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Summary analysis of the 2024 IOTC yellowfin tuna stock assessment

Introduction

Yellowfin tuna has been overexploited in the Indian Ocean since 2015, with stock assessments in 2018 and 2021 carried out by the Indian Ocean Tuna Commission (IOTC) both showing the stock to be overfished and subject to overfishing and highlighting the need for an immediate reduction in fishing pressure. The 2021 stock assessment showed that a sustained 30% catch reduction was necessary to bring about a reasonable likelihood of stock recovery by 2030[1]. This necessitated a catch limit of roughly 300,000 tonnes. However, yellowfin tuna catches have exceeded 400,000 tonnes every year since.

Despite this relentless overexploitation, the latest IOTC Working Party on Tropical Tunas (WPTT) report published in late November 2024 states that Indian Ocean yellowfin tuna is now neither overfished nor subject to overfishing. Given the implausibility of this announcement, Blue Marine Foundation approached respected fisheries scientist Dr Rainer Froese to undertake an initial analysis of the IOTC's 2024 yellowfin tuna stock assessment. In his analysis, Dr Froese highlights a number of highly concerning issues with the assessment, the corresponding management advice and the wider system under which highly migratory stocks like yellowfin tuna are assessed and managed.

Dr Rainer Froese

Dr Froese is a highly respected senior scientist at the Helmholtz Center for Ocean Research (GEOMAR) in Kiel and a Pew Fellow in Marine Conservation. Together with Dr Daniel Pauly, Dr Froese started FishBase, the world's most widely used biological information system, in 1989. Dr Froese has authored or co-authored well over 100 scientific publications. Most recently, he and Dr Pauly published an influential Perspective for *Science* which highlighted the fact that current stock assessment models overestimate productivity and recovery trajectory for marine fish populations[2].

Analysis of the IOTC 2024 yellowfin tuna stock assessment by Dr Froese

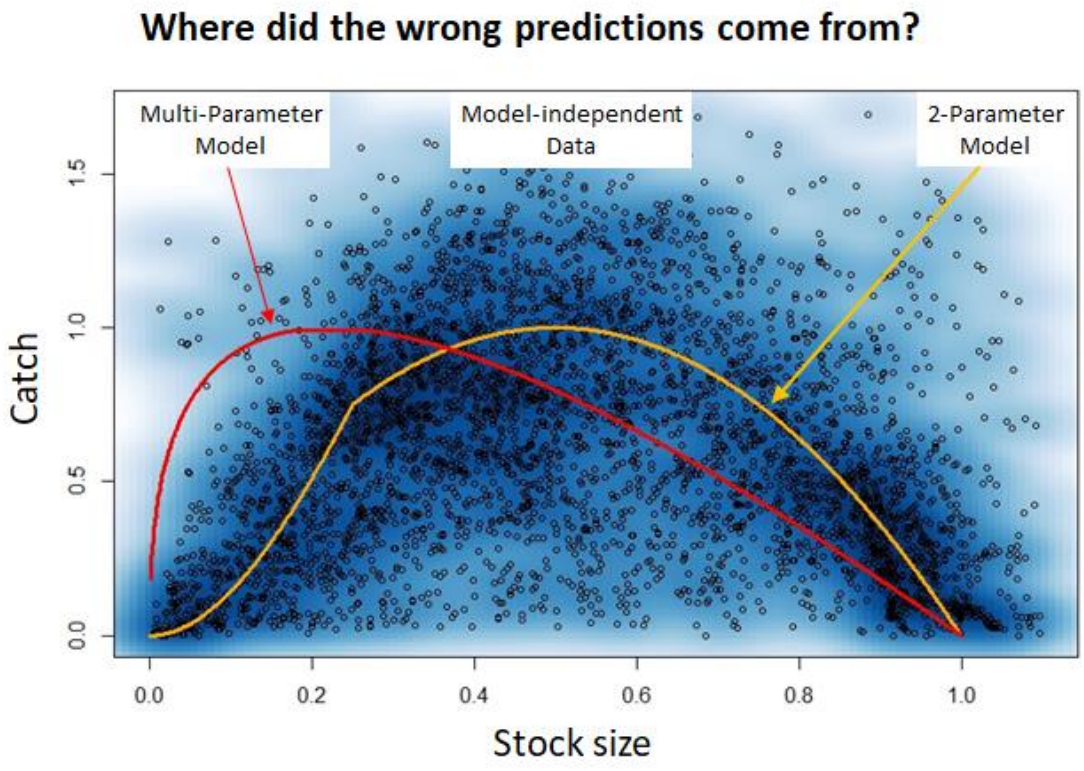
The 2021 and 2024 IOTC yellowfin tuna stock assessments were compared and analysed. On page 32 of the Report of the 26th Session of the IOTC WPTT[3], it shows Kobe plots where spawning biomass at maximum sustainable yield (SBmsy) seems to be 0.3 of the unfished stock biomass (B0). Such very low estimates of SBmsy are a bias/flaw of modern multiparameter models such

[1] Blue Marine Foundation (2022). Yellowfin tuna catches must be cut by 30 per cent to save the stock. Available: https://www.bluemarinefoundation.com/2022 /02/23/yellowfin-tuna-catches-must-be-cut-by-30-per-cent-to-save-the-stock/

[2] Rainer Froese and Daniel Pauly (2024). Taking stock of global fisheries. *Science,* Vol. 385 No. 6711. Available: https://fishbase.de/rfroese/FroesePaulyScience2024.pdf

[3] IOTC (2024). Report of the 26th Session of the IOTC Working Party on Tropical Tunas. Available: https://iotc.org/sites/default/files/documents/2024/11/IOTC-2024-WPTT26-RE_1.pdf

as Stock Synthesis. The assumption of very low peak of surplus production is not supported by available data and has been thoroughly debunked. This has been pointed out most recently in papers such as *Taking stock of global fisheries*[4], Fig. 7 of *New developments in the analysis of catch time series as the basis for fish stock assessments: The CMSY++ method*[5] and in *MSY needs no epitaph—but it was abused*[6], among other publications.



For more information on this, the full presentation is available online.

Looking at page 49 of the WPTT report, the total catch (if correct) suggests that the stock may indeed be able to support a catch level of max 350 kt, with e.g. 300 kt being a precautionary target.

Looking at Fig. 3 on page 50, there are a number of troubling issues:

1. the recruitment estimates fluctuate by a factor of four which is much too wide to support management decisions;
2. biomass estimates (SB/SB0) are far below the 50% proxy for Bmsy as used by surplus production models or the 60% recommended in ecosystem-based fisheries management to ensure that predators are able to fulfil their stabilizing ecosystem function; and

[4] Rainer Froese and Daniel Pauly (2024). Taking stock of global fisheries. *Science,* Vol. 385 No. 6711. Available: https://fishbase.de/rfroese/FroesePaulyScience2024.pdf

[5] R. Froese. et al. (2023). New developments in the analysis of catch time series as the basis for fish stock assessments: The CMSY++ method. *Acta Ichthyologica et Piscatoria* 53. Available: https://fishbase.de/rfroese/CMSY_ACTA_2023.pdf

[6] Daniel Pauly and Rainer Froese (2020). MSY needs no epitaph—but it was abused. *ICES Journal of Marine Science.* Available: https://fishbase.de/rfroese/MSY%20needs%20no%20epitaph.pdf

3. the recent steep last-year-increase in biomass is dubious and a possible wrong output of multi-parameter models, giving too much weight to dubious recruitment. The recent paper by Edgar et al. (2024)[7] goes into detail on this exact issue.

Looking at the 2021 WPTT report when the yellowfin tuna stock was last assessed, most CPUEs for yellowfin show a decline with stabilization at a very low level[8]. However, when looking at the CPUE graphs on page 51 in the 2024 WPTT report, they suddenly seem much more optimistic. Prudent management would keep catches at the previous level which supposedly allowed for the increase in biomass, before the next assessment indeed confirms recovery of biomass. Fig. 8 on page 52 clearly shows the huge uncertainty in biomass estimates, further highlighting the need for very precautionary catch decisions.

Regardless, target biomass for a healthy stock must clearly be higher than the 0.3 B0 estimate currently used. It should at least be 0.5 B0, but 0.6 B0 would be better. The 0.6 B0 target would be close to reasonable proxy estimates of maximum economic yield (MEY), i.e. slightly lower catches than MSY but higher profits due to lower cost of fishing because more fish are in the water.

Conclusion

Recent literature has highlighted the extent to which assumptions in stock assessment models generate high levels of error and uncertainty and, most concerningly, that rising trends reported for overfished stocks have been shown to be inaccurate[9]. This means that greater levels of precaution are needed when it comes to the management of overfished stocks, as emphasised by Dr Rainer Froese in his comments. This is particularly true for Indian Ocean yellowfin tuna where far too much weight has been assigned to dubious recent increases in biomass in the 2024 stock assessment, casting substantial doubt over the results of the assessment and the associated management advice.

[7] G.J Edgar et al. (2024). Stock assessment models overstate sustainability of the world's fisheries. *Science,* Vol. 385, No. 6711. Available: https://www.science.org/doi/10.1126/science.adl6282
[8] IOTC (2021). Report of the 23rd Session of the IOTC Working Party on Tropical Tunas. Available: https://iotc.org/sites/default/files/documents/2021/12/IOTC-2021-WPTT23-RE_FINAL_0.pdf
[9] G.J Edgar et al. (2024). Stock assessment models overstate sustainability of the world's fisheries. *Science,* Vol. 385, No. 6711. Available: https://www.science.org/doi/10.1126/science.adl6282