

APPENDIX 35A
WORKING PARTY ON NERITIC TUNAS PROGRAM OF WORK (2024 – 2028)

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

| Topic in order of priority | Sub-topic and project | Timing | | | | |
|--|---|--------|------|------|------|------|
| | | 2024 | 2025 | 2026 | 2027 | 2028 |
| 1. Data mining and collation | <p>Collate and characterize operational level data for the main neritic tuna fisheries in the Indian Ocean to investigate their suitability to be used for developing standardised CPUE indices. The following data should be collated and made available for collaborative analysis:</p> <ul style="list-style-type: none"> ➤ catch and effort by species and gear by landing site; ➤ operational data: stratify this by vessel, month, and year for the development as an indicator of CPUE over time; and ➤ operational data: collate other information on fishing techniques (i.e., area fished, gear specifics, depth, environmental condition (near shore, open ocean, etc.) and vessel size (length/horsepower)). ➤ Reconstruction of historical catch by CPCs using recovered or captured information. ➤ Re-estimation of historic catches (with consultation and consent of concerned CPCs) for assessment purposes (taking into account updated identification of uncertainties and knowledge of the history of the fisheries) ➤ (Data support missions to priority countries: India, Oman, Pakistan) | | | | | |
| 2. Stock assessment / Stock indicators | Explore alternative assessment approaches and develop improvements where necessary based on the data available to determine stock status for longtail tuna, Spanish mackerel and kawakawa | | | | | |
| 3. Biological information (parameters for stock assessment) including stock structure (connectivity) | <p>Quantitative biological studies are necessary for all neritic tunas throughout their range to determine key biological parameters including age-at-maturity, and fecundity-at-age/length relationships, age-length keys, age and growth, longevity which will be fed into future stock assessments. Priorities for longtail tuna, kawakawa and Spanish mackerel.</p> <p>Genetic research to determine the connectivity of neritic tunas throughout their distributions (This should build on the stock structure work conducted in other previous studies)</p> | | | | | |

| Other Future Research Requirements | | | | | | |
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| 4. Social economic study | <ol style="list-style-type: none"> 1. Undertake quantitative studies on socio-economic aspects of all neritic tunas throughout their range, to determine and explore other sources of data, such as but not limited to trade data from individual countries, nominal catch or other catch data on neritic tuna, information on important and significance of neritic for food security (animal protein), nutrition, contribution to national GDP. (priority countries, Indonesia, Iran, India, Malaysia, Thailand, Pakistan) 2. Identify and utilise other sources of information, by engaging with other bodies such as SEAFDEC, SEAFO, RECOFI, BOBLME, SWIOFC, IOC, among others. 3. Integrate or evaluate market support and recognition for neritic tuna (sub-regional markets) with a focus on data acquisition. 4. Explore alternate sources of data collection, including the rapid use of citizen science-based approaches which are reliable and verified by the SC. 5. Assess/scope/explore the significance and importance of neritic species for food security, nutrition and contribution to national GDP. 6. Strengthen the data collection of catches and species complexes and develop socio-economic indicators of neritic species, related to the national and regional livelihoods and economics of coastal CPCs. 7. Collate information and address data gaps and challenges by taking advantage of regional programmes or joint collaboration with NGOs/CPCs in order to support and facilitate data collection for neritic species. | | | | | |

APPENDIX 35B
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) | | | | | |
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| 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) | | | | | |
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| | 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. | | | | | | |

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| 3 | CPUE standardisation | <p>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.</p> <p>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.</p> | High (3) | | | | | |
| 4 | Size frequency data | <p>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.</p> | High (2) | | | | | |
| 5 | Management strategy evaluation | <p>5.1 Continue to collaborate with the WPM on input to the Management Strategy Evaluation (MSE) process.</p> | High (4) | | | | | |

APPENDIX 35C
WORKING PARTY ON BILLFISH PROGRAM OF WORK (2024 – 2028)

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 | | | | |
|--|--|--------|------|------|------|------|
| | | 2024 | 2025 | 2026 | 2027 | 2028 |
| 1. Reproductive biology study | CPCs to conduct reproductive biology studies, which are necessary for billfish throughout its range to determine key biological parameters including length-at-maturity, age-at-maturity and fecundity-at-age, which will be fed into future stock assessments, as well as provide advice to the Commission on the established Minimum Retention Sizes (<u>Res 18-05, paragraphs 5 and 14c</u>). (Priority: marlins and sailfish). Propose to have a two-day workshop to discuss the standard of billfish maturity staging inter-sessionally prior to the next WPB. Funding are needed to support the workshop participation of CPCs and expert(s) on billfish reproduction (expecting to have confirmation from the host organization). | | | | | |
| 2. Biological and ecological information | 2.1 Age and growth research | | | | | |
| | 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) | | | | | |
| | 2.2 Spawning time and locations | | | | | |
| | 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. | | | | | |
| | 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 | | | | | |

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| 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 <p>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.</p> <p>2.2 Species identification <p>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.</p> <p>2.3 Tagging data recovery from alternate sources (e.g. Billfish foundation) to supplement IOTC tagging database information.</p> </p> | | | | | |
| 3. Observer Training to improve data collection for billfish (and other) species | 3.1 Training for observers with respect to billfish species identification, various length measurements and biological sampling (gonads, spines and otoliths). | | | | | |

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| <p>4. CPUE standardization</p> | <p>4.1 Develop and/or revise standardized CPUE series for each billfish species and major fisheries/fleets for the Indian Ocean.</p> <p>4.1.1 Swordfish: Priority LL fleets: Taiwan,China, EU(Spain, Portugal, France), Japan, Indonesia, South African</p> <p>4.1.2 Striped marlin: Priority fleets: Japan, Taiwan,China</p> <p>4.1.3 Black marlin: Priority fleets: Longline: Taiwan,China; Gillnet: I.R. Iran, Sri Lanka, Indonesia</p> <p>4.1.4 Blue marlin: Priority fleets: Japan, Taiwan,China, Indonesia</p> <p>4.1.5 I.P. Sailfish: Priority fleets: Priority gillnet fleets: I.R. Iran and Sri Lanka; Priority longline fleets: EU(Spain, Portugal, France), Japan, Indonesia;</p> <p>4.1.6 Joint analysis of operational catch and effort data from Indian Ocean longline fleets as recommended by WPM</p> | | | | | |
| <p>5. Stock assessment / Stock indicators</p> | <p>5.1 Workshops on techniques for assessment including CPUE estimations for billfish species in 2021 and 2022. Priority fleets: Gillnet fisheries</p> | | | | | |
| <p>6. Target and Limit reference points</p> | <p>6.1 Assessment of the interim reference points as well as alternatives: Used when assessing the Swordfish stock status and when establishing the Kobe plot and Kobe matrices.</p> | | | | | |
| <p>7. Management measure options</p> | <p>7.1 To advise the Commission, on potential management measures having been examined through the Management Strategy Evaluation (MSE) process.</p> | | | | | |
| | <p>7.1.1 These management measures will therefore have to ensure the achievement of the conservation and optimal utilization of stocks as laid down in article V of the Agreement for the establishment of the IOTC and more particularly to ensure that, in as short a period as possible and no later than 2020, (i) the fishing mortality rate does not exceed the fishing mortality rate allowing the stock to deliver MSY and (ii) the spawning biomass is maintained at or above its MSY level.</p> | | | | | |
| <p>8. Close-Kin Mark-Recapture studies</p> | <p>Review of CKMR applicability for Billfish species and potential feasibility study</p> | | | | | |
| <p>9. Stock structure (connectivity and diversity)</p> | <p>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.</p> | | | | | |

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| 10. Billfish as bycatch | How to provide scientific advice to management on billfish caught as bycatch | | | | | |
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APPENDIX 35D
WORKING PARTY ON ECOSYSTEMS AND BYCATCH PROGRAM OF WORK (2024 – 2028)

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 | | | | |
|--|---|--------|------|------|------|------|
| | | 2024 | 2025 | 2026 | 2027 | 2028 |
| Connectivity, movements, habitat use and post release mortality* | 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 and mortality estimates. | | | | | |
| 1. Fisheries data collection | 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 | | | | | |
| 2. Shark research and management strategy | 2.1 Implementation of work suggested by shark work plan consultancy | | | | | |
| | 2.2 Prioritising shark research based on previous work and including analysing gaps in knowledge | | | | | |

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| 3. Ecoregions development | Support for the development and refinement of ecoregions in the Indian Ocean: <ul style="list-style-type: none"> Development of a pilot study (focused on two ecoregions: one coastal, the Somali Current ecoregion and one oceanic, the Indian Ocean Gyre ecoregion) | | | | | |
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| Other Future Research Requirements (not in order of priority) | | | | | | |
|--|---|------|------|------|------|------|
| Topic | Sub-topic and project | 2024 | 2025 | 2026 | 2027 | 2028 |
| 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 2.3.2 Res. 12/04 (para. 17) The IOTC Scientific Committee shall annually review the information reported by CPCs pursuant to this measure and, as necessary, provide recommendations to the Commission on ways to strengthen efforts to reduce marine turtle interactions with IOTC fisheries. | | | | | |

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| <p>2.3.3 Regional workshop to review the effectiveness of marine turtle mitigation measures</p> <p>2.3.4 Harmonise and finalise guidelines and protocols for safe handling and release of sea turtles caught in IOTC fisheries</p> | | | | | |
| <p>2.3 Seabirds</p> <p>2.3.1 Bycatch assessment for seabirds taking into account the information from the various ongoing initiatives in the IO and adjacent oceans</p> <p>2.3.2 Study on cryptic mortality of seabirds in tuna LL fisheries.</p> <p>2.3.3 Study post release survival rates for seabirds and harmonise and finalise guidelines and protocols for safe handling and release of seabirds caught in IOTC fisheries</p> | | | | | |
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| <p>2.4 Cetaceans</p> <p>2.4.1 Testing mitigation methods for cetacean bycatch in tuna drift gillnet fisheries</p> <p>2.4.2 Harmonise and finalise guidelines and protocols for safe handling and release of cetaceans caught in IOTC fisheries</p> <p>2.4.3. Intersessional meeting to discuss cetacean guidelines, ERA, Data gaps.</p> | | | | | |
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| <p>3. CPUE standardisation / Stock Assessment / Other indicators</p> | <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> | <table border="1"> <tr><td>█</td><td>█</td><td>█</td><td>█</td><td>█</td></tr> <tr><td>█</td><td>█</td><td>█</td><td>█</td><td>█</td></tr> <tr><td>█</td><td>□</td><td>□</td><td>□</td><td>□</td></tr> <tr><td>□</td><td>□</td><td>█</td><td>█</td><td>□</td></tr> <tr><td>█</td><td>█</td><td>□</td><td>□</td><td>□</td></tr> <tr><td>█</td><td>█</td><td>□</td><td>□</td><td>□</td></tr> <tr><td>█</td><td>█</td><td>□</td><td>□</td><td>□</td></tr> <tr><td>█</td><td>█</td><td>█</td><td>█</td><td>█</td></tr> </table> | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | █ | □ | □ | □ | □ | □ | □ | █ | █ | □ | █ | █ | □ | □ | □ | █ | █ | □ | □ | □ | █ | █ | □ | □ | □ | █ | █ | █ | █ | █ |
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| <p>4. Ecosystems</p> | <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> <p>4.2 Assessing the impacts of climate change and socio- economic factors on IOTC fisheries</p> | <table border="1"> <tr><td>█</td><td>█</td><td>█</td><td>█</td><td>█</td></tr> <tr><td>█</td><td>█</td><td>□</td><td>□</td><td>□</td></tr> <tr><td>█</td><td>█</td><td>□</td><td>□</td><td>□</td></tr> <tr><td>□</td><td>□</td><td>█</td><td>□</td><td>□</td></tr> <tr><td>█</td><td>█</td><td>█</td><td>█</td><td>█</td></tr> </table> | █ | █ | █ | █ | █ | █ | █ | □ | □ | □ | █ | █ | □ | □ | □ | □ | □ | █ | □ | □ | █ | █ | █ | █ | █ | | | | | | | | | | | | | | | |
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| 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 | | | | | |

APPENDIX 35E
WORKING PARTY ON TROPICAL TUNAS PROGRAM OF WORK (2024 – 2028)

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 | | | | |
|--|---|--------|------|------|------|------|
| | | 2024 | 2025 | 2026 | 2027 | 2028 |
| Stock assessment priorities | Address the issues identified as priorities by the yellowfin tuna peer review panel (February 2023) | | | | | |
| Abundance indices development | In view of the coming assessments of yellowfin, bigeye, and skipjack develop abundance time series for each tropical tuna stock for the Indian Ocean <ul style="list-style-type: none"> Continue to develop CPUE indices from Longline, PS, 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 Sri Lanka) 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 | | | | | |
| Analysis of tagging data | Analyze data from IOTC tagging programs outside stock assessment models and evaluate its utility and impact on stock assessments. | | | | | |
| Analyse recommendations from independent review | Carry out analyses recommended by the independent review of the yellowfin tuna stock assessment. Explore options, for example, for spatial structure, recruitment trends, movement dynamics, data weighting, selectivity before the 2024 WPTT Data Preparatory meeting. | | | | | |
| Analysis of environmental factors | Evaluate the impact of environmental factors on the dynamics of tropical tuna stocks | | | | | |
| Other Future Research Requirements (not in order of priority) | | | | | | |
| 1. Fisheries Independent Monitoring | 1.1 Use of Close Kin Mark Recapture (CKMR) methods to study fishery independent methods of generating spawner abundance estimates based on genotyping individuals to a level that can identify close relatives (e.g. parent-offspring or half-siblings). | | | | | |

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| | Plan for a staged approach for implementation of a YFT CKMR project | | | | |
| 2. Stock structure (connectivity and diversity) | 2.1 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. | | | | |
| | 2.2 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). | | | | |
| | Connectivity, movements and habitat use | | | | |
| | 2.3 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). 2.4 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. | | | | |
| 3. Biological and ecological information (incl. parameters for stock assessment) | 3.1 Biological sampling | | | | |
| | 3.1.1 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. | | | | |
| | 3.1.2 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. | | | | |
| 4. Historical data review | 4.1 Changes in fleet dynamics need to be documented by fleet | | | | |
| | 4.1.1 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. | | | | |

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| 5. CPUE standardisation | <p>5.1 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).</p> <p>5.11 Investigate the potential to use the Indian longline survey as a fishery-independent index of abundance for tropical tunas.</p> | | | | | |
| 6. Stock assessment stock indicators | <p>6.1 Develop and compare multiple assessment approaches to determine stock status for tropical tunas</p> <p>6.2 Scoping of ongoing age composition data collection for stock assessment</p> <p>6.3 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).</p> | | | | | |
| 7. Fishery monitoring | <p>7.1 Develop fishery independent estimates of stock abundance to validate the abundance estimates of CPUE series.</p> <p>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:</p> <p>Acoustic FAD monitoring, with the objective of deriving abundance indices based on the biomass estimates provided by echo-sounder buoys attached to FADs</p> <p>7.2 Longline-based surveys (expanding on the Indian model) or “sentinel surveys” in which a small number of commercial sets follow a standardised scientific protocol</p> <p>7.3 Aerial surveys, potentially using remotely operated or autonomous drones</p> <p>7.4 Studies (research) on flux of tuna around anchored FAD arrays to understand standing stock and independent estimates of the stock abundance.</p> <p>7.5 Investigate the possibility of conducting ongoing ad hoc, low level tagging in the region</p> | | | | | |
| 8. Target and Limit reference points | <p>8.1 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</p> | | | | | |
| 9. Fisheries Indicators | <p>8.2 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.</p> | | | | | |

APPENDIX 35F

WORKING PARTY ON DATA COLLECTION AND STATISTICS PROGRAM OF WORK (2024 – 2028)

Table 1. Priority topics for obtaining the information necessary to support the Scientific Committee and deliver the necessary advice to the Commission.

| Topic in order of priority | Sub-topic and project | Timing | | | | |
|--|---|-------------|-------------|-------------|-------------|-------------|
| | | 2024 | 2025 | 2026 | 2027 | 2028 |
| 1 Coastal fisheries data collection | 1.2 Assist the implementation of data collection and sampling activities for fisheries insufficiently sampled. Recommended actions include: (regional) training on species identification, designing sampling guidelines for IOTC fisheries. Priority to be given to the following countries / fisheries: <ul style="list-style-type: none"> • Indonesia • India • Bangladesh • Pakistan • I.R. Iran • Kenya • Somalia • Sri Lanka | | | | | |
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| 2 Evaluation of catch and effort data uncertainties | 2.1 Review of historical nominal catches and catch-and-effort data for all stocks being assessed in the following years to determine the level of uncertainty to be used for stock assessment and management procedures ¹ | | | | | |
| 3 Compliance with IOTC data reporting requirements | 3.2 Workshops to clarify data reporting requirements ² and support preparation of annual submissions | | | | | |
| | | 2024 | 2025 | 2026 | 2027 | 2028 |

Other Future Research Requirements (not in order of priority)

| Topic | Sub-topic and project | Timing | | | | |
|--|--|--------|------|------|------|------|
| | | 2024 | 2025 | 2026 | 2027 | 2028 |
| 1 Coastal fisheries data collection | 1.1 Implement a region-wide study focusing on the application of FAO methodology for the characterization of Indian Ocean fisheries (Secretariat, CPCs) | | | | | |
| 3 Compliance with IOTC data reporting requirements | 3.1 Data support missions | | | | | |
| | 3.1.1 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: | | | | | |
| | • Indonesia | | | | | |
| | • India | | | | | |
| | • Pakistan | | | | | |
| | • Oman | | | | | |
| | • Sri Lanka | | | | | |
| | • Somalia | | | | | |
| | • Tanzania | | | | | |
| | • Other (as required / determined) | | | | | |
| | 3.3 Support the documentation of sampling protocols and processing ³ | | | | | |
| 4 Data access | 4.1 Improve discoverability of IOTC scientific assets through standard metadata and DOI (e.g., remote workshops) | | | | | |
| | 4.2 Scoping study to develop indicators for ocean-climate status and trends through an online atlas linked by the IOTC website (including provision of educational resources) | | | | | |
| 5 Support for the implementation of the IOTC Regional Observer Scheme (ROS) | 5.1 ROS e-tools | | | | | |
| | 5.1.1 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 | | | | | |

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| <p>5.2 ROS Regional Database</p> | | | | | |
| <p>5.2.1 Incorporate all historical observer data currently available in other proprietary data formats (e.g., ObServe, ICCAT ST09 and other custom observer forms)</p> | | | | | |
| <p>5.3 ROS Electronic Monitoring Systems</p> | | | | | |
| <p>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 meetings⁴</p> | | | | | |
| <p>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.</p> | | | | | |
| <p>5.5 Revision of ROS data fields through intersessional activity / workshops coordinated by the WPDCS</p> | | | | | |
| | 2024 | 2025 | 2026 | 2027 | 2028 |

APPENDIX 35G
WORKING PARTY ON METHODS PROGRAM OF WORK (2024 – 2028)

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 | | | | |
|--|--|--------|------|------|------|------|
| | | 2024 | 2025 | 2026 | 2027 | 2028 |
| 1. Management Strategy Evaluation | Continuation of Management Strategy Evaluation for Albacore, Skipjack, Yellowfin, Bigeye tunas as well as Swordfish | | | | | |
| | Peer review of BET MSE as per the ToRs endorsed by the SC | | | | | |
| Future Research Requirements (not in order of priority) | | | | | | |
| Management Strategy Evaluation | 1.1 Albacore | | | | | |
| | 1.1.1 Revision of Operating Models based on 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) | | | | | |
| | 1.1.5 External peer review | | | | | |
| 1.2 Skipjack tuna | | | | | | |
| | 1.2.1 Implementation of simulation runs and presentation of results at the TCMP | | | | | |

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| <p>1.2.2 Revision and evaluation of new set of Management Procedures after presentation of MP runs to TCMP and Commission (as needed)</p> | | | | | |
| <p>1.2.3 External peer review (2025-2026)</p> | | | | | |
| <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 Implementation of simulation runs and presentation of results at the TCMP</p> | | | | | |
| <p>1.5.2 Revision and evaluation of new set of Management Procedures after presentation of MP runs to TCMP and Commission (as needed)</p> | | | | | |

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| 1.5.3 External Peer-review | | | | | | |
| Multiple stock status derived from different model structures | Develop specific guidance for the most appropriate models to be used or how to synthesize the results when multiple stock assessment models are presented: model selection and weighting. (see IOTC-2016-WPTT18-R, para.91) | | | | | |
| Stock status guidance and reference points. | 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. | | | | | |
| CKMR pilot project | 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. | | | | | |
| Capacity Building | 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. | | | | | |