management Procedures for swordfish is still to be undertaken. Candidate management procedures will be of two types, model based (Figure 2) and data based (Figure 3).

M class (model-based) MPs

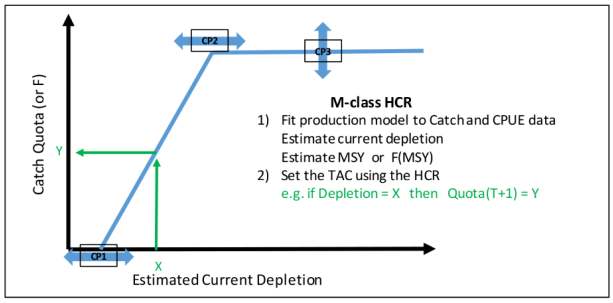

Figure 2: The model-based (M-class) MPs involve two steps: 1) fitting a simple surplus production model, and 2) applying a Harvest Control Rule (HCR) to the model estimates. The individual M-class MPs differ in terms of the Control Parameters (CP1-CP3) that define the shape of the HCR.

D class (data-based) MPs

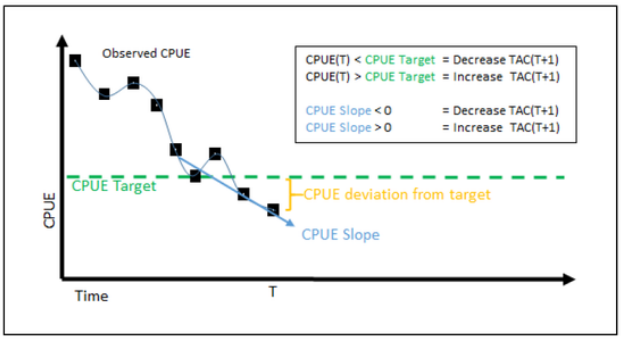

Figure 3: The data-based (D-class) MPs attempt to manage the fishery to achieve a target value of (standardized longline) CPUE. The next TAC is increased relative to the current TAC if current CPUE is above the target CPUE and the CPUE trend is increasing. Conversely, the next TAC is decreased relative to the current TAC if current CPUE is below the target CPUE and the CPUE trend is decreasing. If the CPUE location relative to the target and CPUE slope are in opposite directions, the TAC change could be in either direction, depending on the magnitude of these indicators, and the associated control parameters. Control parameters include: 1) the number of years in the CPUE slope calculation, 2) responsiveness to CPUE target deviation, 3) responsiveness to CPUE slope and 4) the CPUE target

Feedback Requests for the TCMP

The following point is provided to suggest the type of questions on which scientists could benefit from feedback and dialogue with TCMP04.

- Are there any other considerations that scientists should incorporate in the next step of the analysis?