Report of the 26th Session of the IOTC Working Party on Tropical Tunas, Data Preparatory Meeting

Virtual Meeting, 12 June – 14 June 2024

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Contact details:

Indian Ocean Tuna Commission
Abis Centre
PO Box 1011
Victoria, Mahé, Seychelles
Ph: +248 4225 494
Fax: +248 4224 364
Email: IOTC-secretariat@fao.org
Website: http://www.iotc.org

ACRONYMS

aFAD	anchored Fish aggregating device
ASAP	Age-Structured Assessment Program
ASPIC	A Stock-Production Model Incorporating Covariates
ASPM	Age-Structured Production Model
B	Biomass (total)
BDM	Biomass Dynamic Model
BET	Bigeye tuna
B_0	The estimate of the unfished spawning stock biomass
B_{curr}	The estimate of current spawning stock biomass
B_{MSY}	Biomass which produces MSY
B_{thresh}	Threshold level, the percentage of B0 below which reductions in fishing mortality are required
CE	Catch and effort
CI	Confidence Interval
C_{max}	Maximum catch limit
CMM	Conservation and Management Measure (of the IOTC; Resolutions and Recommendations)
CPCs	Contracting parties and cooperating non-contracting parties
CPUE	Catch per unit of effort
current	Current period/time, i.e. $F_{current}$ means fishing mortality for the current assessment year.
D_{max}	Maximum change in catch limit
EEZ	Exclusive Economic Zone
ENSO	El Niño–Southern Oscillation
E_{targ}	The estimate of the equilibrium exploitation rate associated with sustaining the stock at B_{targ}.
EU	European Union
F	Fishing mortality; F_{2011} is the fishing mortality estimated in the year 2011
FAD	Fish aggregating device
FOB	Floating Object (or Fish aggregating devices FADs)
F_{MSY}	Fishing mortality at MSY
GLM	Generalised linear model
HBF	Hooks between floats
I_{max}	Maximum fishing intensity
IO	Indian Ocean
IOTC	Indian Ocean Tuna Commission
IWC	International Whaling Commission
K2SM	Kobe II Strategy Matrix
LL	Longline
M	Natural Mortality
MSC	Marine Stewardship Council
MSE	Management Strategy Evaluation
MSY	Maximum sustainable yield
n.a.	Not applicable
PS	Purse seine
q	Catchability
ROS	Regional Observer Scheme
RTTP-IO	Regional Tuna Tagging Project in the Indian Ocean
RTSS	RTTP-IO plus small-scale tagging projects
SC	Scientific Committee, of the IOTC
SB	Spawning biomass (sometimes expressed as SSB)
SB_{MSY}	Spawning stock biomass which produces MSY (sometimes expressed as SSB_{MSY})
SCAA	Statistical-Catch-At-Age
SKJ	Skipjack tuna
SS3	Stock Synthesis III
Taiwan, China	Taiwan, Province of China
VB	Von Bertalanffy (growth)
WPTT	Working Party on Tropical Tunas of the IOTC
YFT	Yellowfin tuna

STANDARDISATION OF IOTC WORKING PARTY AND SCIENTIFIC COMMITTEE REPORT TERMINOLOGY

SC16.07 (para. 23) The SC **ADOPTED** the reporting terminology contained in Appendix IV and **RECOMMENDED** that the Commission considers adopting the standardised IOTC Report terminology, to further improve the clarity of information sharing from, and among its subsidiary bodies.

HOW TO INTERPRET TERMINOLOGY CONTAINED IN THIS REPORT

Level 1: From a subsidiary body of the Commission to the next level in the structure of the Commission:
RECOMMENDED, RECOMMENDATION: Any conclusion or request for an action to be undertaken, from a subsidiary body of the Commission (Committee or Working Party), which is to be formally provided to the next level in the structure of the Commission for its consideration/endorsement (e.g. from a Working Party to the Scientific Committee; from a Committee to the Commission). The intention is that the higher body will consider the recommended action for endorsement under its own mandate, if the subsidiary body does not already have the required mandate. Ideally this should be task specific and contain a timeframe for completion.

Level 2: From a subsidiary body of the Commission to a CPC, the IOTC Secretariat, or other body (not the Commission) to carry out a specified task:
REQUESTED: This term should only be used by a subsidiary body of the Commission if it does not wish to have the request formally adopted/endorsed by the next level in the structure of the Commission. For example, if a Committee wishes to seek additional input from a CPC on a particular topic, but does not wish to formalise the request beyond the mandate of the Committee, it may request that a set action be undertaken. Ideally this should be task specific and contain a timeframe for the completion.

Level 3: General terms to be used for consistency:
AGREED: Any point of discussion from a meeting which the IOTC body considers to be an agreed course of action covered by its mandate, which has not already been dealt with under Level 1 or level 2 above; a general point of agreement among delegations/participants of a meeting which does not need to be considered/adopted by the next level in the Commission's structure.
NOTED/NOTING: Any point of discussion from a meeting which the IOTC body considers to be important enough to record in a meeting report for future reference.

Any other term: Any other term may be used in addition to the Level 3 terms to highlight to the reader of and IOTC report, the importance of the relevant paragraph. However, other terms used are considered for explanatory/informational purposes only and shall have no higher rating within the reporting terminology hierarchy than Level 3, described above (e.g. **CONSIDERED**; **URGED**; **ACKNOWLEDGED**).

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EXECUTIVE SUMMARY

The 26th Session of the Indian Ocean Tuna Commission's (IOTC) Working Party on Tropical Tunas (WPTT), Data Preparatory Meeting was held online using the Zoom online platform from 12 June - 14 June 2024. The meeting was opened by the Chairperson, Dr Gorka Merino (EU, Spain) who welcomed participants and Vice-Chair, Dr M. Shiham Adam (IPNLF). A total of 72 participants attended the Session (cf. 76 in 2023, 67 in 2022, and 80 in 2021). The list of participants is provided at Appendix I

The following are the recommendations from the WPTT26(DP) to the Scientific Committee, which are provided at Appendix IV

WPTT26(DP).01 (para. 114): The WPTT **RECOMMENDED** that, for fleets with good quality size data, preparation should work towards the use of standardisation, in order to make better use of the information in the data. Standardisation can be used to adjust for time-variation in selectivity caused by variation in the spatial distribution of effort. The independent review recommended to 'Spatially weight the length composition associated with the index by the estimated density (CPUE) to ensure that it represents the population rather than the catch', which is best achieved using standardization.

1. OPENING OF THE MEETING

1. The 26th Session of the Indian Ocean Tuna Commission's (IOTC) Working Party on Tropical Tunas (WPTT), Data Preparatory Meeting was held online using the Zoom online platform from 12 June - 14 June 2024. The meeting was opened by the Chairperson, Dr Gorka Merino (EU, Spain) who welcomed participants and Vice-Chair, Dr M. Shiham Adam (IPNLF). A total of 72 participants attended the Session (cf. 76 in 2023, 67 in 2022, and 80 in 2021). The list of participants is provided at Appendix I.

2. ADOPTION OF THE AGENDA AND ARRANGEMENTS FOR THE SESSION

2. The WPTT **ADOPTED** the Agenda provided in Appendix II. The documents presented to the WPTT26(DP) are listed in Appendix III.

3. THE IOTC PROCESS: OUTCOMES, UPDATES AND PROGRESS

3.1 Outcomes of the 26th Session of the Scientific Committee

3. The WPTT **NOTED** paper IOTC–2024–WPTT26(DP)–03 on the Outcomes of the 26th Session of the Scientific Committee.

4. The WPTT **NOTED** that in 2023, the SC made a number of observations in relation to the WPTT25 report (noting that updates on Recommendations of the SC26 are dealt with under Agenda item 3.4 below). Those observations are provided in the document and have not been reproduced here as they are extensive.

3.2 Outcomes of 28th Session of the Commission (IOTC Secretariat)

5. The WPTT **NOTED** paper IOTC–2024–WPTT26(DP)–05 on Outcomes of the 28th Session of the Commission.

6. **NOTING** that the Commission also made a number of general comments and requests on the recommendations made by the Scientific Committee in 2023, which have relevance for the WPTT. The WPTT **NOTED** that there were several management measures adopted during that meeting that were also of interest to the WPTT. However, the report from that meeting has yet to be finalised. As such the outcomes from those meeting could not be considered by the WPTT at this stage, but the new management measures are listed below:

- Resolution 24/01 *On Climate Change as It Relates to the Indian Ocean Tuna Commission*
- Resolution 24/02 On Management of Drifting Fish Aggregating Devices (FADs) in the IOTC Area of Competence
- Resolution 24/03 *On Establishment a List of Vessels Presumed to Have Carried Out Illegal, Unreported and Unregulated Fishing in the IOTC Area of COMPETENCE*
- Resolution 24/04 *On a Regional Observer Scheme*
- Resolution 24/05 *On Establishing a Programme for Transshipment by Large-Scale Fishing Vessels*
- Resolution 24/06 *On a Ban on Discards of Bigeye Tuna, Skipjack Tuna, Yellowfin Tuna, and Non-Targeted Species Caught by Vessels in the IOTC Record of Authorisation That Operate in the IOTC Area of Competence*
- Resolution 24/07 *On a Management Procedure for Skipjack in the IOTC Area Of Competence*
- Resolution 24/08 *On a Management Procedure for Swordfish in the IOTC Area of Competence*
- Resolution 24/09 *To promote compliance by nationals of Contracting Parties and Cooperating Non-Contracting Parties with IOTC Conservation and Management Measures*

- Resolution 24/10 *On the Promotion of the Implementation of IOTC Conservation and Management Measures*
- Recommendation 24/11 *On Marine Pollution*

3.3 Review of Conservation and Management Measures relevant to tropical tuna (IOTC Secretariat)

7. The WPTT **NOTED** paper IOTC–2024–WPTT26(DP)–05 containing a Review of Conservation and Management Measures relevant to tropical tuna. The aim of this document was to encourage participants at the WPTT26(DP) to review the existing CMMs relevant to tropical tunas.

3.4 Progress made on the recommendations of WPTT25 (IOTC Secretariat)

8. The WPTT **NOTED** paper IOTC–2024–WPTT26(DP)–06 on the Progress made on the recommendations of WPTT25. The WPTT **AGREED** to consider and revise as necessary, its previous recommendations, and for these to be combined with any new recommendations arising from the WPTT26(DP), **NOTING** that these will be provided to the SC for its endorsement.

4. Review of the Data Available at the Secretariat for Tropical Tuna Species

9. **NOTING** that comprehensive data review papers on tropical tunas were presented at the previous sessions of the WPTT held in 2023 and that little new information was available since then, the WPTT **NOTED** presentation IOTC-2024-WPTT26(DP)-07 on Yellowfin tuna data update. This presentation provides a summary of the data updates made since October 2023 and an overview of the main features of the fisheries catching yellowfin tuna in the IOTC area of competence.
10. The WPTT **ACKNOWLEDGED** that the information presented does not yet include data for the statistical year 2023, as these will become available after June 2024 in accordance with the IOTC data reporting cycle.
11. The WPTT **ACKNOWLEDGED** that about 90% of the retained catches of yellowfin tuna have been reported by the IOTC standards for the year 2022, while about 5% was repeated from previous year in the absence of new information. The WPTT **NOTED** that the main issues came from the fisheries of Yemen, Tanzania, Kenya, and Indonesia.
12. The WPTT **NOTED** the major decline in yellowfin tuna catches from deep-freezing longline fisheries in recent years, while catches from coastal longline fisheries increased. The WPTT further **NOTED** that catches from the baitboat fisheries reported in recent years were at similar levels to those observed in the 1990s.
13. The WPTT **ACKNOWLEDGED** the general lack of reporting of size-frequency data from coastal fisheries and the strong assumptions required to derive the full matrix of catch-at-size from such limited data.
14. The WPTT **ACKNOWLEDGED** the incomplete discard data available for yellowfin tuna as well as the challenges of estimating catches from IUU fishing and **ENCOURAGED** the Secretariat continue the work initiated on the estimates available from the Sea Around Us Project (SAUP) to compare and comprehend their estimation process for these catch components.
15. The WPTT **NOTED** the progress made by Indonesia, in collaboration with the Secretariat, to address the SC's requests for re-estimating the retained catches of Indonesian tuna and tuna-like fisheries for the period 2010-2022. The WPTT further **NOTED** that the work includes scaling the historical time series of catch covering 1950-2009, and that preliminary results suggest some expected major changes in the catches of yellowfin and bigeye tunas, and, to a lesser extent, skipjack tuna. The results of the analysis are expected to be presented at the WPTT26 and at the 20th session of the WPDCS to be held in late 2024.

16. The WPTT **NOTED** that the Secretariat aims to conduct a review of the information received on discards, reported through IOTC forms 1DI and ROS data submissions, to identify the main data gaps and better understand the extent of discard practices in IOTC fisheries.

17. The WPTT **ACKNOWLEDGED** the general lack of information on fishing effort in coastal fisheries and **NOTED** that the Secretariat has initiated discussions with I.R. Iran and Sri Lanka to gather information on available catch and effort data, aiming to develop abundance indices for their gillnet fisheries.

18. The WPTT **NOTED** that data reporting quality assessments are provided for each core IOTC dataset (i.e., retained catches, geo-references catches and efforts, and size frequencies) and **REQUESTED** the Secretariat to present the quality assessments by fishery. The WPTT also **REQUESTED** the Secretariat to include the quality scores in each fishery-specific dataset, **NOTING** that this would be particularly relevant for the size-frequency data.

19. The WPTT **RECALLED** that size-frequency data for the 16 IOTC species and most common pelagic sharks are available on 5x5 grids for each fleet, harmonized in fork length (FL) on regular size bins, and filtered to remove outliers (see IOTC-2020-WPDCS16-16).

20. The WPTT **NOTED** that some longline fishery-specific size-frequency datasets were excluded from stock assessments due to poor quality (see IOTC-2021-WPTT23(AS)-07) but have remained available in the datasets for the Working Parties. The WPTT **AGREED** that information on this should be made available when disseminating the data, through metadata and possibly through a flag indicating the issue identified with the data.

21. The WPTT **NOTED** that the Secretariat is working with the large purse seine fleets to obtain the raw size data with information on statistical weights, while historically, size data reported were mainly raised to total catch, **ACKNOWLEDGING** that the IOTC database contains a mix of raw and raised size data and **ENCOURAGING** the purse seine CPCs to submit historical size samples.

22. The WPTT **NOTED** the very high catches of yellowfin tuna in Oman from 2020, which followed a data review by Oman after a workshop conducted with FAO and IOTC in 2019. The fisheries are mainly composed of skiff and handline boats operating daily, where data are collected electronically at landing sites. The WPTT **NOTED** that Oman is internally reviewing its sampling protocol, with adjustments to data from 2014 where catches may have been underestimated.

23. **NOTING** the still high levels of catches of yellowfin tuna reported in the line fishery of Oman, the WPTT **QUERIED** the status of the data collection system in Oman and **NOTED** that the results of the review and revision will be presented at the 20th session of the WPDCS.

5. New Information on Biology, Ecology, Fisheries and Environmental Data Relating to Tropical Tunas

5.1 Review new information on the biology, stock structure, their fisheries and associated environmental data for skipjack tuna

24. The WPTT **NOTED** paper IOTC–2024–WPTT26(DP)–08: Scientific catch estimation for the global FAD tropical tuna purse seine fishery in the Indian Ocean, including the following abstract written by the authors:

> *"This analysis compares IOTC catch data in the public domain with an alternative estimation for associated (log school) purse seine catches based on port sampling data from the European Union sampling program aggregated by 5º square or statistical area, year and quarter."* – see document for full abstract.

25. The WPTT **THANKED** the authors for this analysis and **NOTED** the intent to explore several catch scenarios for the forthcoming stock assessment.

26. The WPTT **NOTED** paper IOTC–2024–WPTT25(DP)–09: Natural Mortality Estimates of Yellowfin Tuna (*Thunnus albacares*) in the Indian Ocean, including the following abstract written by the authors:

"Natural mortality (M) is considered one of the most influential parameters in fisheries stock assessment and management, as it relates directly to stock productivity and reference points used for fisheries management advice. M is very uncertain and difficult to estimate reliably and directly, and often other life history parameters such as growth or maximum observed age are used as proxies to get an estimate of M. Here we use 3 different theoretical estimators (one longevity-based and two growth-based) to calculate M values for Indian Ocean yellowfin tuna (Thunnus albacares). Obtained M values were 0.462, 0.542 and 0.351. However, all three methods are likely subject to bias and/or imprecision, mainly due to incomplete data focused on specific study areas and/or lack of sufficient data from the largest size classes, among others. We then combined the results obtained from the three approaches to obtain a median composite M value, estimated at 0.45 year-1, that was then scaled across age classes to calculate the age-dependent natural mortality. Estimated M-at-age values were higher than those used in the latest 2021 IOTC assessment for the first two years of life, being lower thereafter. Overall, the present study highlights the current information gaps that prevent obtaining more accurate estimates of M and calls for the need for a dedicated sampling that allows the estimate of M more effectively".

27. The WPTT **THANKED** the authors for this interesting analysis that provides alternative scenarios for natural mortality, a parameter that can be difficult to estimate internally in the models but that has a significant impact in stock assessment outcomes.

28. The WPTT **NOTED** that the different approaches tested were among those recommended by a recent review on estimation methods for natural mortality. The WPTT **NOTED** that there was inadequate information to be able to select the ideal estimation method, so all methods were incorporated into a composite estimate which is consistent with the approach taken in the previous assessment.

29. The WPTT **NOTED** that if uncertainties in growth estimates were propagated in the estimation of natural mortality, it would possibly result in CVs larger than the one currently assumed.

30. The WPTT **NOTED** that, given the fact that the maximum age might be poorly estimated in the IOTC and that life history parameters are considered to be similar across both oceans, estimates based on longevity from the Atlantic Ocean could be used as the lower bound for natural mortality, particularly taking into account the fact that studies in the Atlantic were done in areas where fishing mortality is lower and the estimate of maximum age can be less biased than in the Indian Ocean.

31. The WPTT **NOTED** the potential of epigenetic ageing to contribute to this kind of analyses, while **ACKNOWLEDGING** the need to include older fish in the calibration.

32. The WPTT **NOTED** the approach used in ICCAT, following recommendations from Dr. Then, of using the maximum observed age for longevity instead of the average maximum age for longevity-based natural mortality estimations as this is thought to better represent the longevity of the population if it were unexploited.

33. The WPTT **NOTED** that currently three estimates of natural mortality are available for this assessment so they can be used in the model grid and the developers will determine how well each is performing with the aim of ensuring that all models in the uncertainty grid are performing well statistically.

34. The WPTT **NOTED** that the Indonesian domestic catches which have been under review for some time, will be included in the stock assessment (most likely the catches submitted to WPDCS in 2023) and these data can be used as sensitivity runs in order to explore uncertainties in the model grids.

35. The WPTT **NOTED** paper IOTC–2024–WPTT25(DP)–10: Review of the stock structure of yellowfin tuna in the Indian Ocean, including the following abstract provided by the authors:

"Stock identification is an important component of fisheries stock assessments, as different stocks (i.e. semi-discrete groups offish with some definable attributes that are of interest to fishery managers sensu Begg and Waldman, 1999) may possess specific genetic, physiological or/and behavioural traits, that can influence life history processes. In the Indian Ocean a single stock of yellowfin tuna is considered for management purposes, however different studies have suggested a more complex structure. Tag-recapture results suggest fast and large-scale movements of yellowfin tuna within the western Indian Ocean, but low recovery rates have been reported in the eastern Indian Ocean. Otolith chemistry data suggested low east to west connectivity, and parasite data suggests low connectivity between central and eastern Indian Ocean. Different genetic studies have shown the existence of genetically distinct groups, with difference presence in the north and south of the equator, and also that fish captured from the Arabian Sea seem to be genetically different from those collected in other areas of the Indian Ocean. Little is known regarding natal homing behaviour of yellowfin tuna. In conclusion, it is important to promptly address the gaps in our knowledge of population dynamics and structure of yellowfin tuna in the Indian Ocean to ensure that the stock assessment reflects this structure accurately."

36. The WPTT **THANKED** the authors for the interesting and thorough review of the studies available regarding the stock structure of the species.

37. The WPTT **NOTED** that this study provided a review of the information available on the spawning behaviour of the species (from gonad and larval distribution studies), on mobility (tagging, otolith chemistry, parasites and genetics) and on natal homing. It also assessed the potential scenarios and the importance of using a regionally structured assessment under each of them.

38. The WPTT **NOTED** that information available on gonad development and larval distribution support the hypothesis that reproduction could be spatially and temporally restricted.

39. The WPTT **NOTED** that currently it is not known if yellowfin tuna exhibit homing behaviour in which they spawn in the same area throughout their life or spawn in different areas over the course of their life and further **NOTED** that it would be useful to investigate this with genetics with samples from areas where spawning is known to occur.

40. The WPTT **NOTED** that while tagging data indicate a high level of mobility, information from otolith microchemistry, parasites and genetic studies seemed to support some level of spatial structuring of yellowfin tuna in the Indian Ocean.

41. The WPTT **NOTED** that previous studies of large pelagic species have shown that relatively low levels of movement generally cause genetic homogeneity in the populations, so current results are somehow unexpected in this regard. The WPTT further **NOTED** that tagging locations were far from the main fishing grounds, which might bias the perception of fish mobility, particularly when analysing long-term recaptures.

42. The WPTT **SUGGESTED** that the same regional configuration as in the previous yellowfin tuna assessment is repeated in this assessment, but also encouraged the continuation of these studies and **NOTED** the ongoing work for the development of a conceptual model on yellowfin tuna stock structure in the IOTC. The WPTT further **NOTED** that it is useful for the group to start to consider alternative options considering the mounting evidence of the potential for there to be multiple stocks.

6. Review of New Information on the Status of Tropical Tunas

6.1 Review of fishery dynamics by fleet

6.2 Nominal and Standardized CPUE Indices

43. The WPTT **NOTED** paper IOTC–2024–WPTT26(DP)–11_Rev1: Standardised Catch per unit effort of yellowfin tuna in the Indian Ocean for the European purse seine fleet operating on floating objects, including the following abstract provided by the authors:

    "Abundance indices for yellowfin tuna (Thunnus albacares) in the Indian Ocean were derived from the European purse seine CPUE series (2010-2022) for fishing operations made on floating objects (FOB). We used two modelling approaches for CPUE standardization: generalized linear mixed model (GLMM) and spatiotemporal GLMM model (st-GLMM). Moreover, for both modelling approaches, we implemented a hurdle method, which separates the probability of a positive set and the catch (kg) per set in different components. Then, we made predictions on a prediction grid for every time step (year-quarter). To calculate the standardized CPUE per time step, we aggregated the spatial predictions based on an area-weighting approach. The two standardized CPUE series were then compared to the nominal CPUE. To remove the effects of technological improvements and FOB density, several candidate variables were tested to be included as explanatory variables".

44. The WPTT **THANKED** and **CONGRATULATED** the authors for the work, **ACKNOWLEDGING** the importance of providing information on the abundance of the juvenile component of the stock of yellowfin tuna.

45. The WPTT **NOTED** that a "positive set" in the study indicates that some yellowfin tuna were recorded in the catch of the set. It does not refer to the success of the set according to the skipper's logbook.

46. The WPTT **ACKNOWLEDGED** the approach assumes the amount of juvenile yellowfin tuna present in the tuna schools fished is an index of their abundance.

47. The WPTT **NOTED** that the clustering approach was used to account for the spatial effect in some of the models and that no spatial effect was included in the components of the model dealing with the success/failure of the fishing sets.

48. The WPTT **ACKNOWLEDGED** the similarity in the temporal trends between the purse seine CPUE index and the index of vulnerable biomass from the reference case of the last assessment, which did not include any purse seine CPUE time series.

49. The WPTT **NOTED** that the authors did not select one of the two proposed approaches to model the spatial effects (i.e., GLMM and spatio-temporal GLMM) and **AGREED** to decide on this when running the assessment model.

50. The WPTT **NOTED** that the time of day relative to sunrise was not included as covariate in the model due to a technical issue, despite previous analyses indicating that it may explain some variability in abundance. The WPTT **ENCOURAGED** the authors to address this issue and include the covariate in future analyses.

51. The WPTT **NOTED** that it was also suggested to the authors to include the colonisation rate and/or time of the DFAD in the water as covariates in the model. However, this was not possible for many observations and would substantially reduce the size and extent of the dataset.

52. The WPTT **NOTED** that the catch data were pre-processed by the T3 processing tool, meaning the species composition of the catch was derived from an aggregation of samples across quarters and

large areas, which could explain the spatial stratification derived from the clustering approach. Additionally, the WPTT **NOTED** that assessing the impact on the results is challenging because T3 only corrects the species composition of the catch, not the magnitude of the total catch per set. Consequently, the WPTT **ENCOURAGED** the authors to apply the clustering model to the raw logbook data to validate the spatial patterns identified from the processed data.

53. The WPTT further NOTED that the T3 process may create very small amounts of yellowfin tuna in some sets and that it could be useful to include a threshold on the amount of catch per set to improve the identification of positive sets.

54. The WPTT **NOTED** the significant variability between nominal and standardised CPUE indices towards the end of the time series and **QUERIED** the factors contributing to these fluctuations. The WPTT **AGREED** that influence plots would be valuable in identifying which covariates were driving these changes over time. Additionally, the WPTT **SUGGESTED** that the authors reach out to Nicholas Ducharme-Barth at the Pacific Community, who has developed R functions for influence plots tailored to non-standard GLMM approaches. The WPTT **ENCOURAGED** the authors to incorporate these results into future analyses.

55. The WPTT **NOTED** that the computation of the time series of CPUE was consistent and comparable across methods, as both GLMM and spatio-temporal GLMM models calculated the CPUE index by summing up the spatial effects across their respective domains. Specifically, the GLMM used the cluster area, whereas the spatio-temporal GLMM used the fine-scale prediction grid.

56. The WPTT **NOTED** paper IOTC–2024–WPTT26(DP)–12: Associative Behaviour-Based abundance Index (ABBI) for Yellowfin tuna (*Thunnus albacares*) in the Western Indian Ocean, including the following abstract provided by the authors:

"The traditional CPUE abundance indices used for stock assessment currently face multiple challenges due to the use of novel technologies, changes in fishing strategies and contraction of fishing effort. Since several years, the program of work of the IOTC WPTT emphasizes the need for alternative indices of abundance for tropical tuna, including abundance estimates obtained from acoustic data of echosounder buoys. This study presents the Associative Behavior-Based abundance Index (ABBI) for yellowfin tuna (Thunnus albacares) in the Western Indian Ocean. The ABBI builds on knowledge of the associative dynamics of tuna within arrays of floating objects (FOBs) obtained from non-conventional data (acoustic tagging and echosounder buoys) and conventional data (species composition and size of FOB aggregations obtained from logbook and port sampling data), to provide an alternative index of abundance to support stock assessment."

57. The WPTT **CONGRATULATED** the authors for their work and **ACKNOWLEDGED** that the method's primary advantage is that it does not require any estimation of fishing effort, which can be challenging to quantify in purse seine fisheries.

58. The WPTT **ACKNOWLEDGED** that the component of the abundance index on the proportion of FOBs occupied by tuna was estimated from data collected with the integrated echosounder device equipping the buoys of the Marine Instruments model M3I.

59. The WPTT **QUERIED** about the current coverage of these buoys, as data available to the Secretariat showed this model has been progressively replaced by new models and only contributed to about 6% of all buoys deployed in the Indian Ocean in 2023. The authors indicated that they used a threshold of at least 30 available M3I buoys per day for each stratum in their estimations. The WPTT **ENCOURAGED** the authors to anticipate the reduction of coverage of M3I buoys in the future and re-develop the method for more recent buoy models dominating the market.

60. The WPTT **NOTED** that the abundance index exhibited significant and sometimes implausible fluctuations over short time periods; for instance, the population of yellowfin tunas associated with drifting floating objects was approximately seven times higher than the average in mid-2015.

61. The WPTT **NOTED** that these variations might be explained by the uncertainties associated with the estimates of the total numbers of floating objects which were derived from the French buoy dataset, **ACKNOWLEDGING** that the availability of total buoy numbers from the IOTC since early 2020 resulted in fewer variations in the abundance indices.

62. The WPTT **AGREED** that the comparison between the different CPUE indices would be useful to assess their consistency and detect inconsistent values in some years.

63. The WPTT **NOTED** that the index comprises associated and unassociated components, emphasizing that the total population index should be used in the assessment.

64. The WPTT **NOTED** that the model only considers variability in absence time, while residence time (estimated through the Continuous Residence Time; CRT) is fixed at a mean value of 6.64 days. This value is derived from a small sample of yellowfin tunas collected in the Mozambique Channel and around the Seychelles. The WPTT **ACKNOWLEDGED** that the CRT could depend on various factors such as the number of FOBs or the environment and **ENCOURAGED** the authors to further explore how to consider this in future studies.

65. The WPTT **QUERIED** the range of values used for the Phi parameter, which relates the value of absence time to the number of drifting floating objects (FOBs). The WPTT **NOTED** that the value was derived from experiments conducted in an array of anchored FADs based on a model of correlated random walks. The WPTT **ACKNOWLEDGED** that Phi values could be different in arrays of drifting FOBs and observed that sensitivity runs indicated the results were robust to this input parameter, although significant changes in the magnitude of the abundance estimates were observed.

66. The WPTT **REQUESTED** the authors to compare the ABBI with the other abundance indices and with the vulnerable biomass derived from the last assessment model, **NOTING** that the range of sizes should include fish of weight up to 10 kg to compare the index with the SS3 outputs.

67. The WPTT **ENCOURAGED** the authors to include data from the year 2022 in the model for the yellowfin tuna assessment.

68. The WPTT **NOTED** paper IOTC–2024–WPTT26(DP)–13_Rev2: Standardized CPUE abundance indices for adult yellowfin tuna caught in free-swimming school sets by the European purse-seine fleet in the Indian Ocean, 1991-2022, including the following abstract provided by the authors:

> *"Indian Ocean EU purse seine free-swimming school catches of adult yellowfin tuna (YFT) per unit effort for 1991-2022 were standardized using a "Delta" modeling approaches consisting of three components. The first component modeled the detection rate of FSC per unit search time; the second component models the binomial probability that adult YFT are present in a set; and the third component models adult YFT biomass per set given presence assuming a log-normal distribution. Components were modeled using general additive mixed-effects models (GAMMs) including spatial, temporal, vessel, YFT quota and environmental explanatory variables. Predictions were made on a standard grid encompassing core fishing areas by quarter and robust estimate uncertainties were developed using prediction intervals. Results indicate adequate model fits. Estimated adult YFT abundance shows an upswing in estimated abundance since ~2019, consistent with a response to the implementation of a YFT quota in 2017".*

69. The WPTT **CONGRATULATED** the authors on their work and the progress made in deriving abundance indices for the assessment, based on the standardisation of purse seine CPUEs on free-swimming schools.

70. The WPTT **NOTED** that the CPUE assumes that the amount of large yellowfin tuna caught in a fished free-swimming school (FSC) is an index of abundance of adult fish, further **NOTING** that school selection prior to fishing, driving the CPUE encounter rate component, was assumed to be constant over time, e.g., with a minimum estimate of about 5 t of tuna before a purse seine is deployed.

71. The WPTT **NOTED** that the number of FSC sets made in one day was negatively correlated with search time, since this latter was computed as a function of total setting time. The WPTT **ACKNOWLEDGED** that authors re-estimated the FSC search time as daylight hours minus duration on FOB sets.

72. The WPTT **NOTED** the introduction of mixed layer depth (MLD) as a covariate in the model to account for its potential effect on tuna catchability, and the addition of another covariate to account for the effect of the implementation of the total allowable catch (TAC) for yellowfin tuna from January 2017.

73. The WPTT **NOTED** that the implementation of the TAC was found not to affect the component of the CPUE representing encounter rates, which was unexpected. Several potential reasons were assumed for this. First, during certain periods, purse seine vessels were allocated individual TACs to consume during each trip over the year, with their behaviour assumed to remain consistent throughout the year. Second, observations were made on vessels that remained active in the fishery and continued fishing throughout the year, with those reaching their quotas ceasing fishing and being excluded from the dataset.

74. The WPTT **ENCOURAGED** the authors to examine the trend of the standardised CPUE for each quarter in the last 5 years to understand the impact of the TAC, particularly in the last quarter.

75. The WPTT **NOTED** that it might be interesting to link the changes observed in relative abundance derived from the purse seine catch per set with the variability in size composition as available from size-frequency data. For instance, the increased weights could stem from an increase in fish numbers and/or from an increase in average weights.

76. The WPTT **ACKNOWLEDGED** that the comparison of the FSC CPUE index with the FOB CPUE (IOTC–2024–WPTT26(DP)–11_Rev1) and ABBI (IOTC–2024–WPTT26(DP)–12) should account for the time delays required for juveniles to mature into adult yellowfin tunas.

77. The WPTT **NOTED** that the inclusion of this CPUE index in the assessment model underscores the requirement to improve the modelling of selectivity, particularly in enhancing the incorporation of information on the size range of adult yellowfin tunas.

78. The WPTT **NOTED** paper IOTC–2024–WPTT26(DP)–14: Update of joint CPUE indices for the yellowfin tuna in the Indian Ocean based on Japanese, Korean and Taiwanese longline fisheries data up to 2023, including the following abstract provided by the authors:

    "Joint CPUE for yellowfin tuna in the Indian Ocean by the Japanese, Korean and Taiwanese longline fishery was standardized for 1975-2023 by GLM (delta-lognormal). Cluster analysis was conducted before standardization, and cluster number was used for main effect as well as year, quarter, vessel ID and five degree latitude/longitude blocks. CPUEs were successfully created based on aggregated data or subsampled operational data. Standardized CPUEs usually showed decreasing trend but was constant or increasing in recent years."

79. The WPTT **NOTED** that the 2024 collaborative study took place during an in-person workshop, and it developed a joint index for both yellowfin and bigeye tuna.

80. The WPTT **NOTED** that study developed an annual index for a configuration of four areas using operational level data with a 20% sampling rate in each region. Additionally, a quarterly index, corresponding to the temporal resolution of the 2021 assessment, was also created using aggregated data (full dataset).

81. The WPTT **NOTED** that analysts conducted clustering analysis of species composition separately for each fleet as a proxy for targeting strategy. It was suggested that hooks between float (HBF) may not accurately indicate fishing strategy, particularly in the early years of the fishery, and could be confounded with changes in line material throughout the 1990s. The cluster was included as an explanatory variable in the model, nested within the fleet. The WPTT further **NOTED** that since the model has included vessel effect, there was no necessity for fleet/country effect.

82. The WPTT **NOTED** that it had been previously suggested that in the tropical area, the cluster might not effectively indicate targeting due to the fisheries targeting a mix of species. Consequently, the species composition might be confounded with abundance. It was therefore suggested that HBF was used instead of cluster in tropical areas.

83. The WPTT **NOTED** that the in-person workshop took place over a brief period and was subject to stringent data access agreements. Therefore, there was insufficient time to perform additional analyses, such as deriving a single index for the entire stock, examining the assumption of a change in catchability around 2005/06 due to piracy, and determining regional scaling factors, etc. The WPTT also **NOTED** that attempts at standardization using the VAST model were unsuccessful because of convergence issues.

84. The WPTT **NOTED**, a notable shift in species composition around 2005/06 for both the Japanese and Taiwanese fleets, which appeared to have a large effect on the CPUE. The WPTT **AGREED** that this requires further investigation.

85. The WPTT **NOTED** that regional scaling factors, as indicators of relative biomass distribution, were based on data from a specific historical period; thus, regular updates of the analysis are not necessary. However, The WPTT **AGREED** that on-going efforts to improve the methods are valuable.

86. The WPTT **NOTED** paper IOTC–2024–WPTT26(DP)–15: Update of joint CPUE indices for the bigeye tuna in the Indian Ocean based on Japanese, Korean and Taiwanese longline fisheries data up to 2023, including the following abstract provided by the authors:

    > "Joint CPUE standardization was conducted for the Indian Ocean bigeye tuna based on Japanese, Korean and Taiwanese longline fisheries data up to 2023. The intention was to produce combined indices by increasing the spatial and temporal coverage of fishery data. In this study, to produce the indices of the Indian Ocean bigeye tuna, we used subsampled operational data due to the limitation of access to the data and time consumption during the collaborative working group meeting. To account for the inter-annual changes of the target in each fishery, information on the clustering result was used in each region. For standardizing the catch-per-unit-effort data, the conventional linear models and delta-lognormal linear models were employed for the operational and 5° grid resolution data in each region. Broadly, the trend of CPUE was similar to that for the previous stock assessment with some dissimilarity in Region 3. The models were diagnosed by the standard residual plots and influence analyses"

87. The WPTT **NOTED** that the Joint CPUE for bigeye tuna was developed for the application of the Management Procedure (Resolution 23/03) in 2024. The WPTT **NOTED** that CPUEs were preliminarily developed based on operational data, using a sub-sampling rate of 10% for areas R1N, R1S, and R2, and 1% for R3. The WPTT26 was subsequently informed that index for R3 based on a 10% sampling rate can also be made available.

88. The WPTT **NOTED** that previous standardizations had used aggregated data due to data access constraints during the COVID-19 pandemic. The WPTT pointed out that when the Management Procedure was initially tested in the MSE, operational-level CPUEs were used. The WPTT further **NOTED**, during the evaluation of the Management Procedure, CPUEs were generated from exploitable biomass with random error, which did not use aggregated or operational data.

89. Nevertheless, the WPTT **AGREED** that for the application of the Management Procedure, it is important to ensure that the methodology for CPUE standardization remains consistent. The WPTT **NOTED** that the model specification was the same as the previous standardization, with the exception of using HBF in the tropical area instead of cluster as a targeting variable. The WPTT also **NOTED** that the low sub-sampling rate may have led to the changes in the index for R1S and R3 compared to previous analysis. The large difference in sampling levels between areas may create issue when combining the regional index into a single index for input into the Management Procedure. The WPTT **AGREED** that a much higher level of sub-sampling rate is preferable.

90. The WPTT **NOTED** paper IOTC–2024–WPTT26(DP)–16_Rev2: Effort creep in longline and purse seine CPUE and its application in tropical tuna stock assessments, including the following abstract provided by the authors:

> *"This working paper investigates how catchability change may affect the indices of abundance used in Indian Ocean Tuna Commission (IOTC) stock assessments. This is an important issue for assessment outcomes and management advice. The paper begins with an overview of effort creep, placing it in context as a form of productivity increase, which allows us to learn from patterns of technological change in other industries. It considers methods for estimating effort creep, such as statistical analyses that compare catch rates between vessels with different characteristics, leading on to syntheses of analyses across multiple fisheries. For the particular case of tuna longline catch-per-unit-effort (CPUE), it examines previous work to explore factors that may affect catchability, demonstrating how the accumulation of changes in multiple areas can generate long-term growth in catchability. Syntheses of numerous effort creep studies indicate that technology creep should be assumed in all analyses involving time series of fishing effort, particularly if they exceed one decade of temporal coverage. Although index-specific estimates are often unavailable, ignoring effort creep will usually bias biomass estimates to be overly optimistic. Stock assessments should consider a range of scenarios regarding long-term catchability trends, from low to high but noting that 0% is rarely plausible. Finally, the paper proposes levels of effort creep to assume in both longline and purse seine CPUE indices"*.

91. The WPTT inquired whether it is proper to use one index (e.g., longline), which does not assume effort creep, to measure the level of effort creep in another index (e.g., purse seine). During the process, it was suggested that the base index should incorporate the recommended level of effort creep into the calculations and adjustments should be made for various scenarios.

92. The WPTT **NOTED** that the effort creep for Purse Seine can be broken down into different components, such as the speed at which a vessel locates a fish school and the size of the school. Consequently, careful consideration is necessary. The WPTT **NOTED** that the recommendations from the study are not for a specific index or components; rather, they are based on a general approach based on catch rates per day.

93. The WPTT **NOTED** that the suggested effort creep for Purse Seine free school sets exceeded those for FAD sets, which seems counterintuitive given that fewer technical advancements have occurred in fishing on free schools compared to FAD sets. The WPTT **NOTED** that these estimates derive from various sources with different biases and that currently there is a lack of available estimates.

94. The WPTT **NOTED** that many factors can influence effort creep. Gear and fishing strategies vary between countries and target versus non-target species. Some changes, like line material, may affect all species, while others, such as bait type, may predominantly impact the target species. The WPTT26 **AGREED** that extensive analysis and targeted research are necessary to produce more precise estimates.

95. The WPTT welcomed this important work and **AGREED** on the importance of making assumptions that recognise the presence of effort creep. The WPTT **SUGGESTED** including the best available estimates of effort creep as a starting point for assessments, followed by developing a robust research program to refine these estimates.

96. The WPTT **NOTED** that changes in fishing efficiency could vary across time periods and species. It is very possible that technology enhances fishing efficiency for one species but reduce it for another.

97. The WPTT **NOTED** that past Western and Central Pacific Ocean (WCPO) assessments accounted for effort creep, but less so in recent times. The current WCPO CPUE index rarely includes vessel effects, an issue that requires addressing.

98. The WPTT **NOTED** that the IATTC considered a range of 0-2% in their recent model grid for Bigeye Tuna assessment. These values, not based on specific research, were deemed plausible by an expert panel review.

99. The WPTT queried whether some technologies could be implicitly included in spatial-temporal standardization if they indicate favourable fishing locations. It was suggested that technology might be reflected through spatial factors, which would need to vary temporally to account for short-term variations.

100. The WPTT **NOTED** that a significant effort creep value could suggest a substantial reduction in biomass or even stock collapse. For example, an effort creep of 2% over 30 years implies the actual stock is half of what is estimated, while an effort creep of 4% indicates it is a third. It was noted that the stock-recruitment relationship and effort creep are somewhat interchangeable within a stock assessment. Thus, a stock assessment can be used to explore one factor if the other is known, which is not the case.

7. YELLOWFIN STOCK ASSESSMENT

7.1 Discussion on yellowfin assessment models to be developed and their specifications

101. The WPTT **NOTED** the paper IOTC–2023–WPTT25(DP)–17 Towards a conceptual model for yellowfin tuna in the Indian Ocean including the following abstract provided by the authors:

> "Yellowfin tuna (Thunnus albacares) is an important food source, employment, and livelihood for several nations worldwide. The last assessment model for this species was held in 2021, and estimated a stock status of overfished and subject to overfishing. The main goal of this document is to summarize the current knowledge on the biology of yellowfin tuna in the Indian Ocean and provide some advice relevant to the next stock assessment process. This document relies on three main references: the 2021 stock assessment report, the report of the panel review in 2023, and the findings of Langley et al. (2023) regarding recruitment and other aspects of this species, as well as recent papers on the biology of this stock. We also present analyses that provide novel insights into the dynamics of this species and the fishery. Finally, we present future research needs and hypotheses towards an implementation of a conceptual model for this stock, which is the first step of recommended good practices when implementing spatially structured assessment models."

102. The WPTT **NOTED** that the study provided a comprehensive review of information and hypotheses that could build a conceptual model preceding the development of a mathematical population model. However, the study has not yet reached the stage to define the actual conceptual model, which is a goal for the longer term. The study aims to clarify decision points to assist the assessment team in addressing key issues. Therefore, the WPTT **SUGGESTED** to involve more individuals in developing this conceptual model to ensure consideration of a broader range of elements.

103. The WPTT **NOTED** that several prior studies have examined mode progression in various fisheries, suggesting that this should be reviewed more often. It was suggested to use a GitHub repository to manage scripts and analyses based on publicly available data to avoid duplication of work.

104. The WPTT **DICSUSSED** the disappearance of mode progression in the PSFS over the last decade, noting its reoccurrence from 2019, and deliberated on possible causes. The implementation of the yellowfin quota in 2017 was noted, after which the length data seemed more varied. Changes in data quality or sampling protocols were considered unlikely as the methods used by the French, Spanish, and Seychelles PS fleets had not significantly changed in recent years. Another theory pointed to increased fishing around FOB using echo sounders in the past decade; there also seemed to be a strong year class strength persisting for several years, as supported by the CPUE data signals.

105. The WPTT **NOTED** that small fish may have been discarded in earlier years; however, since the adoption of Resolution 19/05, there has been an increase in small fish landings due to the discard ban and increasing local demand. This could explain the higher occurrence of small fish in the samples.

106. The WPTT **ACKNOWLEDGED** that the size-frequency data available at the Secretariat for the large-scale purse seine fishery were derived from different levels of processing and were mostly composed of fully raised size data (i.e., catch at size). **NOTING** that the type of data processing might affect the outputs of analyses such as modal progression, the WPTT **RECALLED** the importance of having long, homogeneous time series of raw size data (including strata weights) and **REQUESTED** that the CPCs with purse seine fisheries liaise with the Secretariat to resubmit the historical size data for the longest time series possible.

107. The WPTT **NOTED** that the analysis included some longline size data that should have undergone filtering according to a review study. The group discussed whether these data should be removed before public release due to concerns about their quality. One suggested solution was to assign a quality code or score to the data before making it available to the public so analysts could be aware of any potential issues.

108. The WPTT **NOTED** that the analysis examined certain hypotheses regarding potential population structure based on a review of available evidence. Evaluating more complex spatial structures (such as multi-stock, natal homing, etc.) may only be possible under future or next-generation stock assessment platforms. However, other hypotheses, such as local dynamics and spatial connectivity, may be viable under a stock assessment platform such as Stock Synthesis that is highly adaptable in configuring multiple area models to examine larval connectivity and time-varying movement.

7.2 Identification of data inputs for the different assessment models and advice framework

109. The WPTT **DISCUSSED** the plan for the 2024 yellowfin assessment, noting that the objective is to enhance the 2021 assessment model by incorporating concepts from the development of the conceptual model and input data. Efforts will focus on creating a new stock assessment model while addressing recommendations from the 2023 external expert panel review.

110. The WPTT **AGREED** to explore the following aspects in the assessment:

- Spatial structure with an emphasis on simpler model structures.
- Uncertainty in catch data, including new analyses of the purse seine fishery (IOTC-2024-WPTT26(DP)-08), and alternative catch estimates from Oman and Indonesia.
- Potential weighting using reporting quality scores for length composition data.
- Utilization of longline CPUE as the primary index; consideration of including PSFS/PSLS index in the uncertainty grid; exploration of the utility ABBI index.
- Alternative steepness values, specifically 0.7, 0.8, and 0.9.
- Natural mortality, with base M derived from Indian Ocean longevity estimates and exploration of other options (e.g. low M option based on Atlantic Ocean longevity estimate).
- New growth parameters (IOTC-2024-WPTT26(DP)-INF04), examination of fixed growth parameters, estimation of growth by fitting to the raw age-length data, and consideration of a two-sex model with distinct growth rates for males and females.
- Weighting of tagging data or analysis of tagging data outside the assessment model.
- Effort creep of 0.5 for the Joint LL index, exploration of alternative values as sensitivities, and estimation of effort creep for PS in relation to the Longline index.
- Diagnostics based on retrospective analysis, likelihood profiles, ASPM, trends in recruitment deviations, etc.
- Selection of models based on diagnostics; consideration of a factorial design to construct the model grid.

111. With regards to the purse seine CPUE index, the WPTT **NOTED** that the expert panel has recommended “Modelling: Do not include the PS CPUE indices as a primary abundance index in the assessment model” (IOTC-2023-WPTT25-13). The WPTT **REQUESTED** that the chair seek clarification from the expert regarding the meaning of "primary abundance index": whether it should be downweighed, used as a sensitivity analysis only, or not considered at all. Once clarified, the WPTT will decide in November how to treat the purse seine index in the assessment.

112. The WPTT also extensively **DISCUSSED** the longline index effort creep and **AGREED**, based on the review paper, to begin with the assumption that effort creep exists. The WPTT deliberated on various approaches to applying effort creep, including whether negative effort creep should compensate for piracy effects and if it should apply to a specific period. It was generally agreed that over the long term, effort creep should be positive. However, determining the level of effort creep is challenging. The group tentatively decided to use a value of 0.5, used by CCSBT in their assessments since 1969. It was acknowledged that linear effort creep is unlikely accurate, but in the absence of additional data, a linear assumption is the best starting point.

7.3 Fishery indicators

113. The WPTT **NOTED** that although there may be some issues worth addressing, the outcomes produced by the Joint CPUE groups will likely be the final results for this year's assessment. Further analysis would require an additional in-person meeting, which, due to access agreements, would be a challenge to coordinate.

8. OTHER MATTERS

114. The WPTT **RECOMMENDED** that, for fleets with good quality size data, preparation should work towards the use of standardisation, in order to make better use of the information in the data. Standardisation can be used to adjust for time-variation in selectivity caused by variation in the spatial distribution of effort. The independent review recommended to ‘Spatially weight the

length composition associated with the index by the estimated density (CPUE) to ensure that it represents the population rather than the catch', which is best achieved using standardization.

9. Review of the draft, and adoption of the Report of the 26th Session of the WPTT(DP) (Chair)

115. The report of the 26th Session of the Working Party on Tropical Tunas Data Preparatory Meeting (IOTC–2024–WPTT26(DP)–R) was **ADOPTED** by correspondence.

Appendix I
List of Participants

AUSTRALIA
Dr. Ashley Williams
CSIRO
ashley.williams@csiro.au

Dr. Don Bromhead
ABARES
Don.Bromhead@aff.gov.au

Ms. Jessica Farley
CSIRO
jessica.farley@csiro.au

Ms. Ann Preece
CSIRO
ann.preece@csiro.au

CHINA
Ms. Yanan Li
Shanghai Ocean University
liyananxiada@yeah.net

EUROPEAN UNION
Mr. Laurent Floc'h
IRD
laurent.floch@ird.fr

Dr. Giancarlo Helar Morón Correa
AZTI
gmoron@azti.es

Dr. Patricia Lastra
Fundazion AZTI
plastra@azti.es

Mrs. Ane Laborda
AZTI
alaborda@azti.es

Dr. Antoine Duparc
IRD
antoine.duparc@ird.fr

Dr. Iraide Artetxe Arrate
AZTI
iraide.artetxe@azti.es

Dr. Iker Zudaire
AZTI
izudaire@azti.es

Mr. Francisco Javier Abascal
Spanish Institute of Oceanography
francisco.abascal@ieo.csic.es

Mr. Miguel Herrera
OPAGAC
miguel.herrera@opagac.org

Dr. David Kaplan
IRD
david.kaplan@ird.fr

Dr. Igaratza Fraile
AZTI
ifraile@azti.es

Dr. Iraide Artetxe
AZTI
iraide.artetxe@azti.es

Dr. Alexandra Maufroy
ORTHONGEL
amaufroy@orthongel.fr

Dr. Gorka Merino
AZTI
gmerino@azti.es

Mr. Jon Uranga
AZTI-BRTA
juranga@azti.es

Mrs. María Lourdes Ramos Alonso
Instituto Español de Oceanografía
mlourdes.ramos@ieo.csic.es

Dr. Nekane Alzorriz
ANABAC
nekane@anabac.org

Dr. Agurtzane Urtizberea
Azti
aurtizberea@azti.es

Dr. Amaël Dupaix
IRD
amael.dupaix@ird.fr

Mrs. Manuela Capello
IRD
manuela.capello@ird.fr

INDIA
Dr. Abdul Azeez
ICAR-CMFRI
azeez.cr7@gmail.com

INDONESIA
Mrs. Riana Handayani
Ministry of Marine Affairs and Fisheries
daya139@yahoo.co.id

Mrs. Saraswati Saraswati
Ministry of Marine Affairs and Fisheries
cacasaras@gmail.com

Mrs. Putuh Suadela
Ministry of Marine Affairs and Fisheries
putuhsuadela@gmail.com

Mrs. Hety Hartaty
National Research and Innovation Agency
hhartaty@gmail.com

Mr. Irwan Jatmiko
National Research and Innovation Agency
irwa020@brin.go.id

Mr. Muhammad Anas
Ministry of Marine Affairs and Fisheries
mykalambe@yahoo.com

Mr. Miko Novri Amandra
Ministry of Marine Affairs and Fisheries
mikonovri161190@gmail.com

Mr. Satya Mardi
Ministry of Marine Affairs and Fisheries
satyamardi18@gmail.com

INDONESIA
Ms. Rennisca Ray Damanti
general secretariat
rennisca@kkp.go.id

Ms. Susiyanti
general secretariat
santiarifin@gmail.com

Mr. Krisna Fery Rahmantya
general secretariat
krisnafr@gmail.com

Mr. Romy Ardianto
general secretariat
romy.ard@gmail.com

Ms. Rosna Malika
general secretariat
alka.rosna@gmail.com

Mr. ignatius hargiyatno
IRD
ignatius.hargiyatno@ird.fr

IRAN, ISLAMIC REPUBLIC OF
Dr. farhad Kaymaram
Iranian Fisheries Science Research I institute
farhadkaymaram@gmail.com

Mr. Fariborz Rajaei
Iran Fisheries organisation
rajaeif@gmail.com

Ms. Marzieh Razaghi
Iran Fisheries organisation
marziehrazaghi.shilathormozgan@gmail.com

JAPAN
Dr. Toshihide Kitakado
Tokyo University of Marine Science and Technology
kitakado@kaiyodai.ac.jp

Dr. Takayuki Matsumoto
Fisheries Resources Institute
matsumoto_takayuki77@fra.go.jp

Ms. Yuka Matsuzawa
Fisheries Agency of Japan
yuka_matsuzawa450@maff.go.jp

KOREA, REPUBLIC OF
Dr. Junghyun Lim
National Institute of Fisheries Science
jhlim1@korea.kr

Dr. Youjung Kwon
National Institute of Fisheries Science
kwonuj@korea.kr

MALAYSIA
Ms. Effarina Mohd Faizal Abdullah
Department Of Fisheries
effarinamohdfaizal@yahoo.com

OMAN
Mr. AlMuatasam Al-Habsi
Ministry of Agricultural, Fisheries Wealth and water resources
muatasim4@hotmail.com

Mr. JOSE RAMON GARCIA-GALLARDO
Sultanate of Oman
ramon@g-gallardolegal.eu

SEYCHELLES
Ms. Elisa Radegonde
Seychelles Fishing Authority
esocrate@sfa.sc

Ms. Joanne Lucas
SFA
j.alucas@sfa.sc

SRI LANKA
Mr. kuruppuge chandrakuamara
Department of Fisheries and Aquatic Resources
ksckdumidi@gmail.com

Mr. Dinesh Peiris
Department of Fisheries and Aquatic Resources
dineshdfar@gmail.com

TANZANIA, UNITED REPUBLIC OF
Dr. Mathew Silas
Deep Sea Fishing Authority
mathew.silas@dsfa.go.tz

THAILAND
Ms. Orawan Prasertsook
Department of Fisheries
orawanp.dof@gmail.com

UNITED KINGDOM
Mr. Stuart Reeves
Cefas
stuart.reeves@cefas.gov.uk

ISSF
Dr. HIILARIO MURUA
hmurua@iss-foundation.org

THE PEW CHARITABLE TRUSTS
Dr. Glen Holmes
gholmes@pewtrusts.org

IPNLF
Dr. Shiham Adam
shiham.adam@ipnlf.org

MAP – Dalhousie
Mr. Scott Schrempf
scott.schrempf@dal.ca

SUSTAINABLE FISHERIES AND COMMUNITIES TRUST
Ms. Beatrice Kinyua
beatrice.kinyua@sfact.org

EUROPECHE
Dr. Shelton Harley
shelton_harley@hotmail.com

WWF
Mr. Umair Shahid
ushahid@wwf.org.pk

IOTC SECRETARIAT

Mr Paul De Bruyn
paul.debruyn@fao.org

Mr Dan Fu
dan.fu@fao.org

Ms Lauren Nelson
lauren.nelson@fao.org

Mr Emmanuel Chassot
emmanuel.chassot@fao.org

Ms Lucia Pierre
lucia.pierre@fao.org

Ms Cynthia Fernandez Diaz
cynthia.fernandezdiaz@fao.org

IOTC consultant
Dr. Simon Hoyle
simon.hoyle@gmail.com

Appendix II
Agenda for the 26th Working Party on Tropical Tunas, Data Preparatory Meeting

Date: 12 June - 14 June 2024

Location: Online

Venue: Virtual

Time: 12:00 – 16:00 (Seychelles time)

Chair: Dr Gorka Merino (European Union); **Vice-Chair:** Dr Shiham Adam (IPNLF)

1. **OPENING OF THE MEETING** (Chair)

2. **ADOPTION OF THE AGENDA AND ARRANGEMENTS FOR THE SESSION** (Chair)

3. **THE IOTC PROCESS: OUTCOMES, UPDATES AND PROGRESS**
   - 3.1 Outcomes of the 26th Session of the Scientific Committee (IOTC Secretariat)
   - 3.2 Outcomes of the 28th Session of the Commission (IOTC Secretariat)
   - 3.3 Review of Conservation and Management Measures relevant to tropical tunas (IOTC Secretariat)
   - 3.4 Progress on the recommendations of WPTT25 (IOTC Secretariat)

4 **REVIEW OF THE DATA AVAILABLE AT THE SECRETARIAT FOR TROPICAL TUNA SPECIES** (IOTC Secretariat)

5 **NEW INFORMATION ON BIOLOGY, ECOLOGY, FISHERIES AND ENVIRONMENTAL DATA RELATING TO TROPICAL TUNAS** (Chair)

5.1 Review new information on the biology, stock structure, their fisheries and associated environmental data for yellowfin tuna:

- Catch and effort
- Observer data
- Catch at size
- Catch at age
- Biological indicators, including age-growth curves and age–length keys

6 **REVIEW OF NEW INFORMATION ON THE STATUS OF YELLOWFIN TUNA** (Chair)

- 6.1 Review of fishery dynamics by fleet (CPCs).
- 6.2 Nominal and standardised CPUE indices.

7 **YELLOWFIN TUNA STOCK ASSESSMENT** (Chair)

- 7.1 Discussion on yellowfin tuna assessment models to be developed and their specifications.
- 7.2 Identification of data inputs for the different assessment models and advice framework.
- 7.3 Fishery indicators.

8 **OTHER MATTERS** (Chair)

9 **REVIEW OF THE DRAFT, AND ADOPTION OF THE REPORT OF THE 26th SESSION OF THE WORKING PARTY ON TROPICAL TUNAS (DATA PREPARATORY)** (Chair)

Appendix III
List of Documents for the 26th Working Party on Tropical Tunas, Data Preparatory Meeting

Document	Title
IOTC–2024–WPTT26(DP)–01a	Draft: Agenda of the 26th Working Party on Tropical Tunas (DP)
IOTC–2024–WPTT26(DP)-01b	Draft: Annotated agenda of the 26th Working Party on Tropical Tunas (DP)
IOTC–2024–WPTT26(DP)-02	Draft: List of documents for the 26th Working Party on Tropical Tunas (DP)
IOTC–2024–WPTT26(DP)-03	Outcomes of the 26th Session of the Scientific Committee (IOTC Secretariat)
IOTC–2024–WPTT26(DP)–04	Outcomes of the 28th Session of the Commission (IOTC Secretariat)
IOTC–2024–WPTT26(DP)-05	Review of Conservation and Management Measures relevant to tropical tuna (IOTC Secretariat)
IOTC–2024–WPTT26(DP)-06	Progress made on the recommendations of WPTT25 (IOTC Secretariat)
IOTC–2024–WPTT26(DP)–07	Review of Indian Ocean yellowfin tuna statistical data
IOTC–2024–WPTT26(DP)–08	Scientific catch estimation for the global FAD tropical tuna purse seine fishery in the Indian Ocean (Abascal F, Kaplan D, Gaertner D, Ramos M, Duparc A, Depetris M, Baez J)
IOTC–2024–WPTT26(DP)–09	Natural Mortality Estimates of Yellowfin Tuna (Thunnus albacares) in the Indian Ocean (Artetxe-Arrate I, Lastra-Luque P, Fraile I, Zudaire I, Correa G, Merino G, Urtizberea A)
IOTC–2024–WPTT26(DP)-10	Review of the stock structure of yellowfin tuna in the Indian Ocean (Artetxe-Arrate I, Fraile I, Lastra-Luque P, Correa G, Urtizberea A, Merino G, Zudaire I)
IOTC–2024–WPTT26(DP)–11	Standardised Catch per unit effort of yellowfin tuna in the Indian Ocean for the European purse seine fleet operating on floating objects (Correa G, Uranga J, Kaplan D, Merino G, Alonso M)
IOTC–2024–WPTT26(DP)-12	Associative Behaviour-Based abundance Index (ABBI) for Yellowfin tuna (*Thunnus albacares*) in the Western Indian Ocean (Baidai Y, Dupaix A, Dagorn L, Deneubourg J, Duparc A, Imzilen T, Capello M)
IOTC–2024–WPTT26(DP)-13	Standardized CPUE abundance indices for adult yellowfin tuna caught in free-swimming school sets by the European purse-seine fleet in the Indian Ocean, 1991-2022 (Kaplan D, Correa G, Alonso M, Duparc A, Uranga J, Santiago J, Floch L, Méndez V, Alayón P, Merino G)
IOTC–2024–WPTT26(DP)-14	Joint longline CPUE for yellowfin tuna in the Indian Ocean by the Japanese, Korean and Taiwanese longline fishery (Matsumoto T, Satoh K, Tsai W, Wang S, Lim J, Park H, Lee S)
IOTC–2024–WPTT26(DP)-15	Update of joint CPUE indices for the bigeye tuna in the Indian Ocean based on Japanese, Korean and Taiwanese longline fisheries data up to 2023 (Lim J, Matsumoto T, Lee S, Wang S, Satoh K, Park H, Tsai W, Su N, Chang S, Chang F)
IOTC–2024–WPTT26(DP)-16	Effort creep in longline and purse seine CPUE and its application in tropical tuna stock assessments (Hoyle S)
IOTC–2024–WPTT26(DP)-17	Towards a conceptual model for yellowfin tuna in the Indian Ocean (Correa G, Artetxe-Arrate I, Urtizberea A, Merino G, Zudaire I)
Information documents	
IOTC–2024–WPTT26(DP)-INF01	Age validation of yellowfin tuna Thunnus albacares in the Indian Ocean using post-peak bomb radiocarbon chronologies (Fraile I, Luque P, Campana S, Farley J, Krusic-Golub K, Clear N, Eveson P, Artetxe-Arrate I, Zudaire I, Murua H, Merino G)
IOTC–2024–WPTT26(DP)-INF02	Standardization of bigeye tuna CPUE by Japanese longline fishery in the Indian Ocean (Matsumoto T, Satoh K)
IOTC–2024–WPTT26(DP)-INF03	Standardization of yellowfin tuna CPUE by Japanese longline fishery in the Indian Ocean (Matsumoto T, Satoh K)

Document	**Title**
IOTC–2024–WPTT26(DP)-INF04	Updating the estimation of age and growth of yellowfin tuna (Thunnus albacares) in the Indian Ocean using otoliths (Farley J, Krusic-Golub K, Eveson P, Luque P, Fraile I, Artetxe-Arrate I, Zudaire I, Romanov E, Shahid U, Razzaque S, Parker D, Clear N, Murua H, Marsac F, Merino G)

Appendix IV
Consolidated recommendations of the 26th Session of the Working Party on Tropical Tunas

WPTT26(DP).01 (para. 114): The WPTT **RECOMMENDED** that, for fleets with good quality size data, preparation should work towards the use of standardisation, in order to make better use of the information in the data. Standardisation can be used to adjust for time-variation in selectivity caused by variation in the spatial distribution of effort. The independent review recommended to 'Spatially weight the length composition associated with the index by the estimated density (CPUE) to ensure that it represents the population rather than the catch', which is best achieved using standardization.