

APPENDIX 36B

WORKING PARTY ON TEMPERATE TUNAS PROGRAM OF WORK (2023 – 2027)

Table 1. Priority topics for obtaining the information necessary to develop stock status indicators for albacore in the Indian Ocean (2023-2027). No WPTmT meeting was held in 2023 to update this plan.

Topic	Sub-topic and project	Priority	Timing				
			2023	2024	2025	2026	2027
1 Stock structure (connectivity and diversity)	1.1 Genetic research to determine the connectivity of albacore throughout its distribution and the effective population size.	Low (5)					
2 Biological information (parameters for stock assessment)	2.1 Biological research (collaborative research to improve understanding of spatio-temporal patterns in age and growth and reproductive parameters)	High (1)					
	2.1.1 Age and growth studies: Uncertainty about the growth curve is a primary source of uncertainty in the stock assessment. A preliminary growth curve was developed in 2019, but there is substantial work to be done to ensure that growth curves include data from smaller size classes, and that spatio-temporal patterns in growth are quantified for use in the stock assessment. Collaborative sampling programs, involving a combination of observer- and port-based sampling, are required to ensure that adequate samples are collected.						
	2..1.2 Quantitative biological studies are necessary for albacore throughout its range to determine spatio-temporal patterns in key reproductive parameters including sex ratio; female length- and age-at-maturity; spawning location, periodicity and frequency; batch fecundity at length and age; spawning fraction and overall reproductive potential, to inform future stock assessments.						

3	CPUE standardisation	3.1 Continue the development of standardized CPUE series for each albacore fishery for the Indian Ocean, with the aim of developing appropriate CPUE series for stock assessment purposes.	High (3)					
3.1.1 Spatio-temporal structure and target changes need to be considered carefully, as fish density and targeting practices can vary in ways that affect CPUE indices. Developments may include changes to fishery spatial structure, new approaches for area weighting, time-area interactions in the model, and/or indices using VAST.								
4	Size frequency data	4.1 Further investigate the size information provided by CPCs in order to better understand the stock dynamics and inputs into the assessment models. This is particularly necessary for the purse seine data.	High (2)					
5	Management strategy evaluation	5.1 Continue to collaborate with the WPM on input to the Management Strategy Evaluation (MSE) process.	High (4)					

APPENDIX 36C
WORKING PARTY ON BILLFISH PROGRAM OF WORK (2025 – 2029)

Table 1. Priority topics for obtaining the information necessary to develop stock status indicators for billfish in the Indian Ocean

Topic in order of priority	Sub-topic and project	Timing				
		2025	2026	2027	2028	2029
1. CPUE standardization	<p>1.1 Develop and/or revise standardized CPUE series for each billfish species and major fisheries/fleets in the Indian Ocean and develop Joint CPUE series where feasible</p> <p>1.1.1 Swordfish: Priority LL fleets: Taiwan,China, EU(Spain, Portugal, France), Japan, Indonesia, South African</p> <p>1.1.2 Striped marlin: Priority fleets: Japan, Taiwan,China</p> <p>1.1.3 Black marlin: Priority fleets: Longline: Taiwan,China; Gillnet: I.R. Iran, Sri Lanka, Indonesia</p> <p>1.1.4 Blue marlin: Priority fleets: Japan, Taiwan,China, Indonesia</p> <p>1.1.5 I.P. Sailfish: Priority fleets: Priority gillnet fleets: I.R. Iran and Sri Lanka; Priority longline fleets: EU(Spain, Portugal, France), Japan, Indonesia;</p>					
2. Biological and ecological information	<p>2.1 Age and growth research</p> <p>2.1.1 CPCs to provide further research on billfish biology, namely age and growth studies including through the use of fish otolith or other hard parts, either from data collected through observer programs, port sampling or other research programs. (Priority: all billfishes: swordfish, marlins and sailfish)</p>					
	<p>2.2 Spawning time and locations</p> <p>2.2.1 Collect gonad samples from billfish or utilise any other scientific means to confirm the spawning time and location of the spawning areas that are presently hypothesized for each billfish species. This will also provide advice to the Commission on the request for alternative management measures (Res. 18-05, paragraph 6). Partially supported by EU, on-going support and collaboration from CPCs are required.</p>					
	2.3 Literature review of biological parameters for billfish					

	2.3.1. Conduct a literature review of biological parameters for billfish through a consultancy and update the supplementary information that companies with species Executive Summaries.					
	2.3 Stock structure (connectivity and diversity) 2.3.1 Continue work on determining stock structure of Billfish species, using complimentary data sources, including genetic and microchemistry information as well as other relevant sources/studies.					
3. Billfish bycatch mitigation	WPB and CPCs scientists to firstly, review and summarise existing information on billfish bycatch mitigation, including also factors influencing at-haul and post-release mortality of billfish, and secondly to undertake further research to inform gaps in understanding on potential effective mitigation approaches, to provide options for the Commission to reduce fishing mortality for species where that is required (e.g. Black Marlin, Striped Marlin and Sailfish) focusing on gillnet and longline fisheries but also including recreational and sport fishing activities .					
Other Future Research Requirements (not in order of priority)						
1. Data mining and processing – (Development of subsequent CPUE indices)	Data on gillnet fisheries are available in Pakistan (and potentially other CPCs) and the recovery of this information and the development of gillnet CPUE indices would improve species assessments, particularly for: <ul style="list-style-type: none"> • Black marlin • Sailfish 					
2. Historical data review	2.1 Changes in fleet dynamics 2.1.1 Continue the work with coastal countries to address recent changes and/or increases of marlins catches especially in some coastal fleets. The historical review should include as much explanatory information as possible regarding changes in fishing areas, species targeting, gear changes and other fleet characteristics to assist the WPB understand the current fluctuations observed in the data and very high increases in some species (e.g., black marlin mainly due to very high catches reported by India in recent years). The possibility of producing alternative catch histories should also be explored. Priority countries: India, Pakistan, Iran, I.R., Indonesia. 2.2 Species identification 2.2.1 The quality of the data available at the IOTC Secretariat on marlins (by species) is likely to be compromised by species miss-identification. Thus, CPCs should review					

their historical data in order to identify, report and correct (if possible) potential identification problems that are detrimental to any analysis of the status of the stocks. Consider the application of DNA-Barcoding technology for billfish species identification.

2.3 Tagging data recovery from alternate sources (e.g. Billfish foundation) to supplement IOTC tagging database information.

3. Stock structure (connectivity and diversity)

Tagging research (PSAT tags) to determine connectivity, movement rates and mortality estimates of billfish (Priority species: swordfish). Similar projects have been partially funded by EU, with a focus on epipelagic species. More tags are needed for swordfish.

4. Billfish as bycatch

How to provide scientific advice to management on billfish caught as bycatch

APPENDIX 36D

WORKING PARTY ON ECOSYSTEMS AND BYCATCH PROGRAM OF WORK (2025 – 2029)

Table 1. Priority topics for obtaining the information necessary to develop stock status indicators for bycatch species in the Indian Ocean

Topic in order of priority	Sub-topic and project	Timing				
		2025	2026	2027	2028	2029
Connectivity, movements, habitat use and post release mortality ¹	Electronic tags (PSATs, SPOT, Splash MiniPAT) to assess the efficiency of management resolutions on non-retention species (BSH in LL, marine turtles and rays in GIL and PS, whale sharks) and to determine connectivity, movement rates, mortality estimates and genetic studies					
1. Fisheries data collection and development of alternative abundance indices	1.1 Catch composition reconstruction (initial focus Sri Lanka, Pakistan and Indonesia)					
	1.1.2 Historical data mining for the key species and IOTC fleets (e.g., as artisanal gillnet and longline coastal fisheries) including workshops:					
	1.1.3 Historical data mining for the key species, including the collection of information about catch, effort and spatial distribution of those species and fleets catching them					
	1.1.4 CPUE standardisation and review of additional abundance indicators series for each key shark species and fishery in the Indian Ocean					
	1.2 Exploring different indices of abundance for sharks such as CKMR					
2. Shark research and management strategy	2.1 Prioritising shark research based on previous work and including analysing gaps in knowledge					

¹ This item is a top priority for the WPEB; however, completing it will require substantial funding, which the WPEB recognizes is unlikely to be provided through the IOTC Scientific budget.

	2.2 Workshop to update and revise shark research plan with a small working group					
3. Studies and training focused on gillnet bycatch mitigation	3.1 Focused GN bycatch mitigation workshop – training and monitoring 3.2 Studies trialling gillnet mitigation measures such as: LED lights, sub-surface setting etc.					

Other Future Research Requirements (not in order of priority)

Topic	Sub-topic and project	2025	2026	2027	2028	2029
1. Review and improve data collection for mobulid rays	1.1 Mobulid ID guide revision and translation. ID guides to be updated with help of CPC scientists					
2. Bycatch mitigation measures	2.1 Gears					
	2.1.1 Undertake a series of gear specific workshops focusing on multi-taxa bycatch issues					
	2.1.2 Develop studies on bycatch mitigation measures for the main gears using in the IOTC area (operational, technological aspects and best practices)					
	2.2 Sharks					
	a) Harmonise and finalise guidelines and protocols for safe handling and release of sharks and rays caught in IOTC fisheries					
	2.3 Sea turtles					
	2.3.1 Res. 12/04 (para. 11) Part I. The IOTC Scientific Committee shall request the IOTC Working Party on Ecosystems and Bycatch to:					
	a) Develop recommendations on appropriate mitigation measures for gillnet, longline and purse seine fisheries in the IOTC area; [mostly completed for LL and PS]					
	b) Develop regional standards covering data collection, data exchange and training					

	2.4.3. Intersessional meeting to discuss cetacean guidelines, ERA, Data gaps.					
3. CPUE standardisation / Stock Assessment / Other indicators	<p>3.1 Develop standardised CPUE series for each key shark species and fishery in the Indian Ocean:</p> <p>3.1.1 Development of CPUE guidelines for standardisation of CPC data.</p> <p>3.1.2 Blue shark: Priority fleets: TWN,CHN LL, EU,Spain LL, Japan LL; Indonesia LL; EU,Portugal LL</p> <p>3.1.3 Shortfin mako shark: Priority fleets: Longline and Gillnet fleets</p> <p>3.1.4 Oceanic whitetip shark: Priority fleets: Longline fleets; purse seine fleets</p> <p>3.1.5 Silky shark: Priority fleets: Purse seine fleets</p> <p>3.2 Joint CPUE standardization across the main LL fleets for silky shark, using detailed operational data</p> <p>3.3 Stock assessment and other indicators</p>					
4. Ecosystems	<p>4.1 Develop a plan for Ecosystem Approach to Fisheries (EAF) approaches in the IOTC, in conjunction with the Common Oceans Tuna Project.</p> <p>4.1.2 Workshop for CPCs on continuing efforts to the development of an EAF including delineation of candidate eco regions within IOTC.</p> <p>4.1.3 Practical Implementation of EBFM with the development and testing of ecosystem report cards.</p> <p>4.1.4 Evaluation of EBFM plan in IOTC area of competence by the WPEB to review its elements components and make any corrective measures.</p>					

	4.2 Assessing the impacts of climate change and socio- economic factors on IOTC fisheries					
	4.3 Evaluate alternative approaches to ERAs to assess ecological risk					
	4.4 Progress on Climate webpage on IOTC website and liaise with WPDCS for technical implementation					
Ecoregions development	Support for the development and refinement of ecoregions in the Indian Ocean: Development of a pilot study (focused on two ecoregions: one coastal, the Somali Current ecoregion and one oceanic, the Indian Ocean Gyre ecoregion)					
Development of Indian Ocean Digital Atlas	Facilitate the discussions with WPDCS to consolidate the Indian Ocean Digital Atlas project with stakeholders					

APPENDIX 36E
WORKING PARTY ON TROPICAL TUNAS PROGRAM OF WORK (2025 – 2029)

Table 1. Priority topics for obtaining the information necessary to develop stock status indicators for bycatch species in the Indian Ocean.

Topic in order of priority	Sub-topic and project	TIMING				
		2025	2026	2027	2028	2029
Stock assessment priorities	Address the outstanding issues identified as priorities by the yellowfin tuna peer review panel (February 2023). Address the additional recommendations made by the WPTT in 2024.					
Abundance indices development	<p>Address the additional recommendations made by the WPTT in 2024 regarding the CPUE indices for yellowfin.</p> <p>In view of the coming assessments of yellowfin, bigeye, and skipjack develop abundance time series for each tropical tuna stock for the Indian Ocean</p> <ul style="list-style-type: none"> • Continue to develop CPUE indices from Longline, purse seine, Pole and line fisheries, and fishery independent indices of abundance such as those derived from echosounder buoys. • Explore and support the development of gillnet CPUE indices for fleets (e.g., Iran, Pakistan and Oman) • Evaluate effect of changes of spatial coverage on the longline CPUE through the Joint CPUE workshop and estimate spatial temporal abundance distribution through VAST modelling approach 					
Fisheries Independent Monitoring	<p>Use of Close Kin Mark Recapture (CKMR) methods which can provide estimates of absolute spawning biomass, mortality, stock structure, and connectivity based on genotyping individuals to a level that can identify close relatives (e.g. parent-offspring or half-siblings).</p> <p>Plan for a staged approach for implementation of a YFT CKMR project</p>					
Analysis of tagging and size frequency data	<p>Analyze data from IOTC tagging programs outside stock assessment models and evaluate its utility and impact on stock assessments.</p> <p>Standardisation of size frequency data.</p>					
Analysis of environmental factors	Evaluate the impact of environmental factors on the dynamics of tropical tuna stocks and the possible role of climate change on changes to selectivity, recruitment deviates and fishing productivity.					

Other Future Research Requirements (not in order of priority)						
		2025	2026	2027	2028	2029
1	Stock structure (connectivity and diversity)	1.1 Genetic research to determine the connectivity of tropical tuna species throughout their distribution (including in adjacent Pacific Ocean waters as appropriate) and the effective population size.				
		1.2 Population genetic analyses to decipher intraspecific connectivity, levels of gene flow, genetic divergence and effective population sizes based on genome-wide distributed Single Nucleotide Polymorphisms (SNPs).				
		1.3 Connectivity, movements, and habitat use, including identification of hotspots and investigate associated environmental conditions affecting the tropical tuna species distribution, making use of conventional and electronic tagging (P-SAT).				
		1.4 Investigation into the degree of local or open population in main fishing areas (e.g., the Maldives and Indonesia – archipelagic and open ocean) by using techniques such flux in FAD arrays or used of morphological features such as shape of otoliths.				
2	Biological and ecological information (incl. parameters for stock assessment)	2.1 Biological sampling				
		2.1.1 Design and develop a plan for a biological sampling program to support research on tropical tuna biology. The plan would consider the need for the sampling program to provide representative coverage of the distribution of the different tropical tuna species within the Indian Ocean and make use of samples and data collected through observer programs, port sampling and/or other research programs. The plan would also consider the types of biological samples that could be collected (e.g. otoliths, spines, gonads, stomachs, muscle and liver tissue, fin clips, etc.), the sample sizes required for estimating biological parameters, and the logistics involved in collecting, transporting and processing biological samples. The specific biological parameters that could be estimated include, but are not limited to, estimates of growth, age at maturity, fecundity, sex ratio, spawning season, spawning fraction and stock structure.				
		2.1.2 Collect gonad samples from tropical tunas to confirm the spawning periods and location of the spawning area that are presently hypothesized for each tropical tuna species.				
3	Historical data review	3.1 Changes in fleet dynamics need to be documented by fleet				
		3.1.1 Provide an evaluation of fleet-specific fishery impacts on the stock of bigeye tuna, skipjack tuna and yellowfin tuna. Project potential impact of realizing fleet				

	development plans on the status of tropical tunas based upon most recent stock assessments.					
4	Alternative indices	4.1 That methods be developed for standardising purse seine catch species composition using operational data, so as to provide alternative indices of relative abundance (see Terms of Reference, Appendix IXb IOTC-2017-WPTT19-R).				
		4.2 Investigate the potential to use the Indian longline survey as a fishery-independent index of abundance for tropical tunas.				
5	Stock assessment stock indicators	5.1 Develop and compare multiple assessment approaches to determine stock status for tropical tunas 5.2 Scoping of ongoing age composition data collection for stock assessment 5.3 Develop a high resolution age structured operating model that can be used to test the spatial assumptions including potential effects of limited tags mixing on stock assessment outcomes (see Terms of Reference, Appendix IXa IOTC-2017-WPTT19-R).				
6	Fishery monitoring	6.1 Develop fishery independent estimates of stock abundance to validate the abundance estimates of CPUE series. All of the tropical tuna stock assessments are highly dependent on relative abundance estimates derived from commercial fishery catch rates, and these could be substantially biased despite efforts to standardise for operational variability (e.g. spatio-temporal variability in operations, improved efficiency from new technology, changes in species targeting). Accordingly, the IOTC should continue to explore fisheries independent monitoring options which may be viable through new technologies. There are various options, among which some are already under test. Not all of these options are rated with the same priority, and those being currently under development need to be promoted, as proposed below: Acoustic FAD monitoring, with the objective of deriving abundance indices based on the biomass estimates provided by echo-sounder buoys attached to FADs				
		6.2 Longline-based surveys (expanding on the Indian model) or “sentinel surveys” in which a small number of commercial sets follow a standardised scientific protocol 6.3 Aerial surveys, potentially using remotely operated or autonomous drones 6.4 Studies (research) on flux of tuna around anchored FAD arrays to understand standing stock and independent estimates of the stock abundance. 6.5 Investigate the possibility of conducting ongoing ad hoc, low level tagging in the region				

7 Target and Limit reference points	7.1 To advise the Commission, on Target Reference Points (TRPs) and Limit Reference Points (LRPs). Used when assessing tropical tuna stock status and when establishing the Kobe plot and Kobe matrices					
8 Fisheries Indicators	8.1 Examination of additional fisheries indicators and their discussion at WP meetings. Perhaps a section in report to accommodate these. See how this is being addressed in other RFMOs.					

Appendix 36f

Working Party on Data Collection and Statistics Program of Work (2025–2029)

Table 1. Priority topics for obtaining the information necessary to deliver the necessary advice to the Commission. * indicates activities with high priority for funding

Topic		Sub-topic and project	2025	2026	2027	2028	2029
1	Coastal fisheries data collection	1.1* Data support missions to assist the implementation of data collection and sampling activities for fisheries insufficiently sampled. Recommended actions include: designing sampling guidelines for IOTC fisheries. Priority to be given to the following countries / fisheries: <ul style="list-style-type: none"> • Indonesia • Pakistan • I.R. Iran • Kenya • Tanzania • Comoros • Madagascar 					
		1.2 Biological sampling workshop, including species identification and genetics sampling					
2	Data access and dissemination	2.1* Ocean-climate information: develop an online digital ocean atlas for the IOTC area of competence, linked by the IOTC website; develop indicators on ocean-climate status to be linked to the atlas portal, along with educational resources					
		2.2 Biological information: collaborate with CPCs to Review, analyse, and manage of biological data and information					
		2.3 Improve accessibility of IOTC scientific products and digital assets through standard metadata and DOI (e.g., remote workshops)					

	2.4	Establish a photo and imagery tool library and archive and develop associated reporting guidelines					
3	Compliance with IOTC data reporting requirements	3.1	Drafting of indicators to assess performance of IOTC CPCs against IOTC Data Requirements; evaluation of performance of IOTC CPCs with those Requirements; development of plans of action to address the issues identified, including timeframe of implementation and follow-up activities required. Priority to be given to the following CPCs / fisheries <ul style="list-style-type: none"> • Indonesia • India • Pakistan • Oman • Tanzania • Other (as required / determined) 				
		3.2 *	Workshops to clarify data reporting requirements ² and support preparation of annual submissions				
		3.3	Support the documentation of sampling protocols and processing ³				
5	Support for the implementation of the IOTC Regional Observer Scheme (ROS)	5.1	ROS e-tools				
		5.1.1	Review and update ROS e-tools according to the new ROS data standards	funding available for 2025			
		5.1.2	Support the adoption of the ROS e-Reporting and ROS national database tools by countries not having any existing observer data collection and management system in place				

² Recommended by the CoC; **regular annual webinars / workshops to be held from 2025 onwards with each CPCs (or group of CPCs) prior to the approaching of the data reporting deadline**

³ Secretariat to finalize the template, CPC to provide information

5.2	ROS Regional Database					
5.2.1	Review and update the ROS database structure					
5.2.2	Incorporate all historical observer data currently available in other proprietary data formats (e.g., ObServe, ICCAT ST09 and other custom observer forms)					
5.3	ROS Electronic Monitoring Systems					
5.3.1	Implement pilot EMS system on gillnet / coastal longline vessels for fleets insufficiently covered by on-board observers, possibly by providing support through remote / in-person meetings ⁴					
5.4	Evaluate the combination of alternative data collection systems and protocols for the collection of scientific observer data for artisanal and coastal fisheries, with an initial expert to develop protocols and guidelines for minimum data collection requirements in coastal fisheries, including through EMS systems through a regional workshop					
5.5	Review and update ROS training materials to the CPCs					
		2025	2026	2027	2028	2029

⁴ Sri Lanka EMS, training and setup of data exchange

APPENDIX 36G
WORKING PARTY ON METHODS PROGRAM OF WORK (2025 – 2029)

Table 1. Priority topics for obtaining the information necessary to deliver the necessary advice to the Commission. Resolution 15/10 elements have been incorporated as required by the Commission.

Topic	Sub-topic and project	Timing				
		2025	2026	2027	2028	2029
1. Management Strategy Evaluation	Continuation of Management Strategy Evaluation for Albacore and Yellowfin tunas as well as Blue shark					
MP Implementation	Monitoring the implementation of SKJ, BET and SWO Management Procedures					
	Peer review of SKJ/SWO MSE/MPs as required by MP resolutions					
Future Research Requirements (not in order of priority)						
Management Strategy Evaluation	1.1 Albacore					
	1.1.1 Revision of Operating Models based on WPALB, WPM and SC feedback, including possible robustness tests					
	1.1.2 Implementation of simulation runs and presentation of results at the TCMP					
	1.1.3 Revision and evaluation of new set of Management Procedures after presentation of MP runs to TCMP and Commission (as needed)					
1.2 Skipjack tuna						
	1.2.1 Run MP using the catch and CPUE standardisation input data, consider exceptional circumstances*, and provide the TAC advice					

1.2.2 Presentation of MP application and exceptional circumstances* and resulting TAC to the TCMP and Commission meeting for adoption of the TAC					
1.2.3 Stock assessment to provide information on stock status					
1.2.4 External peer review (2026-2028)					
<p>1.3 Bigeye tuna</p> <p>1.3.1 Run MP using the catch and CPUE standardisation input data, consider exceptional circumstances*, and provide the TAC advice</p> <p>1.3.2 External peer review</p> <p>1.3.3 Presentation of MP application and exceptional circumstances* and resulting TAC to the TCMP and Commission meeting for adoption of the TAC</p> <p>1.3.4 Stock assessment to provide information on stock status</p>					
<p>1.4 Yellowfin tuna</p> <p>1.4.1 Update OM & present preliminary MP results to TCMP, WPTT/WPM review of new OM</p> <p>1.4.2 Present revised MP results to TCMP; iteratively update development if required)</p> <p>1.4.3 additional iterations if required</p>					
<p>1.5 Swordfish</p> <p>1.5.1 Run MP using the catch and CPUE standardisation input data, consider exceptional circumstances*, and provide the TAC advice</p>					

<p>1.5.2 Presentation of MP application and exceptional circumstances* and resulting TAC to the TCMP and Commission meeting for adoption of the TAC</p> <p>1.5.3 Stock assessment to provide information on stock status Stock assessment to provide information on stock status</p> <p>1.5.4 External peer review</p>						
<p>Stock status guidance and reference points.</p>	<p>Review IOTC stock status characterization against reference points and the framework for the provision of management advice (Resolution 15/10) to address the TORs of ad hoc reference point WG.</p>					
<p>CKMR pilot project</p>	<p>Implementation of a CKMR pilot project for Indian Ocean yellowfin tuna to evaluate the logistics and feasibility of sampling, and levels of cross contamination of DNA.</p>					
<p>Capacity Building</p>	<p>Ongoing development of tools, materials and courses to continue Capacity Building for increasing participation in the MSE process and develop improved MSE communication to fishery managers.</p>					