ANNEX I DESCRIPTION OF THE ACTION

Contribution Agreement

II. INFORMATION ON THE ACTION FOR WHICH THE CONTRIBUTION IS REQUESTED

1 DESCRIPTION OF THE ACTION (Annex I to the Contribution Agreement)
Title: Support to the IOTC Scientific and Compliance Committee's Programs of work
Reference: FAO project symbol GCP/INT/1024/EC

a) **Background and Relevance of the Action**

The Indian Ocean Tuna Commission (IOTC) is an intergovernmental organization responsible for the management of tuna and tuna-like species in the Indian Ocean. The IOTC was established in 1993 under Article XIV of the FAO Constitution with the objectives of ensuring the conservation of tuna and tuna-like species in the Indian Ocean and promoting their optimum utilization, and the sustainable development of the fisheries. The Commission comprises 30 Contracting Parties (Members) and 1 Cooperating Non-Contracting Party, together referred to as CPCs.

To achieve IOTC's primary objectives, it is important that managers have the best possible scientific advice on of the IOTC stocks and their associated ecosystems and Members comply with their obligations related to data and implementation of IOTC conservation and management measures. To this end, the Commission focuses considerable resources on science and compliance with its conservation and management measures.

The Commission has four key science-based functions and responsibilities. Briefly these include:

- gathering, analyzing, disseminating scientific information (including catch and effort statistics and other relevant data) and reviewing the status of the stocks;
- supporting research and development activities in respect of the stocks and fisheries;
- adopting, on the basis of scientific evidence, conservation and management measures to ensure the conservation of the stocks; and
- reviewing the economic and social aspects of its fisheries.

The Commission has a Compliance Committee which reviews and assesses compliance by IOTC member countries in the implementation of the IOTC Conservation and Management Measures. The IOTC Secretariat's Compliance team's primary function is to assist the IOTC Compliance Committee in its work and provide support to members, including:

- the implementation of Monitoring, Control and Surveillance tools adopted by the

Commission;

- maintaining several important resources such as the Record of Authorized Vessels, Active Vessels List, IUU Vessels List, List of Designated Ports, and the IOTC Bigeye Tuna Statistical Document Programme.

Currently, the Commission faces many challenges in both science and compliance, and this project is designed to address some of the most pressing needs. The goals of this project are:

1. **To improve scientific advice for the management of priority tuna, tuna-like and bycatch species caught in IOTC fisheries by:**

   - *supporting the development of management procedures for albacore tuna, skipjack tuna and swordfish;*
   - *reviewing the technical suitability of the current stock assessment for yellowfin tuna*
   - *improving knowledge of shark biology and population size and structure*
   - *improving knowledge of the risks to cetaceans from IOTC fisheries*

2. **To improve data for the management of tuna, tuna-like and bycatch species caught in IOTC fisheries by:**

   - *improving data collection, reporting and management of ROS data at national and regional levels*
   - *improving data collection and reporting of artisanal fisheries data*

3. **To improve compliance with IOTC Conservation and Management Measures by:**

   - *streamlining data management and reporting*
   - *national administrators and vessel operators being more aware of the benefits of gear marking*
   - *strengthening regional and national interagency coordination to combat IUU fishing, fisheries-related crimes and crimes associated with fisheries*

b) Describe the general and specific objectives that the action aims to achieve:

The objectives of this action will contribute to the delivering on the European Commission's priorities relating to sustainable use of the oceans and marine resources and strengthening of the international ocean governance framework as follows:

EU Specific objective 3: more sustainable fisheries worldwide and improved international ocean governance by 2024.

EU Result indicator: Conservation measures based on scientific advice adopted for the main regulated species fished by the EU fleet under the purview of Regional Fisheries Management Organisations (RFMOs) of which the EU is a Member.

- Management procedures for albacore and skipjack tuna and swordfish are made available to the Commission
- A scientifically robust stock assessment for yellowfin tuna is made available to the Commission
- Improved estimates of age, growth, reproduction and stock structure for sharks in the Indian Ocean
- An ecological risk assessment for cetaceans is made available to the Commission
- Improved data collection, reporting and management of ROS data at national and regional

levels
- Improved data collection and reporting of artisanal fisheries data
- Operationalisation and implementation aspects of gear marking are understood by national administrations and vessel operators

EU Result indicator: Fighting illegal, unreported and unregulated (IUU) fishing measured by the number of non-EU Member States that the Commission has engaged in a dialogue with, and the number of countries having addressed their deficiencies

- More streamlined management and reporting of compliance data
- Improved implementation of IOTC port State measures and IOMOU port State control activities

c) Describe the action (on the basis of the main activities planned) and where it will be implemented

Goal 1. To improve scientific advice for the management of priority tuna, tuna-like and bycatch species caught in IOTC fisheries.

Outcome 1.1. Management procedures for albacore and skipjack tuna and swordfish are made available to the Commission

The Management Strategy Evaluation (MSE) is a process that uses a simulation tool to determine the relative performance of harvest strategies against management objectives. To achieve conservation and optimum utilization of tuna stocks, the IOTC is conducting exercises to develop operating models to evaluate Harvest Control Rules (HCR) for the key target species, including albacore tuna.

The IOTC Scientific Committee has been instructed to assess, through the management strategy evaluation process, the performance of HCRs that will on average achieve Target Reference Points (TRPs) and avoid the Limit Reference Points (LRPs) with a high probability.

Further work is now required in order to incorporate revisions from the Technical Committee on Management Procedures (TCMP) in order to finalise the management procedures. The study will also include work on the development of alternative methods for the conditioning of Operating Models that are not based solely on the stock assessment models used for each stock.

Output 1.1.1. Finalised management procedure for albacore tuna

The MSE is already in progress for albacore tuna, with operating models (OMs) having been endorsed by the Working Party on Temperate Tuna (WPTmT), the Working Party on Methods (WPM), and the Scientific Committee (SC); and the evaluation of candidate HCRs pending review by the TCMP and Commission.

The MSE conducted so far has focused on the conditioning of the Operating Model (OM) to the historical and current state of the Indian Ocean albacore tuna stock. The OM being used for the initial evaluation of Management Procedures (MP) for the stock consists of a grid of alternative runs based on the 2019 stock assessment. Three system characteristics of the OM have been identified to have a large influence in the performance of an MP, including the scale, noise and trend of the system dynamics. As such, the OM construction uses a novel factorial-design approach aiming to ensure that a realistic range of options for those three quantities are present in the OM set. Further criteria based on goodness of fit, prediction skill, and ability to explain recent catches have also been used to select and filter plausible models.

Proposed future work include: the investigation of potential factors that lead to the divergence between the OM and the stock assessment models; the further development of criteria for model selection and weighting; and the potential decoupling of the OM conditioning from the stock assessment using Approximate Bayesian Computation (ABC) approach. It has also been suggested that the OM should consider how the changing catch trends in the south-west region of the Indian Ocean should be taken into account in the MSE, given this region is more depleted than other regions.

Overall, this output will contribute towards better informed management of the resources of albacore tuna.

Output 1.1.2. Finalised management procedure for skipjack tuna

The MSE is in progress for skipjack tuna, with OMs having been endorsed by the Working Party on Tropical Tunas (WPTT), WPM and SC, and the evaluation of candidate HCRs is pending review by the TCMP and Commission.

The MSE work conducted so far has been focusing on the evaluations of an empirical MP using an OM that is based on the latest skipjack stock assessment model. The empirical MP is used because the available CPUE is uninformative of biomass and as such the model-based MP did not work well for the skipjack tuna stock. The empirical MP were evaluated against the reference set OM and are tuned to the objectives as agreed by the TCMP. The empirical MP calculated a TAC that is a proportion of a target catch value. The structural uncertainties in the OM have been further extended to include robustness trials for the MP (implementation errors and recruitment declines).

It has been proposed that further work should examine a robustness scenario that includes both implementation error and recruitment decline together, and the consideration of retuning the MP to the tuning objectives in the robustness trials (so that the MP would include implementation error in the feed-back control loop).

Overall, this output will contribute towards better informed management of the resources under the IOTC mandate, in particular of those related to the stocks of skipjack tuna.

Output 1.1.3. Finalised management procedure for swordfish

The MSE is in progress for swordfish, with OMs having been endorsed by the Working Party on Billfish (WPB), WPM and SC, and the evaluation of candidate HCRs is pending review by the TCMP and Commission.

The reference operating model developed over the last two years was based on the 2019 WPB SS3 assessment, and covered the major dynamics of the swordfish population and fisheries. The progress of the swordfish MSE made in 2022 included the development and application of two types of candidate MPs, one model based, and one data based, and the tuning of these MPs (i.e., defining the MP parameters that achieve a certain management goal) for a range of management objectives. The MSE conducted so far showed that tuning objectives can be achieved but there was a large variability and bimodally distributed model estimates between simulations (in terms of the probability of achieving the Kobe green quadrant). Preliminary examination indicated that this is related to the fact that assumptions on the uncertainty grid when assembling the OM resulted in a very wide range of stock dynamics and initial stock status.

Future work shall better quantify and investigate the implications of an OM with a very wide range of variability of initial conditions (as a consequence of some of the choices made when

constructing the structural uncertainty grid) on the MP performance. A new method for uncertainty characterisation in a model ensemble based on the joint prior of biological parameters may be considered, which may help address the issue of bimodally distributed model estimates which typically resulted from the use of discrete values in the uncertain axis.

Overall, this output will contribute towards better informed management of the resources under the IOTC mandate, in particular of those related to the stocks of swordfish.

Outcome 1.2. A scientifically robust stock assessment for yellowfin tuna is made available to the Commission

Output 1.2.1. An independent peer review of the yellowfin tuna stock assessment

The current stock assessment for yellowfin tuna was adopted in 2021 to inform the IOTC Commission of stock status and management advice. However, the IOTC's WPTT and SC have noted (in the current and previous assessments of this stock) that areas of uncertainty of the assessment require follow-up investigation and expert advice, and that the assessment outcomes may be affected by alternative model configurations, data streams, biological parameters, assumptions and other sources of uncertainty.

The Commission has endorsed the recommendation from the SC that follow-up work, including an independent peer review, is conducted in order to improve confidence in future yellowfin stock assessments in the IOTC. Therefore, this action will consist of a peer review process for the evaluation of the most recent stock assessment for yellowfin tuna.

The peer review process and its role in providing improved scientific advice for management is a priority for the Commission.

Outcome 1.3. Improved estimates of age, growth, reproduction and stock structure for sharks in the Indian Ocean

The Commission has expressed concern that information on key bycatch species such as sharks and rays is lacking. This means that the impacts of the tuna fisheries on such species are difficult to assess quantitatively. There is therefore a need to investigate the biology of key shark species including blue, shortfin mako, oceanic whitetip and silky sharks, which are the most commonly caught shark species in IOTC fisheries.

The biology of shark species is poorly understood in the Indian Ocean, and in many cases, biological parameters used in their assessments are inferred from studies conducted in other oceans. This is problematic as biological parameters are known to vary widely across the ocean basins. This lack of knowledge has prevented assessments from being conducted for shortfin mako, oceanic whitetip and silky sharks (an assessment is available for blue sharks).

Output 1.3.1. Estimates of age and growth for blue, shortfin mako, oceanic whitetip and silky sharks

The IOTC Working Party on Ecosystems and Bycatch (WPEB) has included studies on biology, including age and growth, its workplan to address these knowledge gaps.

It can be expected that improvements in the knowledge of age and growth characteristics will reduce uncertainty in the assessment for these shark species in the Indian Ocean.

Output 1.3.2: Information on reproductive biology for blue, shortfin mako, oceanic whitetip and silky sharks

The WPEB has included studies on reproductive biology in its workplan. The proposed activities, concentrating on producing improved knowledge of reproductive biology for these key shark species in the Indian Ocean, will address this workplan.

It can be expected that improvements in the knowledge of reproductive biology will reduce uncertainty in the assessments for these shark species in the Indian Ocean.

Output 1.3.3: <u>Estimates of population size and structure for shortfin mako</u>

The Commission has identified the need to investigate the biology of shortfin mako shark, which is a species commonly caught in IOTC fisheries and is considered to be one of the more vulnerable species due to its low productivity and high susceptibility to gears being used to target IOTC species.

There is currently weak evidence of population structure and size of shortfin mako shark globally and in the Indian Ocean. Currently it is assumed to be a single stock across the Indian Ocean, but this may not reflect the reality of the population. Furthermore, there is also a lack of reliable catch information suitable for determining population size which limits the availability of abundance trends. This creates uncertainties and undermines the ability of assessments to be able to accurately reflect the nature of the stock, meaning that current assessments are not considered robust enough to provide management advice for this stock.

There is a clear need to underpin shortfin mako assessments with a basic understanding of its population structure and possible connectivity among populations within the Indian Ocean (and potentially with adjacent populations in the Atlantic and Pacific Oceans).

The lack of reliable catch information impedes the assessment process. This study will attempt to provide a semi fisheries-independent estimate of population size based on Close Kin Mark Recapture (CKMR) techniques.

It can be expected that improvements in the knowledge of the population size and structure of shortfin mako shark will reduce uncertainty in the assessment for this species as the results of the study will provide another source of data for assessment models.

For these reasons, the WPEB has included studies on stock structure and the use of CKMR techniques to address these knowledge gaps, in its workplan.

Outcome 1.4: An ecological risk assessment for cetaceans is made available to the Commission

Output 1.4.1: <u>An ecological risk assessment for cetaceans based on best available information</u>

The number of fisheries interactions and mortalities involving cetaceans in the Indian Ocean is highly uncertain and most likely greatly underestimated. Interactions between cetaceans and fisheries potentially pose a threat to cetacean populations. The WPEB has requested that the interactions between cetaceans and fisheries be assessed as a matter of priority, in order for it to be able to provide better advice on the risks to cetaceans from fishing operations to the Commission.

To this end, the WPEB has recommended that an Ecological Risk Assessment (ERA) be conducted to assess the risk and susceptibility to cetaceans species encountered in the Indian Ocean by the main gears being used in tuna fisheries and to work towards filling cetacean bycatch data gaps.

ERAs have been undertaken in the Indian Ocean for sharks (in 2018) and marine turtles (in 2013), but this will be the first ERA for cetaceans to be conducted in the region.

Goal 2. To improve data for the management of tuna, tuna-like and bycatch species caught in IOTC fisheries

Outcome 2.1: Improved data collection, reporting and management of Regional Observer Scheme data at national and regional levels

Since its introduction in 2009, implementation of the ROS has remained very low among IOTC CPCs; and where observer programmes have been established, the quality of information collected and reported is highly variable.

Recognizing these issues, in 2016 the IOTC adopted Resolution 16/04 "*On the implementation of a pilot project in view of promoting the Regional Observer Scheme of IOTC*". As part of its plan and long-term strategy to further support the implementation of the Regional Observer Scheme, the pilot project identified and tackled each of the key issues that currently prevent the collection, analysis, and reporting of high-quality data, to contribute to stock assessment and management advice through the development of new technologies, tools, standards, and processes.

Among the key components of this outcome are the development of electronic tools that facilitate collection, analysis, reporting and management of scientific observers' data by enforcing a bottom-up process where data fields are fully standardized and relevant information flows *upwards*, from scientific observers to national focal points to the ROS Database (hosted by the IOTC Secretariat).

Some support was provided through a previous project funded by the EU (EC 305) which focused mostly on training on the use of the "old" ROS e-tools (developed with funds from WWF / NOAA / World Bank) to national observers in Kenya and Mauritius. Other activities relating to the development of the electronic tools have been funded through the IOTC regular budget.

Output 2.1.1: Finalised electronic tools to support data collection by scientific observers

The development of the ROS Pilot Project has triggered, among other things, a complete redesign of the paper-based ROS data collection forms to ensure comprehensive and immediate (i.e., onboard and during fishing operations) recording of ROS data fields.

Once collected, this information needs to be properly *digitized* before being shared with national focal points to support the de-briefing process and to build, when necessary, a repository of scientific observer data housed at the national level.

Two categories of IOTC CPCs currently exist with respect to the ROS requirements:

1) Those that already have proprietary IT systems and workflows to collect and manage scientific observer data

2) Those that are in the process of implementing a ROS-compliant national observer programme and do not yet have the infrastructure and processes to fully support the ROS data flow

This output targets CPCs belonging to the second category and is closely linked to the development of electronic tools for ROS data management and reporting at national level (output 2.1.2).

A prototype data collection tool (the "*ROS e-collection tool*") has already been developed by IOTC to explore potential approaches to the digitalization of scientific observer data collected in agreement with the previous (pre-2018) ROS requirements. This prototype has been presented to

several selected CPCs (Sri Lanka, Indonesia, Mauritius, and Kenya) and has now reached a stage where it will undergo further development through this project .

Output 2.1.2: <u>Finalised electronic tools to support data management and reporting by national ROS focal points</u>

The SC has noted that while many ROS trip data are submitted electronically to the Secretariat, a significant number of these is either reported through custom electronic formats (not fully compliant with the ROS data requirements) or in formats from which data cannot easily be extracted (e.g., PDF documents). For this reason, only 66% of trip data submitted to the Secretariat is currently included in the ROS database.

The IOTC Secretariat is currently liaising with the CPCs which report ROS data in non-standard formats but have the necessary IT tools and know-how to collect and manage scientific observer data in digital format, to evaluate the possibility of designing custom data-exchange components that will allow the production of ROS-compliant datasets from existing proprietary data management systems (e.g., *ObServe*).

Beside these custom components, which would be fundamental to improve the quality and completeness of all non-standard ROS data submissions that are currently converted with ad-hoc, time-consuming procedures by the Secretariat, the IOTC has also supported the design of a prototype for a separate electronic tool (the "*ROS national database*") that mainly targets the same categories of CPCs as in the case of the ROS e- collection tool (see Output 2.1.1) and will contribute to the implementation of the full ROS data workflow at national level.

A prototype of the ROS national database tool was trialled by Kenya and Mauritius in 2019 and 2020 during two 5-day training missions using funds from the EU project (305). Since then the prototype has been further extended to incorporate the changes introduced by the various revisions of the ROS specifications (2018-2021).

Although this tool has reached a relatively stable level of implementation, it still requires additional work, to be undertaken through this project, to be fully functional.

Outcome 2.2: Improved data collection and reporting of artisanal fisheries data.

Output 2.2.1: <u>Improved time series of catches and other scientific data for science and management purposes</u>

Coastal, artisanal fisheries represent between 50-70% of the total annual catches of the 16 tuna and tuna-like species under IOTC mandate. IOTC working parties and the SC have repeatedly noted the major uncertainties associated with the catch, effort, and size data available for coastal fisheries; and this fundamentally affects the quality of stock assessments and management of IOTC species, particularly neritic tunas and billfish. The Commission has repeatedly expressed its concern that some CPCs fail to report fisheries statistics to the IOTC as agreed by the Commission.

A range of factors may affect the quality of the statistical data reported to the IOTC Secretariat, depending on the complexity of the fisheries and the systems in place to collect, process, and manage the data at national level. The accuracy and precision of the data can be affected by biased sampling protocol, low sampling coverage, poor data resolution (e.g., due to mis-identification of species), and errors in processing and reporting. In addition, several CPCs fail to submit their fisheries data to the Secretariat by the IOTC standards and in accordance with the deadlines, which affects the data updates for the working parties and stock assessments.

The Working Party on Data Collection and Statistics (WPDCS) has identified, as a priority, the provision of targeted assistance to some coastal countries. This project will contribute to improved data collection and sampling for selected artisanal fisheries and, overall, improve CPCs understanding and compliance with IOTC reporting requirements.

Output 2.2.2: <u>Reconstruction of historical catch series for CPCs with persistent data quality issues</u>

Annual time series of nominal catches may constitute the main source of information available for assessing the status of stocks of several IOTC species and the most commonly caught pelagic sharks (e.g., blue sharks) with data-limited methods. In this context, the quality and robustness of the assessment essentially rely on the completeness and accuracy of the species-specific catch data available at the Secretariat. However, major issues in species identification combined with the common reporting of catches as species aggregates, and the systematic under-reporting of some species have been identified by the IOTC working parties and the SC to substantially affect the quality of the nominal catches for some species, particularly sharks, rays, billfish and neritic tunas.

For some specific fisheries characterized by outstanding issues of data quality, the IOTC Secretariat has been estimating species and gear composition for many years, following methodologies endorsed by the SC. This is particularly the case for the artisanal fisheries of Indonesia which currently contribute to more than 20% of the total catches of IOTC species. Similarly, the WPDCS has identified large uncertainties in the magnitude and composition of catches from the artisanal fisheries of India, the gillnet fisheries of Pakistan, and several other artisanal fisheries (e.g., Tanzania, Comoros, Mozambique).

The project will support work identified historical data mining and reconstruction of time series of catch as priority to improve the inputs of stock assessment models and increase the quality of the assessments.

Goal 3. To Improve compliance with IOTC Conservation and Management Measures

Outcome 3.1: Streamlined reporting and management of compliance data

Being compliant with the significant and growing number of obligations laid out in IOTC CMMs, has proven to be a major challenge for IOTC CPCs. At present, CPCs, in their efforts to fulfil them, primarily use forms and reporting templates developed by the IOTC Secretariat, which are submitted at various times in the year, via e-mail. Since this may involve inputs from different national authorities, CPCs often encounter difficulties in reporting on time, which affects their annual national compliance scores, but also receiving and using feedback from the IOTC Secretariat.

In this context, the eMARIS (electronic Monitoring And Reporting Information System) application was developed as an interactive and user-friendly on-line platform that provides a unique and tailor-made channel for CPCs to report their obligations to the IOTC Secretariat. Essentially, eMARIS seeks to improve general CPCs' compliance rates and timeliness through streamlined data reporting, improved follow-up of CPCs' performance and enhanced communication and feedback with/from the IOTC Secretariat.

Due to the potential benefits of using eMARIS, the Commission at its 26th Session endorsed its use and entry into implementation for the next compliance assessment cycle of the 2023 Compliance Committee meeting (CoC20). As a result, the eMARIS application is expected to be launched in production during the last semester of 2022.

Output 3.1.1: <u>National compliance officers trained in the use of eMARIS</u>

During the development phase of the eMARIS, the IOTC Secretariat development team conducted a first pilot training session in November 2021, where a selected group of volunteer CPCs had the opportunity to get familiarized with the system, express their views and provide feedback. The first pilot focused on the use of the system during a yearly cycle of data collection and was attended by the IOTC Secretariat, Seychelles, the European Union and Thailand.

In a follow-up to the first training pilot session, and prior to the roll out of the application going into production, a second training pilot session took place in June-July 2022. This second pilot intended to obtain additional feedback to refine the system, bearing in mind the need to generate interest and engagement from its future target users. This pilot was organised into two sessions, including a general guided tour of the application, followed by individual sessions consisting of a series of role play exercises. The CPCs that participated were Australia, China, India, Indonesia, Japan, Malaysia, Maldives, Mauritius, Mozambique, Seychelles, Sri Lanka and the United Kingdom.

During both pilot training sessions, participants viewed the application very positively, and described the processes as user friendly. To facilitate the implementation of eMaris by all CPCs, there is a need for training at national level, for officers who will be responsible for submitting information and reports through eMARIS, especially for the developing IOTC Member States.

Output 3.1.2: <u>IT technical, operational and maintenance support to IOTC web applications (eMARIS and ePSM)</u>

The objective of this project component is to provide IT services in support of the eMARIS and e-PSM web-based applications, currently accessible to CPCs through a dedicated section of the IOTC website. This will include IT support to the IOTC Secretariat staff and technical / operational support to all application end-users, as well as performing corrective, evolutive and security maintenance tasks.

In the case of e-PSM, specific activities might be required to account for future possible developments such as the migration of the platform onto the cloud, and specifically to maintain a timely and accurate synchronization of the platform with all reference data currently hosted by other IOTC systems (e.g., reference statistical codes, list of RAV vessels, etc.). More generally, actions shall also be taken to guarantee the possibility that IOTC statistical systems can extract aggregated (and anonymized) data from the e-PSM to produce analysis and summaries in support of the IOTC scientific working parties.

About eMARIS

In 2015, the IOTC Performance Review made two recommendations related to compliance with data collection and reporting requirements and following up on infringements. These recommendations prompted the eMARIS concept, which was endorsed by the Commission (S22) in 2018. Following the recruitment of one User Interface Design (UI) / User Experience Design (UX) expert, one software architect expert and one quality assurance expert in May 2019, the development phase started in July 2019 and ended in August 2021.

From September 2021 Phase 2 of the project started with piloting the application with a few users from selected CPCs. To this end, in November and December 2021 the Secretariat, the European Union (remote), Seychelles and Thailand (remote) were introduced to the use of eMARIS and the results of the feedback were integrated into the system. Feedback led to a beta version of the application that was piloted with all CPCs in mid-2022. Full roll-out and availability for use by CPCs has been taking place during the 2nd semester of 2022. In a transition phase from 2022 to 2023,

CPCs will have the option to submit information through eMARIS or in the existing format, until capacity is built in all CPCs for its universal application. Under the same contract, and in parallel, the on-line Record of Authorised Vessels is being developed, with full roll-out planned for March 2023.

About e-PSM

Worldwide efforts to manage fisheries extending across national and international boundaries onto the high seas continue to be undermined by Illegal, Unreported and Unregulated Fishing (IUU). Port State Measures (PSM) have been recognised as one of the most cost-effective means for enhancing compliance in fisheries management. Before the entry into force of the 2009 FAO Agreement on PSM on 5th June 2016, at its 20th Session the IOTC adopted Resolution 10/11 on PSM to Prevent, Deter and Eliminate IUU Fishing. The Resolution (which is superseded by Resolution 16/11) makes provisions for all stakeholders (vessel representatives, port States and flag States) to utilise the e-PSM application. To facilitate and strengthen the implementation of the PSM Resolution, the IOTC Secretariat has developed a web-based information system with the financial support of the Global Partnership for Oceans project of the World Bank. The e-PSM application was launched in 2016 with national e-PSM national trainings for CPCs. The e-PSM application is a monitoring, control and surveillance web-based tool developed to assist IOTC CPCs in implementing the IOTC PSM. It consists of three modules (forms and processes, library, and reporting). Since 2016, IOTC has had a functioning e-PSM application developed to facilitate and assist the CPCs to implement the IOTC Resolutions related to PSM.

At its 19th Session, the Compliance Committee (CoC19) recommended that the Commission considers making the use of the electronic Port State Measures (e-PSM) application a mandatory tool, and this was endorsed by the Commission (S26) in 2022.

Output 3.1.3: <u>Scoping study report on the integration of eMARIS with existing IOTC information and data management systems (statistical, online RAV, e-PSM, statistical document programme, ROS)</u>

IOTC has a functioning e-MARIS application that has been developed to facilitate and assist the CPCs to report data and information based on the requirements of the IOTC Resolutions. The software systems employed to store, retrieve and run queries on (among others) statistical data by IOTC, comprises several database management systems which include SQLServer, PostgreSQL and MS Access. At present, work is being undertaken to transform the IOTC Record of Authorised Vessels (RAV) into an online application, whereby CPCs will be able to upload new records and update existing records by themselves, although the final validation and integration of new information will remain under the remit of the IOTC Secretariat.

Following on from the advice of the IOTC Performance Review Panel, these applications are required to automatically integrate information and data from CPCs and perform automatic cross-referencing of reports for the various reporting obligations, including scientific data.

This project will support a scoping study to better understand the feasibility of integrating eMARIS with the existing IOTC information and data management systems.

All activities under this output shall be conducted in close coordination with the Data Section of the Secretariat, which is responsible for the data management systems and workflow specifically related to the provision and dissemination of statistical fishery data (based on the requirements of Res. 15/02, Res. 22/04, Res. 12/02) as well as of the standard classifications (species, gears,

morphometric data, floating object (FOB) activities etc.).

This scoping study shall therefore analyse the current state-of-play and propose potential mechanisms to facilitate the exchange of fisheries statistical data between CPCs (through e-MARIS) and the IOTC statistical systems which is currently performed via direct communication between national focal points and the IOTC Secretariat.

Whether the provision of ROS data shall be included within eMARIS is something yet to be formally discussed, considering that the submission of ROS trip data shall happen asynchronously, and following their validation at national level by ROS national focal points through IT tools already developed and available as advanced prototypes.

The scoping study shall also further consider how to enable the extraction of data from the eMARIS repositories by the IOTC statistical systems, which is a required data flow to produce regular data summaries in support of the IOTC scientific working parties (e.g., list of active vessels by type / CPC / year, daily position of instrumented buoys as per Res. 19/02).

Outcome 3.2: Improved understanding of the operationalisation and implementation aspects of gear marking by national administrations and vessel operators

Output 3.2.1: Operationalisation and implementation workshop report

Fishing gear marking makes an important contribution to sustainable fisheries as it assists in fishing effort management and control, facilitating monitoring, control and surveillance, and deterring IUU fishing. The marking of fishing gears is also key to improving the state of the marine environment, and to enhance safety at sea by combatting, minimizing and eliminating abandoned, lost or otherwise discarded fishing gear (ALDFG) and facilitating the identification, ownership and recovery of such gear.

With a view to introducing a management measure for the marking of fishing gears, the Commission discussed a proposal in 2019, without reaching consensus for its adoption. As a result, the IOTC Secretariat was requested to initiate a process to develop draft guidelines on how IOTC might operationalize the FAO voluntary guidelines on the marking of fishing gear. The resulting consultant's report entitled *"Operationalisation of FAO Voluntary Guidelines for the Marking of Fishing Gear in the IOTC Area of Competence"*, was presented to the fifth meeting of the Working Party on the Implementation of Conservation and Management Measures (WPICMM05) in 2022, and later to the IOTC Compliance Committee (CoC19). CPCs requested more time to provide comments (during the 2022/2023 intersessional period) on the report for its eventual discussion and possible adoption at the Commission meeting scheduled for 2023.

In order to improve knowledge and understanding among CPCs on the operationalisation aspects of incorporating fishing gear marking as an integral component of fisheries management, the IOTC Secretariat, through this project, proposes to hold a pilot workshop on the operationalisation and implementation of fishing gear marking with a view to discuss the *Operationalisation of FAO Voluntary Guidelines for the Marking of Fishing Gear in the IOTC Area of Competence*.

Outcome 3.3: Strengthening regional and national interagency coordination to combat IUU fishing, fisheries-related crimes and crimes associated with fisheries

Output 3.3.1: National PSM and PSC inspectors are trained and are more aware of the synergies between of IOTC port State measures and IOMOU port State control activities

IOTC is working with Memorandum of Understanding on Port State Control for the Indian Ocean Region (IOMOU) to raise awareness of national inspectors under the different inspection regimes of Port State Measures (PSM) under the PSMA, and Port State Control (PSC) under ILO (Maritime Labour Convention , C188 Convention on Work in Fishing of 2007) and IMO (Cape Town Agreement of 2012) instruments. The ultimate goal is to improve the coordination and efficiency of inspectors in combating IUU fishing, whilst contributing to improved maritime safety and security, enhanced protection of the marine environment and better labour conditions.

This project, will contribute to support the development and delivery of training programs for relevant port State control and port State measures regimes, will identify common areas of collaboration in order to improve efficiency and coordination at CPCs' national level to effectively tackle IUU fishing and related matters.

d) Methodology to be followed/project implementation

Goal 1. To improve scientific advice for the management of priority tuna, tuna-like and bycatch species caught in IOTC fisheries.

Outcome 1.1. Management procedures for albacore and skipjack tuna and swordfish are made available to the Commission

Output 1.1.1. Finalised management procedure for albacore tuna

The current operating models for Indian Ocean albacore tuna will be revised. This will include:

- reviewing the selection and weighting scheme
- testing the dynamics of the OM under extreme scenarios
- formulating different scenarios for future OM dynamics.

A new cycle of OM conditioning will be required for albacore, with varying complexity depending on the outcome of the upcoming stock assessment meeting.

Following this a refinement of the existing MSE framework for Indian Ocean albacore tuna will be carried out. This will involve testing and improving the performance of the biomass dynamics model currently in use, if possible. The dimensionality of the analysis proposed, given the number of years and scenarios, and for two stocks, will require access to extra computational facilities. Alternative Harvest Control Rules will also be developed and evaluated.

The evaluation of albacore management procedures performance is the final step in the process. This will include conducting the necessary MSE runs and tuning exercises so as to achieve the required performance over the chosen management objectives.

This analysis will be presented and reviewed at the WPM, WPTmT, SC and TCMP.

Output 1.1.2. Finalised management procedure for skipjack tuna

The current operating models for Indian Ocean skipjack tuna will be revised based on suggestions from the TCMP in 2022. This will include tuning the MPs to the 50%, 60% and 70% criteria and evaluating the performance of the MPs to recruitment decline in the presence of implementation error. The revised MP will then be presented to the TCMP in 2023. Based on feedback from the TCMP, an implementation cycle for the MP will be proposed as necessary. A set of candidate MPs (including HCR and data input) will be proposed to the TCMP for consideration by the Commission.

The evaluation of skipjack management procedures performance is the final step in the process. This will include conducting the necessary MSE runs and tuning exercises so as to achieve the required performance over the chosen management objectives.

This analysis will be presented and reviewed at the WPM, WPTT, SC and TCMP.

Output 1.1.3. Finalised management procedure for swordfish

The current operating models for Indian Ocean swordfish will be revised. This will include:

- reviewing the selection and weighting scheme
- testing the dynamics of the OM under extreme scenarios
- formulating different scenarios for future OM dynamics.

A new cycle of OM conditioning will be required for swordfish, with varying complexity depending on the outcome of the upcoming stock assessment meeting.

Following this a refinement of the existing MSE framework for Indian Ocean swordfish will be carried out. This will involve testing and improving the performance of the biomass dynamics model currently in use, if possible. The dimensionality of the analysis proposed, given the number of years and scenarios, and for two stocks, will require access to extra computational facilities. Alternative Harvest Control Rules will also be developed and evaluated.

The evaluation of swordfish management procedures performance is the final step in the process. This will include conducting the necessary MSE runs and tuning exercises so as to achieve the required performance over the chosen management objectives.

This analysis will be presented and reviewed at the WPM, WPB, SC and TCMP.

Outcome 1.2. A scientifically robust stock assessment for yellowfin tuna is made available to the Commission

Output 1.2.1. An independent peer review of the yellowfin tuna stock assessment

The independent peer review will be undertaken by an independent panel of leading stock assessment experts who have minimal or no involvement in the IOTC scientific processes. A review workshop will be held in consultation with the stock assessment expert from the IOTC as well as the Chairs and Vice-Chairs of the IOTC WPTT, WPM and SC.

The review workshop will consider: the model inputs, commenting on the adequacy and appropriateness of data sources and data inputs to the yellowfin tuna stock assessment; the model configuration, assumptions and settings; model diagnostics; and future research areas with the identification of priorities to improve future assessments.

The peer review workshop will provide recommendations for improving the assessment, including data inputs, model configuration, biological parameters, modelling approaches and treatment of uncertainty.

In conjunction with the IOTC WPTT scientists, improvement options that are feasible for application to the 2024 yellowfin assessment will be identified and assessments will be made about how these can also be applied in the assessments of bigeye, skipjack and other IOTC stocks.

Outcome 1.3. Improved estimates of age, growth, reproduction and stock structure for sharks in the Indian Ocean

Output 1.3.1. <u>Estimates of age and growth for blue, shortfin mako, oceanic whitetip and silky sharks</u>

This study on age and growth of blue, shortfin mako, oceanic whitetip and silky sharks in the Indian Ocean will include:

- Development of a plan for obtaining representative samples from across the Indian Ocean as the range of these species are considered to spread across the whole of the Indian Ocean.
- Vertebrae and other relevant body parts and data will be collected through fisheries observer programs or other research/data collection programs.
- Preparation of vertebrae samples followed by the application of routine analytical techniques to estimate age and growth.
- Analysis of previously obtained vertebrae samples, where available, for age validation studies.
- Validation of the accuracy of the ageing methods will be conducted where possible.

Output 1.3.2: <u>Information on reproductive biology for blue, shortfin mako, oceanic whitetip and silky sharks</u>

This study on the reproductive biology of blue, shortfin mako, oceanic whitetip and silky sharks in the Indian Ocean will include:

- Development of a plan for obtaining representative samples from across the Indian Ocean as the range of these species are considered to spread across the whole of the Indian Ocean.
- Gonads and other relevant reproductive materials will be collected through fisheries observer programs or other research/data collection programs.
- Preparation of gonad samples and application of routine histological or other appropriate techniques to estimate fecundity, age at maturity, sex ratios, spawning season, and spawning fraction.
- Analysis of previously obtained samples, where available, for the inclusion of further data points in the study.

Output 1.3.3: <u>Estimates of population size and structure for shortfin mako</u>

This study will apply genetic techniques to better understand the population size and connectivity of shortfin mako sharks throughout its distribution. Activities will include:

- Development of a plan for obtaining representative samples from across the Indian Ocean.
- Collection of muscle tissue and hard structure (including vertebrae) samples, and associated information through observer programs and/or other research/data collection programs.
- Addition of any existing samples to the overall sample collection.
- Preparation of samples and application of genetic analytical techniques and population structure synthesis.
- Statistical analyses to determine population size and structure.

Outcome 1.4: An ecological risk assessment for cetaceans is made available to the Commission

Output 1.4.1: <u>An ecological risk assessment for cetaceans based on best available information</u>

A semi-quantitative Ecological Risk Assessment study will be conducted. Activities will include:

- Reviewing information on cetacean bycatch in IOTC fisheries.
- Reviewing population demographics for cetacean species in the Indian Ocean and any information on the spatial and temporal overlap between fishing effort and cetacean distribution.
- Carrying out a productivity assessment of cetacean species in the Indian Ocean.
- Carrying out a susceptibility analysis taking into account the spatial distribution of cetacean populations and of the fisheries.

Goal 2. To improve data for the management of tuna, tuna-like and bycatch species caught in IOTC fisheries

Outcome 2.1: Improved data collection, reporting and management of ROS data at national and regional levels

Output 2.1.1: <u>Finalised electronic tools to support data collection by scientific observers</u>

IT support is required to further develop and finalise the prototype electronic ROS data collection tool. The activities to achieve this include:

a) Resolving all outstanding performance and stability issues identified during the initial trials of the prototype
b) Extending the prototype to include full support to the revised ROS data collection requirements
c) Iteratively improving the usability of the prototype according to feedback collected from end users
d) Designing proper update mechanisms to guarantee timely synchronization of the tool with the most recent versions that might become available during its development lifecycle

The electronic data collection tool will be finalized through an iterative process, incorporating user feedback and will then be trialled in the field. Additional support will then be required to support the adoption of the ROS e-collection tool by end-users (i.e., ROS national observers). The activities to achieve this include:

a) Designing online / printed user manuals for the installation and usage of the ROS e-collection tool
b) Delivering in-person training sessions to national observers from selected CPCs that either did not participate to the ROS pilot project or could not benefit from the training on the last version of the ROS data collection requirements. Training should focus on the usage of the ROS data collection tool, including the resolution of common problems encountered during its usage

Output 2.1.2: <u>Finalised electronic tools to support data management and reporting by national ROS focal points</u>

IT support is required to further develop and finalise the prototype ROS national database tool, implement an interface to manage the administrative aspects of the ROS regional database, and more generally support a robust data flow of ROS information from national institutions to the

IOTC Secretariat. The activities that will be carried out to achieve this include:

- For the ROS national database tool:

a) Resolving all outstanding performance and stability issues identified during the initial trials of the prototype
b) Extending the prototype to include full support to the revised ROS data collection requirements
c) Iteratively improving the usability of the prototype according to feedback collected from end users
d) Designing proper update mechanisms to guarantee timely synchronization of the tool with the most recent versions that might become available during its development lifecycle
e) Extending the tool to include more advanced functionalities to support the debriefing and analysis processes

- For the ROS Regional Database:

a) Designing an administrative interface (a web application or similar) to support all tasks necessary for the management of the full ROS data submission workflow by the IOTC Secretariat. This administrative interface will support:

   1. the management of a registry of accredited ROS observers and National focal points (including their contact details, roles, activity status, and credentials)
   2. the validation of all received ROS data submissions, including the provision of feedback to the responsible national focal points
   3. the production of summary statistics regarding the level of submission (at any given date) of validated ROS trip data for all concerned fisheries and CPCs

b) Assessing the feasibility of, and eventually designing custom IT tools and / or integrated modules and procedures to extract ROS-related data from external systems / repositories (*ObServe*, *SWIOFish* DB, other national statistical systems, etc.) identified as holding historical as well as recent scientific observer data collected for Indian Ocean fisheries by IOTC CPCs

Additional support is necessary to deliver training on the ROS national database tool (to ROS national focal points) as well as on the ROS administrative interface (to the IOTC Secretariat Staff). The activities to achieve this include:

a) Designing online / printed user manuals for the installation and usage of the ROS national database tool
b) Delivering in-person training sessions to national focal points from selected CPCs that either did not participate to the ROS pilot project or could not benefit from the training on the last version of the ROS national database tool. Training should focus on the usage of the ROS national database tool, including the resolution of common problems encountered during its usage
c) Designing an online user manual for the usage of the ROS regional database administrative interface
d) Delivering in-person / remote training sessions to staff from the IOTC Secretariat responsible for the support of the ROS regional data exchange workflow
e) Delivering the required technical training and support to personnel from the research institutions or ministries holding scientific observer data in custom formats / databases,

and which specifically agreed in sharing this information with the ROS Regional Database through dedicated conversion tools (when possible)

Outcome 2.2: Improved data collection and reporting of artisanal fisheries data.

Output 2.2.1: <u>Improved time series of catches and other scientific data for science and management purposes</u>

This project component involves data compliance and support missions by the IOTC Secretariat to priority coastal CPCs. The purpose of these missions is to: identify the reasons behind inconsistencies in some data sets and why some data are not fully reported to the Secretariat to IOTC standards; propose a plan of action for each CPC to improve data collection and reporting in the future; and where necessary, provide direct technical assistance. The missions will aim to:

- Understand the pros and cons of the data collection and reporting systems in place and identify issues and bottlenecks
- Provide technical support in establishing and maintaining statistical systems for collecting and reporting artisanal fisheries data to the IOTC
- Organise workshops to clarify data reporting requirements and to facilitate reporting and improve compliance in terms of IOTC mandatory statistical data collection and reporting requirements.

Output 2.2.2: <u>Reconstruction of historical catch series for CPCs with persistent data quality issues</u>

A study will be conducted to reconstruct historical catch series for CPCs that have been identified as having persistent data quality issues. Activities will include:

- In-field missions and collaboration with national scientists to identify ancillary sources of data providing historical information on fishing effort and catches (e.g., shark fin trade)
- Review of peer-reviewed scientific articles and grey literature including historical information on fisheries activities and production
- Developing and comparing methods of catch reconstruction (e.g., generalized additive models, random forest models, ratio-based method)

CPCs will be prioritised on the basis of the importance of the fisheries concerned, and on the expected improvements in the data available for the stock assessments of the targeted species, as regularly determined by the IOTC WPs. Eventually, the support could be extended to all other CPCs for which historical data is lacking or incomplete, if time and funds will allow.

Goal 3. To Improve compliance with IOTC Conservation and Management Measures

Outcome 3.1: Streamlined reporting and management of compliance data

Output 3.1.1: <u>National compliance officers trained in the use of eMARIS</u>

The training of national compliance officers in the use of eMARIS, will consist of in-country capacity building missions, where all relevant national authorities will receive a general overview of the system and will engage in different role play exercises, depending on their profile or field of competence. In particular the trainings will aim to support developing States throughout the whole compliance process, which comprises:

- Completion of the reporting templates;
- Submission of information/reports;
- Understanding the assessment/feedback processes and follow-ups;

- Issuance of the implementation and compliance reports;

The national trainings in the use of eMARIS will also place special attention on briefing country managers on how to manage their national accounts and users, following-up on scheduled reporting obligations and to brief them on what backstopping support are available to them.

Output 3.1.2: <u>IT technical, operational and maintenance support to IOTC web applications (eMARIS and ePSM)</u>

Funds are required for technical, operational and maintenance-services of front-end / back-end developers to ensure the smooth running of the system and provide backstopping support. Activities will include:

- Provision of generic IT support to the IOTC Secretariat staff about the structure of the web applications domain, the underlying data assets, and all end-users functionality provided by the platforms
- Provision of IT support to the IOTC Secretariat staff in the management of issues and problems that could be encountered with the applications
- Provision of technical/operational support to all applications end-users
- Provision of IT support to solve critical issues such as systematic application crashes and degradation
- Performing evolutive maintenance on the application stack, and implementation of domain update requirements when necessary
- Introduction of adequate security measures to guarantee the integrity of both the applications runtime and the underlying data assets, as well as the continuous (24/7) operation of the systems by envisaging proper recovery mechanisms to bring the systems back on-line in the shortest time possible after any incident
- Performing any other tasks related to the functionality of the applications

Output 3.1.3: <u>Scoping study report on the integration of eMARIS with existing IOTC information and data management systems (Statistical, online RAV, e-PSM, Statistical document programme)</u>

Funds are required to support a consultancy to carry out a scoping study. Activities to be undertaken by the consultant will include:

- Review of all relevant information and data management systems used by IOTC Secretariat
- Carry out a data integration analysis and identify possible solutions
- Elaborate a roadmap for integrating the various IOTC information and data management systems, including proposal to develop electronic reporting systems where none currently exists
- Carry out an assessment on the financial implications for implementing the roadmap

Outcome 3.2: Improved understanding of the operationalisation and implementation aspects of gear marking by national administrations and vessel operators

Output 3.2.1: <u>Operationalisation and implementation workshop report</u>

Funds will be used to support the implementation of a pilot operationalisation and implementation workshop to be conducted in one of the CPCs with the largest fleet of authorised gillnetters, as gillnet has been recognised in the consultant's report as the gear that poses the

highest ecological risk if abandoned, lost or otherwise discarded at sea. The specific area where the workshop shall be held will be decided taking into account the need to ensure that conditions are met for wide participation by other CPCs.

Once the location of the workshop is decided, to overcome language barriers, it is proposed that a local consultant is recruited to work alongside the Secretariat to develop the content for the workshop, especially for the section devoted to vessel operators.

Representatives of national administration and representatives of operators and fishers should attend the workshop, as they are the actors that will operationalise the marking of gears and control its implementation.

The workshop will discuss the report 'Operationalisation of FAO Voluntary Guidelines for the Marking of Fishing Gear in the IOTC Area of Competence' to provide comments and recommendation related to the context of the CPC hosting the workshop.

Outcome 3.3: Strengthening regional and national interagency coordination to combat IUU fishing, fisheries-related crimes and crimes associated with fisheries

Output 3.3.1: <u>National PSM and PSC inspectors are trained and are more aware of the synergies between of IOTC port state measures and IOMOU port state control activities</u>

Funds will be used to support the delivery of trainings to national PSM and PSC inspectors, in order to raise their knowledge and awareness on the existing synergies between IOTC port state measures and IOMOU port State control activities. Additionally, the trainings will serve to:

- Showcase existing information sharing platforms to effectively implement PSM under the IOTC,
- To review IOMOU and IOTC legal frameworks with the aim of identifying commonalities and key elements for better coordination and harmonization of procedures
- To enhance capacities and create channels for information exchange

e) Expected results and their use:

The project focuses on areas where substantial improvements are required, such as the quality and completeness of data available for bycatch species and where urgent management interventions are required such as for the yellowfin tuna stock assessment. Datasets held by the IOTC Secretariat are published ahead of the scientific meetings and new data and science findings are published as scientific papers which are open-access documents that are subject to peer-review at working party meetings. These provide highly suitable indicators for evaluating the success of projects such as this which are based on improvements to data and science.

A number of indicators of success have been identified for each of these outputs and are detailed in Annex 1 where the log frame can be found. A summary is provided below. The expected outputs of the actions are:

Goal 1. To improve scientific advice for the management of priority tuna, tuna-like and bycatch species caught in IOTC fisheries.

Outcome 1.1. Management procedures for albacore and skipjack tuna and swordfish are made available to the Commission

Output 1.1.1. <u>Finalised management procedure for albacore tuna</u>

The activity of this study will contribute to the development of a finalised management strategy evaluation for albacore tuna, including reviewing and extending current operating models and conducting the necessary MSE runs and tuning exercises so as to achieve the required performance over the chosen management objectives.

Output 1.1.2. <u>Finalised management procedure for skipjack tuna</u>

The activity of this study will contribute to the development of a finalised management strategy evaluation for skipjack tuna, including reviewing and extending current operating models and conducting the necessary MSE runs and tuning exercises so as to achieve the required performance over the chosen management objectives.

Output 1.1.3. <u>Finalised management procedure for swordfish</u>

The activity of this study will contribute to the development of a finalised management strategy evaluation for swordfish, including reviewing and extending current operating models and conducting the necessary MSE runs and tuning exercises so as to achieve the required performance over the chosen management objectives.

Outcome 1.2. A scientifically robust stock assessment for yellowfin tuna is made available to the Commission

Output 1.2.1. <u>An independent peer review of the yellowfin tuna stock assessment</u>

The output of this action will be a fully peer-reviewed yellowfin tuna stock assessment which can be used to inform management of this stock in the Indian Ocean

Outcome 1.3. Improved estimates of age, growth, reproduction and stock structure for sharks in the Indian Ocean

Output 1.3.1. <u>Estimates of age and growth for blue, shortfin mako, oceanic whitetip and silky sharks</u>

The study will collect length at age to improve growth estimates, derive the age structure of the population in the catch, and obtain samples to estimate the biological parameters for blue, shortfin mako, oceanic whitetip and silky sharks in the Indian Ocean.

Output 1.3.2: <u>Information on reproductive biology for blue, shortfin mako, oceanic whitetip and silky sharks</u>

The study will obtain samples to estimate the reproductive biological parameters for blue, shortfin mako, oceanic whitetip and silky sharks in the Indian Ocean.

Output 1.3.3: <u>Estimates of population size and structure for shortfin mako</u>

The study will collect data and samples from around the Indian Ocean to determine the population size and structure of shortfin mako sharks.

Outcome 1.4: An ecological risk assessment for cetaceans is made available to the Commission

Output 1.4.1: <u>An ecological risk assessment for cetaceans based on best available information</u>

The outputs of this study will comprise a report on the ecological risk assessment analysis for cetaceans.

Goal 2. To improve data for the management of tuna, tuna-like and bycatch species caught in IOTC fisheries

Outcome 2.1: Improved data collection, reporting and management of ROS data at national and regional levels

Output 2.1.1: Finalised electronic tools to support data collection by scientific observers

The expected outcome is a ready-to-use tool that will complement other means (including those directly designed and managed by the IOTC Secretariat, such as the ROS data collection templates) to collect all required ROS data fields at national levels.

Other expected outcomes following the development of the tool are the drafting of its user manuals and the delivery of in-person training sessions to end-users (national observers from concerned CPCs).

With the successful finalization of the ROS electronic data collection tool, the IOTC expects a sensible reduction in the time required for the digitalization of scientific observer data and for their provision to national focal points for de-briefing and management purposes.

At the same time, this tool has been identified as crucial to increase the accuracy and completeness of collected information due to its automated error-checking procedures and cross-referencing of auxiliary information (e.g., through direct connection to the IOTC Record of Authorised Vessels).

Output 2.1.2: Finalised electronic tools to support data management and reporting by national ROS focal points

The expected outcomes include:

1. A ready-to-use finalized tool to collate ROS information at national level and submit ROS data to the IOTC ROS regional database that will complement other means (including those directly designed and managed by the IOTC Secretariat, such as the ROS data reporting forms).
2. An interface to be used by the IOTC Secretariat to support the ROS workflow both from the administrative (registry of accredited observers and national focal points) and data quality points of view (validation of data submissions against the ROS standards)
3. A set of standalone tools and modules to convert scientific observer data to the ROS format when these are available within other custom systems and databases (depending on the result of the assessment).
4. The drafting of user manuals and the delivery of in-person / remote training sessions to all concerned end-users regarding the tools and workflows in 1), 2) and 3)

With the successful finalization of the ROS national database tool and the development of the envisaged data conversion components to facilitate the exchange of information from existing proprietary systems to the ROS, the IOTC expects to see a marked increase in the fraction of ROS trip data submitted to the Secretariat that is directly included in the ROS regional database, and also that all historical submissions provided in non-suitable electronic formats are eventually converted and stored in the ROS database and kept there for future reference.

Outcome 2.2: Improved data collection and reporting of artisanal fisheries data.

Output 2.2.1: Improved time series of catches and other scientific data for science and management purposes

The activity of this study will contribute to the improvement of the accuracy and completeness of the data used for assessing the status of the IOTC stocks and monitoring the ecosystem effects of tuna fishing on some sensitive pelagic species such as sharks and rays.

Output 2.2.2: Reconstruction of historical catch series for CPCs with persistent data quality issues

The activity of this study will contribute to the improvement of the knowledge on the status of the data-poor IOTC species and some of the elasmobranch species commonly caught in Indian Ocean tuna and tuna-like fisheries.

A key output from this activity is a reconstructed historical catch series that can be presented to the SC for cases where the historical time series subject to reconstruction covers species and fisheries for which "official" (yet incomplete or highly aggregated) data are already available to the Secretariat.

In other cases, the reconstructed time series might refer to species / fisheries for which no information has ever been received by the Secretariat (e.g., all Somali artisanal fisheries, or data for bycatch or discarded species from other CPCs). In these circumstances, the reconstructed information should first be presented to the relevant working parties (WPNT / TmT / TT / B / EB), then to the WPDCS and finally to the SC for endorsement, if deemed adequate.

Goal 3. To improve compliance with IOTC Conservation and Management Measures

Outcome 3.1: Streamlined reporting and management of compliance data

Output 3.1.1: National compliance officers trained in the use of eMARIS

Training CPCs on the use of eMARIS will contribute to the effective implementation of the tool, will kick-start its use and help to overcome potential initial impediments, especially concerning developing States.

Output 3.1.2: IT technical, operational and maintenance support to IOTC web application (eMARIS and ePSM)

The provision of IT backstopping support and maintenance will strongly contribute to ensuring the proper functioning and improvement of the systems, for the benefit of end-users.

Output 3.1.3: Scoping study report on the integration of eMARIS with existing IOTC information and data management systems (Statistical, online RAV, e-PSM, Statistical document programme

The scoping study will provide understanding on the feasibility of integrating eMARIS with existing IOTC information and data management systems, crucial to reduce the hurdles faced by CPCs, whilst promoting improved insights and analytics.

Outcome 3.2: Improved understanding of the operationalisation and implementation aspects of gear marking by national administrations and vessel operators

Output 3.2.1: Operationalisation and implementation workshop report

The workshops will discuss the report "Operationalisation of FAO Voluntary Guidelines for the Marking of Fishing Gear in the IOTC Area of Competence", provide comments and improve CPC's understanding of the implementation actions required to operationalise the marking of fishing gear.

Outcome 3.3: Strengthening regional and national interagency coordination to combat IUU fishing, fisheries-related crimes and crimes associated with fisheries

Output 3.3.1: National PSM and PSC inspectors are trained and are more aware of the synergies between of IOTC port state measures and IOMOU port state control activities

The national trainings will contribute to facilitating cooperation, coordination and information-sharing between authorities carrying out inspections in ports of the merchant and fishing sectors, in line with relevant international and regional instruments related to fishing vessels, fishing vessel personnel and fishing operations. This will result in improved knowledge and awareness of PSM and PSC inspectors on common areas for collaboration and coordination at national level to combat IUU fishing, fisheries-related crimes and crimes associated with fisheries.