Report of the 27th Session of the IOTC Working Party on Tropical Tunas, Data Preparatory Meeting

Virtual Meeting, 11 June – 13 June 2025

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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
DFAD	Drifting Fish Aggregating Device
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 27th 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 11 June - 13 June 2025. 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 64 participants attended the Session (cf. 72 in 2024, 76 in 2023, 67 in 2022, and 80 in 2021). The list of participants is provided at Appendix I.

The meeting reviewed the available data for tropical tuna species, with a particular focus on bigeye tuna. Participants discussed the updated and revised input data for the upcoming bigeye tuna assessment, including new growth parameter estimates and CPUE indices from both longline and purse seine fisheries. The WPTT also discussed and agreed on the initial model configurations and parameters for the bigeye tuna Stock Synthesis model. Additionally, the WPTT addressed various issues related to tropical tuna, including the required input data for implementing the skipjack management procedure.

1. OPENING OF THE MEETING

1. The 27th 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 11 June - 13 June 2025. 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 64 participants attended the Session (cf. 72 in 2024, 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 WPTT **NOTED** the late submission of several key documents (e.g., bigeye tuna CPUE standarations) and **RECALLED** that the IOTC requires working papers to be submitted at least 15 days prior to the meeting. While it is recognised that delays are often caused by resource and time constraints beyond the control of the authors, the WPTT **URGED** scientists to make every effort to submit papers before the deadline to allow adequate review by meeting participants.

3. THE IOTC PROCESS: OUTCOMES, UPDATES AND PROGRESS

3.1. Outcomes of the 27th Session of the Scientific Committee

4. The WPTT **NOTED** paper IOTC–2025–WPTT27(DP)–03 on the Outcomes of the 27th Session of the Scientific Committee.

5. The WPTT **NOTED** that in 2024, the SCs endorsed the WPTT26 report including the recommended action points on joint CPUE standardizations (Appendix IX of the WPTT26 report) and agreed progress against these would be discussed further under Agenda item 3.4 (below).

3.2. Outcomes of 29th Session of the Commission (IOTC Secretariat)

6. The WPTT **NOTED** paper IOTC–2025–WPTT27(DP)–04 on Outcomes of the 29th Session of the Commission.

7. **NOTING** that the Commission also made a number of general comments and requests on the recommendations made by the Scientific Committee in 2024, 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.

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

8. The WPTT **NOTED** paper IOTC–2025–WPTT27(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 WPTT27(DP) to review the existing CMMs relevant to tropical tunas.

3.4. Progress made on the recommendations of WPTT26 (IOTC Secretariat)

9. The WPTT **NOTED** paper IOTC–2025–WPTT27(DP)–06 on the Progress made on the recommendations of WPTT26. 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 WPTT27(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

10. The WPTT **NOTED** papers IOTC-2025-WPTT27(DP)-07_1 and IOTC-2025-WPTT27(DP)-07_2 , which provided an overview of the information and data held by the Secretariat on the three oceanic tropical tuna species, with a specific focus on bigeye tuna, which is scheduled for assessment this year. The documents describe long-term catch trends, the distribution of catches across the Indian Ocean, the main characteristics of the fisheries in recent years, the reporting quality of the Secretariat's core datasets.

11. The WPTT **NOTED** that, following the review by Hoyle et al. 2021, data from certain fleets were excluded from the size dataset due to concerns about sampling quality.

12. The WPTT **NOTED** that in 2023, the total retained catches of the three tropical tuna species, as estimated by the Secretariat, exceeded 1.2 million tonnes, with bigeye tuna catches estimated at approximately 106,000 tonnes, which is about 9% of the total.

13. The WPTT **ACKNOWLEDGED** that the contribution of artisanal fisheries — defined as fishing vessels under 24 metres in length operating exclusively within the national jurisdiction areas (NJA) of coastal States — to the total catch of tropical tuna has exceeded that of industrial fisheries in recent years, accounting for approximately 55%. In contrast to yellowfin and skipjack tunas, bigeye tuna is predominantly caught by large-scale fisheries operating both in areas beyond national jurisdiction and within NJAs, contributing approximately 80% of the total catch of the species in recent years.

14. The WPTT **NOTED** that catches of tropical tunas from Indonesian fisheries have been substantially revised based on the new methodology presented at the 20th session of the WPDCS in 2024 (IOTC-2024-WPDCS20-16_Rev1) and endorsed by the SC. The methodology was applied to the period 1950–2022.

15. The WPTT **NOTED** significant differences in Indonesia's catch data between 2022 and 2023, highlighting a substantial increase in purse seine catches. This was primarily due to the Secretariat applying the legacy methodology for estimating catch composition in Indonesian coastal fisheries for the year 2023.

16. The WPTT **ACKNOWLEDGED** that Indonesia is in the process of re-estimating its 2023 catches using the same methodology applied for the period 2010–2022, and that the updated data are expected to be submitted to the Secretariat before September 2025.

17. The WPTT **NOTED** that the revised catch estimates of Indonesia have included fisheries with historical bigeye tuna catches, such as longline fisheries. Furthermore, the WPTT **HIGHLIGHTED** that uncertainty in Indonesia's purse seine catch data may be related to the association of these fisheries with AFADs, which often result in higher catches of small-sized fish.

18. The WPTT **NOTED** that the variability in the BET mean weights across various fisheries may indicate potential unreliability in the data, and that this variability is likely due to a mix of large and small fish in the catches, as well as the absence of sampling from certain fisheries, including some purse seine and other gears.

19. Furthermore, the WPTT **NOTED** that the mean weight of BET from free school fisheries may reflect differences in data availability, with more weight data reported than individual fish counts across different strata. It was observed that many large fish dominate the mean weight estimates in these cases. The WPTT also **NOTED** this effect can also be attributed to the change in fishing operations in the Mozambique Channel, the increased use of technologies such as sonar and echo sounders to target free school fisheries, leading to a higher proportion of large bigeye tuna being caught.

20. The WPTT **NOTED** an increase in the occurrence of small fish samples in recent years from purse seine fishing on free schools, compared to earlier years, **SUGGESTING** that historical data may be less reliable due to limited information on fishing mode associated with the sample data. Since purse seine fisheries were introduced around the 1980s, sampling during that period was minimal and likely biased toward larger fish. **NOTING**, that earlier sample data were often raised, compared to unraised size data in the latest years, which may affect the comparability of length-based sample sizes over time.

21. The WPTT **NOTED** continued uncertainty in the bigeye tuna catch estimates, particularly for Indonesia in 2023, and **REQUESTED** that sensitivity tests be conducted, similar to those previously applied for yellowfin tuna.

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 tropical tuna

22. The WPTT **NOTED** paper IOTC–2025–WPTT27(DP)–08, which updates the estimation of age and growth of bigeye tuna in the Indian Ocean from counts of daily and annual increments in otoliths, with the following summary provided by the authors:

> *"This paper provides an update on bigeye tuna (Thunnus obesus) (BET) otolith ageing activities in the western Indian Ocean that have occurred since Farley et al. (2021). New age estimates were obtained for 146 bigeye tuna ranging in size from 22.0 to 182.5 cm fork length (FL), using a combination of both daily (n=42) and annual (n=104) ageing methods. The youngest fish was aged 59 days and the oldest was 11.6 years. These new data were combined with age data obtained during the 'GERUNDIO' project1 (Farley et al. 2021), providing a total of 253 age estimates for analysis*" – see the paper for the full summary.

23. The WPTT **THANKED** the authors for the paper **NOTING** that it is useful to have an update on age and growth parameters for bigeye tuna ahead of the assessment. The WPTT **NOTED** that this provides an update on the Farley et al. (2021) growth curve that was included in the 2022 assessment in half of the model runs (IOTC-2021-WPTT23-05_Rev1).

24. The WPTT **NOTED** that this work includes 146 new age estimates combined with the previous data from the GERUNDIO project. The WPTT **NOTED** that the VB-LogK growth curve estimated from this study is very similar to the Farley et al. (2021) curve.

25. The WPTT **NOTED** that there were relatively fewer older fish sampled during this study and that the maximum aged individual was 14.7 years and largest fish was 182 cm. The WPTT **NOTED** that the larger fish continue to grow and would be included in the plus group in the assessment model.

26. The WPTT **NOTED** that the authors estimated sex-specific growth models which suggest males growth slightly larger than females on average; the data were insufficient, particularly in the eastern Indian Ocean, for estimating area-specific models. The WPPT **NOTED** that the authors have not yet investigated looking at individual cohorts or year groups in the analysis so **ENCOURAGED** this work to be done in the future.

27. The WPTT **NOTED** that this new growth curve differs substantially from the Eveson et al. (2015) which was used in previous assessments and was based primarily on tagging data for which the age at release may have been wrongly estimated. The WPTT **NOTED** that for the assessment conducted in 2022, both the Eveson et al. (2015) and Farley et al. (2021) growth curves were included as the group felt that the Farley curve was not derived from enough samples over a wide enough area, a problem which appears to have been overcome with this update on the study.

28. The WPTT **NOTED** that the samples all came from purse seine fleets which may introduce bias in the estimation of asymptotic length, as larger individuals occurring in deeper habitats may not be selected by this fishery.

29. The WPTT **NOTED** that the length-frequency data held by the Secretariat from the purse seine fleet fishing on schools associated with drifting floating objects may include useful and complementary information on growth, which could be incorporated into the analysis using a joint likelihood approach.

30. Therefore, the WPTT **ENCOURAGED** the CPCs to conduct more analysis investigating the model progression as well as trying to include samples from other gears, in particular longline fleets, in future analyses as longline fleets are more likely to catch larger deep-diving individuals. The WPTT **NOTED** that during the GERUNDIO project, attempts were made to collect samples from the longline fleets but this proved challenging.

31. The WPTT **AGREED** to start with the Eveson et al. (2015) growth curve in the assessment to maintain continuity with the 2022 model and the new Eveson et al. (2025) growth curve will then be introduced to evaluate the impact of this.

32. The WPTT **NOTED** that during the 2024 yellowfin stock assessment, age-length data was incorporated into the assessment model as a sensitivity run and these data were used to estimate the growth parameters within the SS3 model. The WPTT **SUGGESTED** that this approach could be explored for this year's bigeye assessment using the data from the Eveson et al. (2025) study.

33. The WPTT **REQUESTED** the authors to share the age and length data from this study with the stock assessment modellers for inclusion in the assessment.

34. The WPTT **NOTED** that in 2024 the Secretariat organised a workshop in Sri Lanka which focused on species identification and sampling best practices and **NOTED** the intention to organise another for this year.

35. The WPTT further **NOTED** that the Secretariat are also planning a project to develop a regional sampling program around the Indian Ocean, in line with the IOTC Strategic Science Plan (IOTC-2024-SC27-18). The sampling will involve collecting length-frequency information for neritic species as well as collecting samples for genetic and aging analyses. The WPTT **NOTED** that bigeye could be included as a priority species for the otolith sampling in order to get a wider range of samples from different gears and areas.

36. The WPTT **NOTED** paper IOTC–2025–WPTT27(DP)–11, which updates the Bayesian Skipjack tuna CPUE Standardization for the Maldives Pole and Line Fishery for 1995–2024, with the following summary provided by the authors:

> *"The Maldives Pole-and-line CPUE index remains a key input for stock assessment and management procedure of Skipjack tuna. This paper presents an updated Maldives Pole-and-line Skipjack tuna CPUE series for use in the application of the empirical Skipjack tuna Management Procedure (SKJ MP) adopted under the Resolution 24/07. The updated series, incorporating data from 2023 and 2024, follows the methodology as in IOTC-2023-WPTT25(DP)-13 and is required for the first application of SKJ MP. Results indicate a slight decline in skipjack abundance from a 2022/23 peak, with trends consistent with historical cycles observed between 2000 and 2010. The updated index closely matches previous estimates (1995–2022). While future revisions and development could improve the index, this update is submitted for review by the 27th Working Party on Tropical Tuna – Data Preparatory Meeting, ahead of SKJ MP application".*

37. The WPTT **THANKED** the authors for the paper, which followed the methodology as described in Medley et al. 2020, and applied to derive indices of abundance from catch rates of skipjack and

yellowfin tunas caught in the Maldivian pole-and-line fishery 1995-2022 (Medley et al. 2023, IOTC-2023-WPTT25(DP)-13).

38. The WPTT **NOTED** that the updated index was presented with inclusion of new data from 2023 and 2024, and following the methodology as previously applied in IOTC-2023-WPTT25(DP)-13). The WPTT further **NOTED** that the update was presented to support SKJ MP application and hence no new developments or structural modifications were introduced to the underlying model.

39. The WPTT **NOTED** that the authors compared the observed and expected residuals for diagnostics, and they showed significant differences, though all diagnostics are very similar to the diagnostic results seen in the last CPUE produced using the same methodology (i.e. IOTC-2023-WPTT25(DP)-13)).

40. The WPTT **NOTED** that the effect of vessel size on CPUE is confounded with other factors contributing to increased fishing power (e.g., motorisation), and that previous attempt to disentangle the contributions of these different factors through expert opinion was not successful.

41. The WPTT **NOTED** that the authors previously investigated the impact of vessel size extensively as a covariate as this has been the factor that has shown the most change as the fishery developed and so is important for estimating the fishing power through time. The WPTT further **NOTED** that other factors such as the engine power and number of poles appear to correlate with the trend of the increasing size of the vessels. The WPTT **NOTED** that while the number of poles has been recommended as a suitable factor for standardisations in the past, this is strongly correlated with the vessel length – i.e. the longer the vessel, the more fishermen and so poles can be used onboard. The WPTT **NOTED** the intention of the authors to re-evaluate these factors with the use of more extensive logbook data in the future.

42. The WPTT **NOTED** that during analysis there was some consideration of the cooperative nature of the pole-and-line fisheries in terms of locating fishing schools but this needs to be further investigated in the future.

43. The WPTT **NOTED** that no information on school type is available for catch data reported from the Maldivian pole-and-line fishery. All geo-referenced catch is aggregated into an 'unclassified' category rather than being disaggregated by association type, making it difficult to determine the proportion of catch by association type. The WPTT **ACKNOWLEDGED** that following the data submission requirements in AFAD resolution (23/01), Maldives have recently improved its catch reporting to include AFAD associated fishing mode.

44. By contrast to catch data, length-frequency data have been reported to the Secretariat with school type information since 2012. The WPTT **NOTED** that the size composition of catches in the Maldives does not appear to differ depending on whether the catch is associated with a FAD or not.

45. The WPTT further **NOTED** that the length-frequency data for skipjack tuna caught in pole-and-line fishery appears to show a bi-modal distribution which suggests that large skipjack may be caught in free schools. The WPTT **NOTED** that the authors are aware of this distribution and Maldives have been attempting to consider this during sampling to improve representativeness and avoid introducing bias.

46. The WPTT **NOTED** that the locations of the AFADs are known by latitude and longitude but catch are recorded by grids (, i.e., https://keyolhu.mv/home/fadlist), so it may be possible to attempt to overlay the catch data with AFAD locations to try to determine catches associated with AFADs and **NOTED** that this may be considered in future CPUE standardization work.

47. The WPTT **NOTED** that the AFADs are important for socio-economic reasons primarily as they provide a backup fishing location for when fishers are prevented from fishing further out due to weather or other factors. The WPTT **NOTED** that the authors do not consider this to have a large impact on catchability but this needs further exploration.

48. The WPTT **NOTED** that environmental conditions were not specifically considered as co-variates in the standardisation but there is some spatial separation incorporated.

49. The WPTT **NOTED** paper IOTC–2025–WPTT27(DP)–13, which updates the long time series CPUE standardization for skipjack tuna of the EU purse-seine fishery on floating objects in the Indian Ocean, with the following summary provided by the authors:

    "In 2023, a 1-component GAMM model to standardize SKJ catch per FOB set of the Indian Ocean EU purse-seine fleet for the period 1991-2021 was presented (Kaplan et al. 2023a). This paper updates that model to include data for the period 2022-2023 for the SKJ management strategy evaluation (MSE) process. Results indicate a downward trend in SKJ catch per set since 2018."

50. The WPTT **NOTED** that the series presented here only runs up until 2023. The WPTT **ENCOURAGED** the authors to re-run the analysis to include the 2024 data ahead of Management Procedure that will be run during the WPM.

51. The WPTT **NOTED** that in the future it may be preferable to present only the standardisation method during the data preparatory meeting, rather than the full series. Since data from the previous year may not yet be fully available or quality-checked at that time, it would be more efficient to conduct the analysis later in the year to avoid duplicating work.

52. The WPTT **NOTED** that the time series indicates a downward trend in the abundance estimate beginning around 2018. The WPTT **NOTED** that this coincides with the adoption of management measures for yellowfin tuna, which led the purse seine fleet to increasingly target skipjack schools instead. The WPTT **NOTED** that this shift in effort will have put additional pressure on the skipjack stock, hence the observed decline in CPUE. The WPTT **NOTED** that this decreasing trend also seemed to appear in the Maldivian pole-and-line CPUE series but starting around 2021.

53. The WPTT **NOTED** that EU,Spain have continued to use the original Tropical Tuna Treatment (T3) process for estimating species composition for scientific but not compliance purposes. The WPTT further **NOTED** that in this CPUE standardisation, the T3 process was used for this estimation for all years. However, the WPTT **NOTED** the intent of the EU,France to use the newer T3 model to estimate species composition from 2024 data onwards and further **NOTED** that this will be used for all EU purse seine fleets in the future.

54. The WPTT **NOTED** that the presented CPUE standardisation only includes data from EU flagged vessels, not from Seychelles vessels.

55. The WPTT **NOTED** that it would be beneficial to create a common repository for IOTC work on CPUE series where codes could be shared and a small, anonymised sample of the operational data is provided to facilitate the understanding of the dataset. The WPTT **NOTED** that this would help to improve transparency and reproducibility and would enable the group to keep track of the work that has been done. The WPTT **NOTED** the Secretariat's involvement in the recent joint longline CPUE workshop which helps to improve transparency.

56. The WPTT **NOTED** a presentation IOTC–2025–WPTT27(DP)–12, which assesses current impacts of climate change on a) ocean productivity and b) skipjack tuna habitat, with the following summary provided by the authors:

    "The productivity available to fish is decreasing in the warming Indian Ocean; important links between the annual catch rates of skipjack tuna and size of feeding habitat; the skipjack tuna

feeding habitat is more and more affected by unsuitable environmental conditions (sea surface temperature, sea surface height anomaly)".

57. The WPTT **NOTED** that climate change is increasing the heat content of the upper Indian Ocean, leading to a reduction of the useful ocean productivity for the high trophic level feeding. The large marine heat wave that occurred in 2024 impacted the size of the suitable habitat for skipjack feeding which, combined with high catches in recent years, may increase the risk of overfishing.

58. The WPTT **NOTED** that the daily feeding habitat of skipjack was driven by the occurrence of chlorophyll-a gradients (as this is used as a proxy for food availability) and by suitable physical conditions; annual suitable habitat levels were computed first by month from the daily habitat and then month to year.

59. The WPTT **NOTED** that the potential fish production plots presented relate to the feeding capacity of all high trophic level species focusing on the occurrence of productivity fronts only, while the skipjack tuna habitat is species-specific including productivity fronts and the suitable physical conditions (i.e. removing the unsuitable physical conditions).

60. The WPTT **NOTED** that estimating the feeding habitat for adult yellowfin and bigeye tuna is more complex as these species feed at depth. Juveniles of yellowfin are likely also be affected as often mixing with skipjack tunas near the surface.

6. REVIEW OF NEW INFORMATION ON THE STATUS OF BIGEYE TUNAS

6.1. Nominal and Standardized CPUE Indices

61. The WPTT **NOTED** paper IOTC-2025-WPTT27(DP)-09, which provides an update of joint CPUE indices for bigeye tunas in the Indian Ocean based on Japanese, Korean and Taiwanese longline fisheries data up to 2024, including the following abstract provided by the authors:

"Joint CPUE standardization for the Indian Ocean bigeye tuna was conducted using Japanese, Korean and Taiwanese fisheries data up to 2024. This effort aimed to provide the IOTC Scientific Committee with updated abundance indices for use in the stock assessment in 2025 for this stock. The collaboration sought to enhance the spatial and temporal coverage of fishery data, thereby producing combined indices. To account for inter-annual variations in the target species for each fishery, data on hooks between floats or clustering results were incorporated for each region. Conventional regression models were applied to standardize catch-per-unit-effort data, using shared operational data in each region. Overall, the trend in CPUE was broadly consistent with those used in previous stock assessments and MP applications."

62. The WPTT **ACKNOWLEDGED** the comprehensive workload completed by the joint CPUE workshop in Busan earlier this year. The WPTT **NOTED** the apologies by the author that these indices were only made available past the submission deadline for the WPTT(DP).

63. The WPTT **DISCUSSED** model checking procedures, and that these should occur to double-check the models. The WPTT also **DISCUSSED** whether there had been changes to fishing vessel numbers over time, that may be influencing the CPUE indices, and it was **NOTED** that this should be presented in any future updates on the joint CPUE indices.

64. The WPTT **NOTED** that there had been a small correction to the CPUE index from that which was the basis of the input to the BET MP. Withstanding this, the WPTT **NOTED** that the impact to the TAC produced from the MP was likely to be small, both because the change had little impact on the indices, and because there is a 15 % limit to changes to the TAC within the MP.

65. However, the WPTT **REQUESTED** that as there was a small correction in the CPUE, the management procedure for BET be re-run and the results be examined at the WPM.

66. The WPTT **NOTED** that the joint LL CPUE indices are the main source of abundance for the BET stock assessment and **AGREED** to use this update in the current BET stock assessment in 2025.

67. The WPTT **NOTED** paper IOTC-2025-WPTT27(DP)-14, which provides standardized catch per unit effort of bigeye tuna in the Indian Ocean for the European purse seine fleet operating on floating objects, including the following abstract provided by the authors:

> "*Indian Ocean EU purse seine floating object (FOB) school catches of big-eye tuna (BET;* Thunnus obesus*) per fishing set for the period 1991-2023 were standardized with two geostatistical spatiotemporal modelling approaches using the sdmTMB R package. One approach considered only the recent time period 2010-2023, but included detailed covariates describing intensity and use patterns of drifting fish aggregating devices (dFADs) by the fleet. The second approach considered the full time period 1991-2023, but was limited standardization for vessel size, identifier and mixed layer depth. In both cases, a generalized Gamma model was chosen for modeling catches as this distribution family had the lowest AIC. Predictions were made on an extrapolation area for every time step (year-quarter). To calculate the standardized CPUE index, we aggregated the spatial predictions based on an area-weighting approach. We also presented influence plots to explore the impacts of the model components on the standardized CPUE index. The FOB index from this study showed a long-term negative temporal trend, though over the most recent period (>2010), estimated abundance is more or less stable with a noticeable increase in abundance over the period 2021-2022. The index provided here can be incorporated into the 2025 bigeye stock assessment model to inform changes in biomass of juvenile BET*".

68. The WPTT **DISCUSSED** various aspects of the PS CPUE indices developed, including the comparison between the previous index developed in 2022, and the current index, and comparisons between a 'long' (1991-2023) and 'short' (2010-2023) index. The WPTT **DISCUSSED** the impact of covariates on the indices, noting that no one covariate had a large impact on the 'short' index, but that the same covariates had larger impacts on the 'long' index.

69. The WPTT **DISCUSSED** the comparison between the LL CPUE index, and the PSLS index in areas 1N + 1S, and **NOTED** that although these fleets are targeting different sized fish, it is likely that trends seen in the PSLS CPUE would be reflected in the LL CPUE, maybe with a slight delay in the LL CPUE due to that fleet targeting larger fish.

70. The WPTT **NOTED** that quarterly changes in CPUE are unlikely driven by quarterly changes in biomass, and more likely changes in fleet dynamics. This is because BET is a minority species, and fishing patterns are likely driven by the fleet targeting other species, such as SKJ which have quarterly spatial patterns in abundance.

71. The WPTT **SUGGESTED** that the CPUE series could be disaggregated into quarters to understand whether there were similar changes observed in the quarterly patterns, and this may smooth the CPUE indices.

72. The WPTT **DISCUSSED** the impact of technological 'creep' within the long index and **NOTED** that these issues are not likely to be an issue in the 'short' index due to technological changes being relatively stable over the last two decades. However, in the 'long' index, this may be an impact, and that technology such as echosounder buoys have provided up to 10 % increase in catch. However, this variable does not impact the CPUE index that much. This is again due to the issue

that BET are not being targeted, and that input data for the CPUE indices are based on fishing vessels targeting SKJ or YFT and not BET.

73. The WPTT **DISCUSSED** the size data within each year for fish associated with log schools to understand if there have been any changes to the length composition of fish caught within this fishery, to provide further context and information for the PS indices.

74. The WPTT also **NOTED** that recent restrictions on YFT catch may be impacting data collection, and fleet dynamics relating to BET (and SKJ) catch, which in turn, would impact the PS CPUE indices.

75. The WPTT **NOTED** that these indices were used in the final grid of stock assessments for BET in 2022.

7. BIGEYE TUNA STOCK ASSESSMENT

7.1. Discussion on bigeye tuna assessment models to be developed and their specifications

76. The WPTT **NOTED** the presentation summarizing the structure and configuration of the bigeye tuna assessment model. The WPTT **DISCUSSED** the general steps required for the new assessment, which will be reviewed by the WPTT in October. These steps include sequential updates to the previous reference model to evaluate the addition and revision of input data, conducting sensitivity analyses to understand the impact of model assumptions, and constructing a model grid to incorporate key uncertainties.

77. The WPTT **AGREED** that growth estimates from the new otolith aging study (IOTC-2025-WPTT27(DP)-08) should be used for the assessment. These estimates are considered more reliable than those by Eveson et al. 2015, which were based on tag data now believed to be biased. Since the growth estimates by Eveson et al. 2015 have been used in previous analyses, the new assessment should evaluate the impact of adopting the new estimates.

78. The WPTT **NOTED** that the VB-LogK growth curve suggested by the new study cannot be easily parameterized in Stock Synthesis. The main difference in the new growth estimates is a change in growth rates at ages 0–2 quarters, but overall growth is well characterized by the standard Von Bertalanffy (VB) model. The WPTT **AGREED** to use the VB curve estimated by the new study.

79. The WPTT **DISCUSSED** options for natural mortality (M) and **NOTED** that the previous assessment included a base option with relatively low M for adult age classes (0.0625 per quarter), as well as an alternative age-dependent M based on a Lorenze curve and a maximum age of 17 observed in the Atlantic Ocean ("Mhambel17"). These two options were included due to their consistency and proximity, but they did not cover the full range of uncertainty in M explored in that assessment.

80. Given the importance of this parameter, the WPTT **AGREED** to continue exploring plausible options for M, including the approach used in the recent ICCAT bigeye tuna assessment but based on the maximum age of 14.7 years estimated for the Indian Ocean. This method, based on the Hamel and Cope meta-analysis, incorporated uncertainty into adult M estimates by using quantiles from the predicted distribution. The WPTT **REQUESTED** assistance from scientists involved in the ICCAT assessment to help configure this parameterization.

81. The WPTT **NOTED** that the previous assessment included the purse seine index in the final models and **AGREED** to continue exploring its utility. The WPTT also **NOTED** that an expert review of the yellowfin assessment recommended against using the purse seine index due to the general issues associated with purse seine catch-effort data (e.g., potential hyperstability). However, the last

assessment did not find major conflicts between purse seine and longline indices, and the fits to the purse seine index were reasonable. The WPTT **NOTED** that standardization of purse seine catch-effort data has been improving. Nevertheless, the rationale for using the index should be thoroughly documented in the bigeye assessment, given the recommendations from the yellowfin review.

82. The WPTT **DISCUSSED** whether to consider the long (1990–2023) or short (2010–2023) purse seine CPUE series. Generally, the longer time series is more informative, but it is relatively new and does not include some explanatory variables (such as buoy ownership) that have only recently become available. The choice of time series needs further investigation, including the assessment of potential conflicts with longline CPUE.

83. The WPTT **NOTED** that the CPUE modeller will provide indices for regions R1N and R1S so they can be assigned to the appropriate model region. These indices will be made available before the October meeting.

84. For the longline index, the WPTT **AGREED** to apply a positive catchability increase of 0.5% per year in half of the models of the ensemble developed for management advice, based on recent studies and discussions regarding longline effort creep. The other half would not use a correction factor for the Joint Longline CPUE. This is also consistent with the assumptions made for the 2024 yellowfin tuna assessment.

85. The WPTT **AGREED** that the assessment should start with only longline CPUE and then explore the effect of including purse seine CPUE. The assessment will also explore different weighting options for the CPUE indices.

86. The WPTT **NOTED** that in the previous assessment that tagging data have been down-weighted relative to CPUE (e.g., by assigning a multiplier of 0.1 to the likelihood component). This was based on the consideration that the full mixing assumption is unlikely to be met, and that tagging data have been shown to conflict with CPUE abundance. It was **NOTED** that the 0.1 weight option would reduce the influence of tagging data on abundance estimates without unduly undermining the fits to tagging observations.

87. The WPTT **NOTED** that Indonesia's catch re-estimates have been endorsed by the SC and should be used as the basis for the assessment. However, the impact of changing from IOTC best scientific estimates to the new estimates needs to be evaluated. The WPTT further **NOTED** that re-estimates for 2023 and 2024 are not yet available and urged Indonesia to provide them to the Secretariat. If these estimates are not available, the assessment will need to consider options for the last two years of Indonesia's catches and address the associated uncertainty where possible.

88. The WPTT **AGREED** on the initial model configuration and parameters that serve as the basis or starting point for the new assessment, with potential sensitivities highlighted (Appendix IV). The choice of model grid will be based on the uncertainties identified through the sensitivity analyses.

8. REVIEW OF NEW INFORMATION ON THE STATUS OF YELLOWFIN TUNAS

8.1. Standardised CPUE indices

89. The WPTT **NOTED** the update provided by the SC Chair on the progress made by the Joint CPUE Working Group regarding the standardization of the yellowfin tuna index. The WPTT **RECALLED** that the CPUE index used in the 2024 yellowfin assessment showed different trends in the main regions compared to the previous index, though the reasons for these differences remain unclear.

This has been identified as a key source of uncertainty in the assessment and warrants further investigation.

90. The WPTT further **RECALLED** that the SC requested the Joint CPUE Working Group to review the yellowfin tuna CPUE in 2025, in time for review at the WPTT27 assessment meeting, in accordance with the recommended action points related to Joint CPUE standardizations (Appendix IX of the WPTT26 report).

91. The WPTT **EXPRESSED** appreciation for the considerable efforts made by the CPUE Working Group to address the SC's request. The WPTT **NOTED** that the group has convened several in-person workshops this year, focusing on the standardization of three species (albacore, bigeye, and yellowfin tuna) and addressing various issues for each, all under a strict data access protocol that offers very limited flexibility.

92. The WPTT also **NOTED** that the group aimed to follow the action points recommended by the SC, particularly regarding improving the transparency of the process. The WPTT Chair, an external expert, and the Secretariat have been invited to participate in the workshops to provide input, and Google Drive has been used to share and review scripts among participants.

93. The WPTT **NOTED** that the preliminary analyses conducted so far have investigated the following issues in the 2024 standardization work:

- The inclusion of R1a (Arabian Sea) catch and effort data in the standardization is unlikely to be the main driver of the change in the index.
- Vessel ID was not used in the positive component of the delta-LN model in the 2024 analysis, and while this is not expected to have a significant impact, should be explored further
- The extraction of the index from the binomial component (zero/non-zero) for producing std-CPUE was not performed according to best practices. As a result, the trend in the proportion of positive catches (which declined after 2010) had almost no effect on the final index for R1b (the main region). This will be revised to follow best practice.

94. The WPTT **NOTED** that these investigations are still at an early stage. While the above issues have been identified and examined in a preliminary manner, the assessment of their impact remains inconclusive and is subject to ongoing investigation. The WPTT **AGREED** that the preliminary recalculation of the CPUE series was for discussion within the WPTT only and would not be disseminated outside the data preparatory meeting.

95. The WPTT **NOTED** that the CPUE group will continue their investigation and aims to provide a full report to the WPTT meeting in October. Based on the review of the CPUE, the WPTT and SC can decide whether the yellowfin assessment will need to be revised. The CPUE Working Group has pledged to complete the work in time to allow for adequate review.

96. The WPTT **NOTED** the information document that proposes a Pilot sampling to support the CKMR studies for Indian Ocean yellowfin tuna in the north Arabian sea (Pakistan), with the following summary provided by the authors:

> "This working paper presents a pilot biological sampling initiative led by WWF-Pakistan, in partnership with CSIRO and supported by WWF-Italia and Bolton Food. The project evaluates the feasibility of tissue sampling to support CKMR for Indian Ocean yellowfin tuna in Pakistan's North Arabian Sea. Aligning with IOTC's priority research areas (IOTC 2017), this pilot targets 522 fish specimens across six size classes to contribute to a larger Indian Ocean-wide CKMR project aiming to collect 30,000 samples (Williams et al., 2023). Samples will be collected from gillnet-caught tuna at Karachi, focusing on both juveniles

(<50 cm) and adults (>75 cm). Metadata and tissue samples will be extracted under strict quality control and shipped to CSIRO for analysis. This initiative represents Pakistan's contribution to regional science-based management and capacity building for long-term yellowfin sustainability"

97. The WPTT **NOTED** that CKMR (Close-Kin Mark-Recapture) studies can provide absolute estimates of population size and key metrics such as mortality. These studies also help in understanding the contributions of localized spawning areas and migratory dynamics.

98. The WPTT **NOTED** that the proposed 12-month pilot project will begin in the R1 (Northwest) region of the Indian Ocean yellowfin tuna stock and primarily focus on the EEZ of Pakistan. The WPTT **SUGGESTED** that coordinating with other countries in the region could be beneficial for the project, although logistical challenges may make it difficult to involve additional coastal countries at this stage.

99. The WPTT **NOTED** that the project plans to utilize a network of fishermen and middlemen at ports to cross-check fishing times and sample locations. While the timing of sampling can be inferred from the duration of fishing trips, determining the exact catch location may be challenging and could require local fishing knowledge. It was further noted that fishermen in Pakistan typically do not fish outside their EEZ, so it is reasonable to assume that samples will originate from within Pakistan's EEZ.

9. OTHER MATTERS

100. The WPTT **NOTED** that during S29, the Commission was informed of a pilot study conducted by the EU, which created a new category of vessels designed to retrieve FADs before they drift into the EEZs of coastal states. The Commission discussed the feasibility of establishing such a vessel category for FAD retrieval and minimizing environmental impact but expressed concerns about the potential for these vessels to increase the capacity or efficiency of supply vessels. The WPTT also **NOTED** that the Commission requested the EU to share the results of the pilot project and tasked the SC with reviewing the potential impact of this activity on the fishing capacity of the purse seine fleet.

101. The WPTT **CONSIDERED** a presentation on the pilot study conducted by the EU, providing some initial insights into the activity of the vessel and results from the study.

102. The WPTT **NOTED** the discussions raised regarding the role of specialized vessels in FAD retrieval and **ACKNOWLEDGED** the professionalism of these vessels. It was **NOTED** that collaboration with other companies could be particularly beneficial, especially for retrieving FADs that drift near coastlines.

103. The WPTT further **NOTED** the importance of understanding the cost-effectiveness of using such vessels, including whether it is more efficient to deploy purse seine vessels for FAD retrieval and to also considered the carbon footprint associated with using large purse seine vessels for this purpose.

104. The WPTT **NOTED** that the WCPFC, which had previously phased out supply vessels, is now reconsidering their use for FAD recovery in regions where entanglement and FAD stranding are frequent.

105. The WPTT **NOTED** that during the research activities, no cases of entanglement were observed. **NOTING** that most of the materials used in the FADs were biodegradable and reusable.

106. The WPTT **ACKNOWLEDGED** that while the presentation provided useful insights about the pilot study, submission of a detailed paper to a future meeting, with consideration given to discussions on the presentation and analysis requested by the Commission would facilitate scientific review of the proposed new category of vessel and their activity.

10. REVIEW OF THE DRAFT, AND ADOPTION OF THE REPORT OF THE 27TH SESSION OF THE WPTT(DP) (CHAIR)

107. The report of the 27th Session of the Working Party on Tropical Tunas Data Preparatory Meeting (IOTC–2025–WPTT27(DP)–R) was **ADOPTED** by correspondence.

Appendix I
List of Participants

Chairpersons					
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Appendix II
Agenda for the 27th Working Party on Tropical Tunas, Data Preparatory Meeting

Date: 11 June - 13 June 2025

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 27th Session of the Scientific Committee (IOTC Secretariat)
   - 3.2 Outcomes of the 29th 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 WPTT26 (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 tropical 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 BIGEYE TUNA** (Chair)

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

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

7.1 Discussion on bigeye 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 **REVIEW OF NEW INFORMATION ON THE STATUS OF YELLOWFIN TUNA** (Chair)

8.1 Nominal and standardised CPUE indices.

9 **OTHER MATTERS** (Chair)

10 **REVIEW OF THE DRAFT, AND ADOPTION OF THE REPORT OF THE 27th SESSION OF THE WORKING PARTY ON TROPICAL TUNAS (DATA PREPARATORY)** (Chair)

Appendix III
List of Documents for the 27th Working Party on Tropical Tunas, Data Preparatory Meeting

Document	Title
IOTC-2025-WPTT27(DP)-01a	Draft: Agenda of the 27th Working Party on Tropical Tunas (DP)
IOTC-2025-WPTT27(DP)-01b	Draft: Annotated agenda of the 27th Working Party on Tropical Tunas (DP)
IOTC-2025-WPTT27(DP)-02	Draft: List of documents for the 27th Working Party on Tropical Tunas (DP)
IOTC-2025-WPTT27(DP)-03	Outcomes of the 27th Session of the Scientific Committee (IOTC Secretariat)
IOTC-2025-WPTT27(DP)-04	Outcomes of the 29th Session of the Commission (IOTC Secretariat)
IOTC-2025-WPTT27(DP)-05	Review of Conservation and Management Measures relevant to tropical tuna (IOTC Secretariat)
IOTC-2025-WPTT27(DP)-06	Progress made on the recommendations of WPTT27 (IOTC Secretariat)
IOTC-2025-WPTT27(DP)-07	Review of Indian Ocean bigeye tuna statistical data (IOTC Secretariat)
IOTC-2025-WPTT27(DP)-08	Updating the estimation of age and growth of bigeye tuna (*Thunnus obesus*) in the Indian Ocean from counts of daily and annual increments in otoliths. (Eveson P, Luque P, Farley J, Krusic-Golub K, Artetxe-Arrate I, Clear N, Fraile I, Duparc A, Faucheux C, Juan-Jorda M, Mattlet A, Nunes A, Sousa R, Guerreiro A, Diaha C, Murua H, Zudaire I)
IOTC-2025-WPTT27(DP)-09	Update of joint CPUE indices for bigeye tunas in the Indian Ocean based on Japanese, Korean and Taiwanese longline fisheries data up to 2024 (Kitakado T, Wang S, Tsuda Y, Park, H, Lim J, Nirazuka S, Tsai W)
IOTC-2025-WPTT27(DP)-11	An update of Bayesian Skipjack tuna CPUE Standardization for the Maldives Pole and Line Fishery, 1995 – 2024 (Shimal M, Medley P, Ahusan M, Adam S)
IOTC-2025-WPTT27(DP)-12	Current impacts of climate change on ocean productivity and skipjack tuna habitat (Druon J et al.)
IOTC-2025-WPTT27(DP)-13	Update on the long time series CPUE standardization for skipjack tuna (*Katsuwonus pelamis*) of the EU purse-seine fishery on floating objects (FOB) in the Indian Ocean (Kaplan D, Grande M, Alonso R, Báez J, Duparc A, Uranga J, Imzilen T, Merino G, Correa G)
IOTC-2025-WPTT27(DP)-14	Standardized catch per unit effort of bigeye tuna in the Indian Ocean for the European purse seine fleet operating on floating objects (Correa G, Kaplan D, Uranga J, Grande M, Imzilen T, Merino G, Alonso R)
IOTC-2025-WPTT27(DP)-INF01	Pilot sampling to support CKMR for Indian Ocean yellowfin tuna in the north Arabian sea (Pakistan) (WWF-Pakistan)

Appendix IV
Initial configuration and parameters for the bigeye tuna Stock Synthesis model

Model parameter	Description	Starting input parameters	Grid possible options (may change)
Recruitment	B-H stock-recruitment relationship steepness Continuous recruitment into age 0 in each quarter Regional apportioning of recruitment to R1N, R1S, R2, and R3. Temporal recruitment deviates: 1975-2023 Temporal spatial recruitment deviates: 2001-2022	R_0 Norm(10,10); $\boldsymbol{h = 0.80}$ $PropR_2$ Norm(0, 1.0) $\boldsymbol{\sigma_R = 0.6}$	***h = 70, h = 80, h=90***
Initial population	Initial, exploited state in 1975. Initial fishing mortality for LL1N, 1S,2,3 fisheries estimated	Norm(0.10,99)	

Age and growth	40 quarterly age-classes, with a **plus group (40+)** **Growth based on VB model with age-specific *k*** to approximate mean length-at-age from: Eveson et al. (2012) *k* deviates for ages 1,8,9,10. Starting value to have continuity from previous model. **Growth based on VB model** (no age-specific *k*): Eveson et al. (2025) **Conditional-age-at-length** – growth estimated internally within SS3 based on data from Eveson et al. (2025), following methods used in IOTC YFT stock assessment in 2024: test this method. Mean weights (W_j) from weight-length relationship $W = aL^b$	**Eveson2012 | Eveson2025** L_{inf}=150.913 cm | L_{inf} = 170.8 cm k = 0.332 | k = 0.30 CV = 0.10 **Chassot et al. (2016)** *LW:* a = 2.217 x 10^{-5}, b = 3.01211	**Gnew; GCAAL**
Natural mortality	'**Mhamel15**' = Lorenzen-based M with adult M estimated using Hamel (2021) estimator. Age-specific function. This is the base M used in the 2022 assessment, along with '**Mhamel17**' that used a maximum age of 17. **'MLorHam6'** = Lorenzen-based M with adult M fixed, using minimum (4 yr) and maximum (14.7 yr) reference ages for average M calculation. This is the same method as used in ICCAT using the 25, 50th, and 75th percentiles of the predicted distribution to estimate values for adult M. This option is operationalised within SS3 using 'Option 6' within the natural mortality settings – see the SS3 User Manual for more details. The M values are calculated outside the model, using a script obtained directly from ICCAT staff.	A_{max} = 14.7 yr	**MHamel15; MHamel17; MLorHam6**

Maturity	Length-specific logistic function with 50:50 male and female fish in mature population.	L_{50} = 110.888 cm Maturity slope = -0.25 (Shono et al. 2009)	
Movement	Age dependent with two blocks: age classes 3-8 and 15-40. Ramp function ages 8-15. No movement prior to age 3. Constant movement among quarters.	12 movement coefs. Norm(0,4)	
Selectivity	Age-specific, constant over time. LL: LL1N and LL1S = separate logistic params; LL2 and LL3 = separate double normal params. LINE2: shares principle LL sel. CPUE: shares principle LL sel. PSLS: Separate selectivity for PSLS1N, common selectivity PSLS1S and PSLS2 PSFS: Common selectivity for all fisheries; shared with OT1N/2. LF2: logistic; LINE2: share principle LL sel; BB1N: double-normal.	Logistic p1 Norm(20,10), p2 Norm(1,10) Double normal Five node cubic spline	**Double normal; logistic for LL2 & LL3** (dependent on model development).
Catchability	Temporally invariant. Shared regional catchability coefficient. No seasonal variation in catchability for LL CPUE. Include PS CPUE for 1S + 1N separately, test inclusion of both short + long indices.	Unconstrained parameter LLq	**CPUEpss; CPUEpsl** (short and long CPUE from PS fleet; dependent on model development).

	Include 0.5 % discount on LL and PS CPUE to account for unaccounted 'gear creep' (proxy for 'catchability') in half of the models.		
Fishing mortality	Hybrid approach (method 3, see SS3 User Guide for more info)		
Tag mixing	Tags assumed to be randomly mixed at the model region level four quarters after the release quarter. Accumulation after 28 quarters.		
Tag reporting	All (adjusted) reporting rates constant over time, common tag reporting rate fixed for all PS fisheries. Non-PS reporting rates uninformative priors.	PS RR 1.0 Others Norm(-0.7,5)	
Tag variation	Over dispersion parameters estimated for each tag release groups.	Beta prior (mean 10, s.d. 3)	
Length comp.	Multinomial error structure.	PSLS ESSmax= 10 PSFS, LL, others ESSmax= 1.0	