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Consideration of Exceptional Circumstances for the Bigeye Tuna MP 2022

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Abstract

The IOTC has adopted a management procedure (MP) which will be used to recommend the Total Allowable Catch (TAC) of bigeye tuna in the Indian Ocean. As part of the MP schedule, the Commission has adopted an annual review of evidence for exceptional circumstances that could make the implementation of the TAC advice risky to the stock or fishery.

The Exceptional Circumstances Guidelines specify a three-stage process: (i) examining evidence for exceptional circumstances, (ii) determining severity and impact, and (iii) recommending any management or research action that should be taken. A wide range of information is reviewed to examine if there is evidence for exceptional circumstances, e.g., the data inputs to the MP, changes in the knowledge of stock or fishery uncertainties against which the MP was tested, and implementation of MP TAC advice.

Changes in the data used in the CPUE standardisation, a new growth curve and an alternative natural mortality scenario used in the 2022 stock assessment models were items identified as potential exceptional circumstances for the 2022 bigeye MP. Severity and impact are considered low for these items and, therefore, no research or management action on TAC is recommended.

The Exceptional Circumstances Guidelines (IOTC–2021–SC24 Appendix 6A) provide a scientific process for developing appropriate management responses to exceptional circumstances and, hence, provide transparency in TAC decision making by the Commission.

1 Introduction

The IOTC has adopted a management procedure (MP) which will be used to recommend the Total Allowable Catch (TAC) of Bigeye Tuna in the Indian Ocean. As part of the MP schedule, the Commission has adopted an annual review of evidence of exceptional circumstances that could make implementing the MP TAC advice risky. Exceptional circumstances are conditions or data that fall outside the range of uncertainties that the MP was tested against, i.e., the reference set of operating models used for Management Strategy Evaluation (MSE), and the robustness tests. The Exceptional Circumstances Guidelines (IOTC, 2021: IOTC–2021–SC24 Appendix 6A) provide a scientific process for examining evidence for exceptional circumstances, evaluating potential impacts, and developing appropriate management responses if necessary. This process of examining evidence for exceptional circumstances provides a safety-net around the MP TAC advice and transparency in TAC decision making by the Commission.

The exceptional circumstances process has three stages:

1) determine whether any exceptional circumstances exist,

2) determine the severity and impact of the exceptional circumstances on achieving the objectives of the MP, and

3) if necessary, identify the research or management actions that could be taken by the IOTC.

2 Examining evidence for the existence of exceptional circumstances in 2022

The guidelines specify the information that should be checked for evidence of exceptional circumstances. The range of uncertainties and conditions that the MP was tested against are the MSE operating models used for the final tuning of the MP (Hillary et al., 2022; Kolody & Jumppanen, 2021), and a set of robustness tests. The data input specification (e.g., standardisation of the CPUE) are specified in Williams et al. (2022) and Kitikado et al. (2022). Any changes in fishing or catches are identified in the data preparation report (IOTC, 2022a).

The following items, specified in the Exceptional Circumstances Guidelines, have been examined:

- New knowledge about the stock, population dynamics or biology,
- Changes in fisheries or fishing operations,
- Changes to input data to the MP, or missing data, or
- Inconsistent implementation of the MP advice (e.g., total catch is greater or less than the Total Allowable Catch (TAC)).

2.1 New knowledge - Stock, population dynamics or biology

2.1.1 Stock status

Preliminary information on the status of the stock is available from the 2022 stock assessment for bigeye tuna (Fu et al., 2022) which will be discussed and finalised at the WPTT meeting in 2022. The preliminary results indicate that the 2022 stock status results are similar to results from the 2019 assessment (Fu, 2019), but the stock status estimates are slightly more pessimistic. The 2022 assessment includes 3 years of updated data and the key uncertainties considered in the 24 models in the reference set are steepness, growth, natural mortality, and selectivity. We have compared the depletion estimates from the new stock assessment with the range of scenarios included in the bigeye tuna operating models (Figure 1). The stock assessment estimates of depletion are within the 90% probability interval of the projections of the operating models used to test the performance and tune the MP, and therefore there is no evidence of exceptional circumstances in relation to new information on the status of the stock. Any new information on the stock presented at WPTT should be considered further in formulating 2022 TAC advice or identified for exploration in the review of exceptional circumstances in 2023.

2.1.2 Population dynamics

The estimated population dynamics of the stock can be affected by changes to parameters in the models, e.g. new growth and natural mortality parameters. The new information on growth of bigeye tuna was presented to the WPTT in 2021 (Farley et al., 2021). The MSE operating models did not include this new growth information. The 2022 stock assessment has incorporated the new growth, and old growth, and updated data (catch, CPUE, length frequency etc) in the preliminary reference set of models. The effect of the new growth in the assessment appears to be slightly higher historical estimates of SSB but similar recent estimates, leading to more pessimistic estimates of depletion. A new natural mortality scenario was also included in the 2022 assessment. As noted above (see Figure 1), the SSB depletion timeseries from the new assessment falls within the range of operating models, and the recent estimates are within the range of the projections (which start from 2019). The scale and trends in these SSB estimates are very similar across the model results, indicating that the population dynamics are reasonably stable. Thus, there are no exceptional circumstances noted in relation to the population dynamics.

2.1.3 Biology

The new growth information, alternative natural mortality scenario and other biological parameters in the assessment (e.g. steepness) are not used in the MP or input data. None of the stock assessment results are used in the MP to set the TAC. The biomass estimates from the model component of the MP may deviate from the assessment biomass estimates (Kolody & Jumppanen, 2016), but this is expected as different assessment methods, data and model structures are explored in future. The MSE testing of the MP demonstrated that even for a wide range of potential real states of the population, the performance objectives of the Commission would be met by using the MP to calculate the TAC. As the new growth information and alternative natural

mortality scenario do not affect any inputs or parameters in the MP, there are no exceptional circumstances associated with this new information.
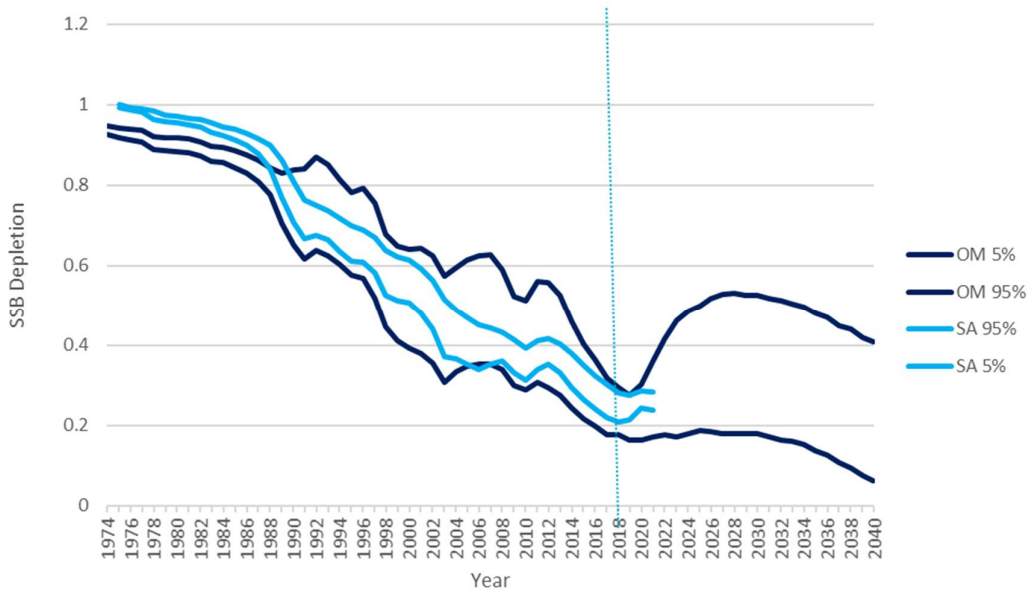

Figure 1 Comparison of the 90% probability interval for SSB depletion from the bigeye tuna MSE operating models (OM) (Hillary et al., 2022) and the 2022 stock assessment (SA) (Fu et al., 2022). The vertical line at year 2018 indicates the end of the historical years of the operating model and start of projections.

2.2   Fishery or fishing operations

There were no major changes in fisheries or fishing operations identified in the data reported to IOTC (IOTC, 2022a), and no substantial changes in data reporting or quality.

2.3   MP input data

2.3.1   Catch data

The MP uses the same catch data as prepared for the stock assessment in 2022 (IOTC, 2022b). The catch data has been collated using the same methods used in 2019 and used in MP testing. Recent catches, and the percentage of catch reported relative to estimated, is similar to previous years with no unusual or missing data (IOTC, 2022a). The WPTT(DP) has reviewed recent nominal catches, fishery features, quality and representativeness of catch data relative to previous years and have noted similar or slightly improved reporting (IOTC, 2022c). There do not appear to be any new issues or evidence for exceptional circumstances in relation to the catch data.

2.3.2 CPUE data

The CPUE data have been collated using the same methods developed in 2019 and used when testing the MP. The CPUE series is created from the spatially stratified CPUE series (Kitikado et al., 2022) and recombined using area weighting from Hoyle et al (2019), to create a single CPUE series used in the MP (Williams et al., 2022). The CPUE standardisation combines operational data from Japan, Korea and Taiwan,China longline fleets. In 2022 the operational data were not available (covid constraints restricted travel to access these data), and 1x1 data were used instead. This is a potential exceptional circumstance, however, the general trend in the 2022 series is similar to the 2019 series used in MSE operating models and the additional CPUE points fall within the 90% probability interval from the projections of the operating models (Figure 2). The severity and impact of this difference in the CPUE in 2022 is very low, and therefore no action on TAC is recommended.

The CPUE standardisation will be updated again in 2024 for the next scheduled running of the MP (a shorter interval, which will allow for an offset between running the MP and running the stock assessment). When the CPUE is updated, this potential exceptional circumstance can be further evaluated in relation to the TAC set for 2024 and 2025.
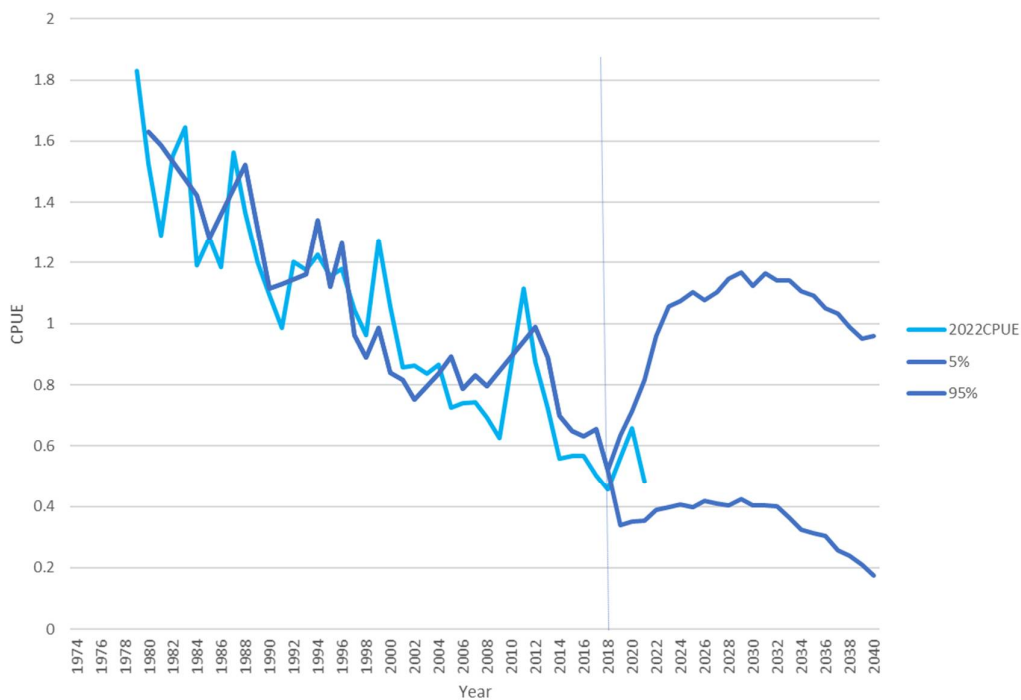

Figure 2 Comparison of the 90% probability interval for the CPUE from the bigeye tuna MSE operating models (dark blue lines) (Hillary et al, 2022) and from the 2022 CPUE series used in the MP (light blue line) (Williams et al., 2022). The vertical line at year 2018 indicates the end of the historical years of the operating model and projections start in 2019.

2.4   Catch relative to TAC

The 2022 bigeye tuna MP advice will be the first TAC to be implemented for bigeye by the IOTC, therefore an exceptional circumstance for catch relative to TAC cannot exist. Reported recent catches (IOTC, 2022b) are above the MP calculated TAC and therefore fishing will need to be constrained.

3   Discussion and Conclusion

The Exceptional Circumstances Guidelines make it clear that identifying exceptional circumstances does not necessarily result in changes to the recommended TAC. In fact, changes to the recommended TAC should be avoided except in situations where the TAC advice would pose a risk to the stock or the fishery if implemented. The alternatives are to collect more information, or do research, to inform review of evidence of exceptional circumstances in the next year or years. Another alternative is to proceed with the TAC advice (or precautionary advice) and trigger a review of the MP earlier than planned. Recommending a change to the TAC is appropriate if there is a high risk to the stock. If the TAC is to be adjusted, further evaluation of the scale and severity of the exceptional circumstance provides guidance (% change) on how to calculate an adjustment to the TAC.

A wide range of items are reviewed to examine if there is evidence for exceptional circumstances, i.e., the data inputs to the MP, the range of uncertainties against which the MP was tested, and implementation of MP TAC advice. This review is conducted annually to provide advice to the SC on any risks with the operation of the MP and TAC advice.

The 2022 preliminary updated stock assessment did not provide any new or different knowledge on the population dynamics or status of the stock. However, new information on growth was provided to the WPTT in 2021 and has been incorporated into the stock assessment in 2022, and an alternative natural mortality scenario has also been incorporated. The new growth data and natural mortality scenario did not have a substantial effect on the stock status or historical trends. These data are not used in the MP, and therefore no research or management action on TAC is recommended in relation to this new information.

This 2022 review of evidence of exceptional circumstances has identified that the data used for the CPUE standardisation was different to CPUE standardisation specification for the MP (Williams et al, 2022). Using 1x1 degree data instead of operational data in the analysis was considered to have very low impact and severity because the new CPUE trend is similar to the historical trend, and the new standardised CPUE is within the 90% probability interval of the projections. No research or management action on TAC is recommended.

The annual review of exceptional circumstances is an important component of providing management advice using an adopted management procedure. It is the safety net process that evaluates the extent to which the MP is operating as expected (from the MP testing) and identifies any risks associated with implementing the MP TAC advice. It requires consideration of evidence

for exceptional circumstances. It provides a scientific process for developing appropriate management responses if any exceptional circumstances are identified and, hence, provides transparency in TAC decision making by the Commission. From the information discussed here, there does not appear to be any need to adjust the TAC calculated by the MP.

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