

## UPDATES ON THE IMPLEMENTATION OF THE IOTC REGIONAL OBSERVER SCHEME AND ITS PILOT PROJECT

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### Purpose

To inform the WPDCS18 of the status of implementation and reporting to the IOTC Secretariat of the Regional Observer Scheme (ROS) set out by Resolution 11/04 at the 15<sup>th</sup> Session of the Commission in 2011, and recently (22 September 2022) superseded by Resolution [22/04](#) *On a regional observer scheme*.

### Background

Fisheries observer data is important for fisheries management, providing an independent source of detailed, high-quality information on fishing activities and catches at a sufficient level of resolution to be used for analyses such as the standardisation of catch rates and analysis of bycatch mitigation measures. At the 13<sup>th</sup> Session of the Commission (S13), the Commission adopted Resolution 09/04 *on a Regional Observer Scheme*, which was superseded in 2010 by Resolution 10/04, in 2011 by Resolution 11/04, and in 2022 by Resolution 22/04. The main objective of the IOTC Regional Observer Scheme is to “collect verified catch data and other scientific data related to the fisheries for tuna and tuna-like species in the IOTC area of competence” (Res 22/04, para. 2).

Resolution 22/04 *On a Regional Observer Scheme* makes provision for the development and implementation of national observer schemes among the IOTC CPCs and that “CPC shall ensure that all fishing vessels of 24 meters length overall and above and under 24 meters, if they operate outside the exclusive economic zone (EEZ) of the flag CPC and in the IOTC area of competence, comply with the minimum observer coverage of 5% as defined by the number of operations/sets” (Res 22/04, para. 3).

The Resolution also states that “landings from artisanal fishing vessels shall also be monitored at the landing place by field samplers. The indicative level of the coverage of the artisanal fishing vessels shall be 5% of the total levels of vessel activity (i.e., total number of vessel trips or total number of active vessels)” (Res 22/04, para. 8) and that “Field samplers shall monitor catches at the landing place with a view to estimating catch-at-size by type of boat, gear and species, or carry out such scientific work as may be requested by the IOTC Scientific Committee” (Res 22/04, para. 9).

As there are currently no established guidelines for the collection of data from artisanal vessels fishing within their national EEZ, so this remains an area for further development.

Several national observer programmes have now been established for industrial fleets across the Indian Ocean and these are used to collect scientific fisheries data by onboard observers, according to research requirements specified by each of the coordinating organisations. Scientific observer data are therefore collected and reported at the regional level to the IOTC Secretariat as part of the mandate of the ROS and are summarised in this paper.

### Update on the status of implementation and reporting

#### Implementation of the observer scheme

As of 22<sup>nd</sup> November 2022, sixteen CPCs (Australia, China (including Taiwan,China), Comoros, EU (France<sup>1</sup>, Spain, Portugal), Indonesia, Japan, Kenya, Rep. of Korea, Madagascar, Maldives, Mauritius, Mozambique, Seychelles, South Africa, Sri Lanka, and Thailand) have submitted a list of observers and have been allocated an IOTC observer registration number. A total of **367** observers are currently registered as active.

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<sup>1</sup> Including Mayotte due to its status as a French outermost region since January 2014

To date, information for a total of **2,504** trips has been reported to the IOTC Secretariat (in different formats) by Australia, China (including Taiwan, China), EU (France, Italy, Portugal, and Spain), the United Kingdom, France OT, Indonesia, Japan, Kenya, Rep. of Korea, Madagascar, the Maldives, Mauritius, Mozambique, Seychelles, South Africa, Sri Lanka, and Tanzania.

**Appendix A** provides a summary of the status of implementation of the ROS between 2012 and 2021 by all IOTC CPCs. **Appendix B** and **Appendix C** provide an estimation of the level of effort covered by observers between 2017 and 2021 for industrial longline and purse seine vessels (data updated as of 30<sup>th</sup> October 2022).

## Reporting in electronic format

At the SC20 in 2017, there was a recommendation for all observer data to be submitted in electronic format:

(Para. 115) "*Resolution 11/04 On a Regional Observer Scheme requests the submission of a report after each trip but the SC **RECOMMENDED** that on the next revision of the Resolution, this should be amended to request the submission of data in an electronic format suitable for automated data extraction (including historic data) with a given deadline so that information from multiple trips can be provided*".

An increasing number of CPCs are now submitting data electronically, including Australia, EU, France, EU, Spain, EU, UK, China (partial), Indonesia, Japan, Kenya, Maldives, Mozambique, Mauritius, and Sri Lanka (see also [Appendix A](#)) although not all the formats adopted for data submission are suitable for automated and accurate extraction of the information to be stored in the ROS regional database.

Furthermore, several important data fields marked as *for reporting purposes* are regularly missing from these submissions (e.g., estimated catch by species at set level for some of the PS fleets) although known to be available to the data providers and in addition, a potential misunderstanding on the meaning of "*optional / mandatory for reporting*" (see the ROS data fields specification) was encountered with some CPCs thus preventing the submission of important data fields (e.g. weight measurements of caught / retained individuals) that were instead available in earlier reports.

## A Pilot Project for the ROS

Since its origination in 2009, national implementation of the Regional Observer Scheme remains very low among IOTC CPCs. Where observer programmes have been established, these are wide ranging and highly variable in the type and quality of information collected and the reporting of data to IOTC standards remains poor and so the data that are submitted and stored regionally are currently of little value.

In recognition of these issues and in a positive step towards addressing the problems and seeking solutions, the IOTC adopted Resolution 16/04 "*On the implementation of a pilot project in view of promoting the Regional Observer Scheme of IOTC*" and following this a pilot project has been developed. This was discussed and further developed at the WPEB, WPDCS<sup>2</sup> and SC<sup>3</sup> in 2016, circulated to all Members for comment in March 2017 and was approved by the Commission in May 2017<sup>4</sup>.

The project outlines a comprehensive plan as part of a long-term, holistic strategy for supporting the implementation of the Regional Observer Scheme in the IOTC area of competence. It aims to tackle each of the key issues that currently prevent the collection and analysis of high-quality data to contribute to stock assessment and management advice through the development of new technologies, tools, standards, and processes. The overall strategic framework is centred on five key components:

1. Observer training programme and minimum standards
2. Electronic reporting
3. Observer database development and historic data collation
4. Electronic monitoring system

<sup>2</sup> IOTC-2016-WPDCS-22: <http://www.iotc.org/documents/pilot-project-iotc-regional-observer-scheme>

<sup>3</sup> IOTC-2016-SC19-14: <http://iotc.org/documents/pilot-project-iotc-regional-observer-scheme-0>

<sup>4</sup> IOTC-2017-S21-10: <http://www.iotc.org/documents/pilot-project-iotc-regional-observer-scheme-1>

## 5. Observation in-port

A critical component in each of the work streams is the piloting phase and Resolution 16/04 provides a framework for trialling these innovations by drawing together the outputs from the various work streams and operationalising them in selected voluntary CPCs.

### Outcomes of SC24 relevant to the IOTC ROS and its pilot project

#### *Report of the 17<sup>th</sup> Session of the Working Party on Data Collection and Statistics (WPDCS17)*

The SC **RECALLED** the importance that documentation on sampling design and raising procedures be provided by CPCs to the Secretariat in agreement with Res. 15/02 and **ACKNOWLEDGED** that the Secretariat is developing a template for the provision of such information, and that the activity has been included in the WPDCS Program of Work.

The SC **NOTED** that Japan expressed their interest to participate as reviewer in the peer-review process leading to the finalization of the ROS Observer Training Programme’s outputs, in particular for what concerns the expected updates to the data collection and reporting requirements.

The SC **NOTED** that the 1<sup>st</sup> meeting of the ad hoc Working Group on the Development of Electronic Monitoring Programme Standards (WGEMS) took place from the 15 – 17 November 2021.

The SC **NOTED** the outcomes and recommendations from the WPDCS specifically regarding the WGEMS, **ACKNOWLEDGED** that the nature and scope of the Working Group also include elements of compliance, and **DISCUSSED** whether to maintain the Working Group under direct responsibility of the WPDCS.

The SC **NOTED** the outcomes of the 1<sup>st</sup> ad-hoc IOTC WGEMS and **RECOMMENDED** the Commission endorse its continuation in the future and for the Commission to discuss if the WGEMS should remain under the WPDCS or report directly to the SC or CoC. The SC **ENDORSED** the Terms of Reference and Plan of Work for the WGEMS.

#### *Implementation of the Regional Observer Scheme*

The SC **NOTED** paper IOTC–2021–SC24–07 which provided an update on the status of implementation and reporting to the IOTC Secretariat set out by Resolution 11/04 On a Regional Observer Scheme (ROS) including the coverage estimated for both the longline and purse seine large scale fisheries from concerned CPCs, and how these compare to the expected minimum coverage level

The SC **CONGRATULATED** the Secretariat for the compilation of the data which provide a comprehensive view of the status of the ROS.

The SC **ENCOURAGED** CPCs to validate the information provided in appendices A, B and C of paper IOTC-2021-SC24-07, and confirm that it correctly reflects the status of implementation of the ROS at the national level, and to liaise with the IOTC Secretariat should any discrepancy be identified.

The SC **NOTED** that the annual observer coverage estimated by the Secretariat for longline fisheries (Appendices B1-B2 of paper IOTC-2021-SC24-07 is calculated as the proportion of hooks observed with respect to the total number of hooks deployed by the fleet while the second paragraph of the IOTC Resolution 11/04 mentions a coverage of “at least 5% of the number of operations/sets”, further **NOTING** that the number of fishing sets is also used in ICCAT, IATTC and WCPFC for deriving observer coverage and that harmonisation in methods should be sought across tuna RFMOs.

The SC **NOTED** that that the matter has been extensively discussed during the WPDCS and that the effort expressed in number of hooks is the only information on fishing effort reported to the Secretariat for most longline fisheries as per the mandatory requirements of IOTC Resolution 15/02 (para 4b).

In absence of data on the total number of sets, the SC **ENDORSED** the methodology of the Secretariat for estimating the observer coverage for longline fleets from the effort expressed in hooks and **AGREED** that the number of fishing sets shall

be considered for submission as part of the data requirements for longline fisheries, further **NOTING** that this would require to amend the IOTC Resolutions 15/01 and 15/02.

To fulfil the official coverage rates stipulated in 11/04, Japan requested to compute the coverage rates using data on sets, available in all Japanese National Reports in the past and to revise the validation Table from this year.

The SC **NOTED** that the observers on longliners may not observe all the hooks on a line and **QUERIED** whether the coverage should be estimated from the hooks observed or from all the hooks deployed during an operation observed by the observer, i.e., considering that the hooks observed on a line are a representative sample of the whole line. Japan noted their preference to use the term “deployed” as they expressed it is difficult to interpret “observed number of hooks”. The latter term is therefore applied differently amongst CPCs/RFMOs. Japan further noted that to avoid ambiguity, CCSBT uses “deployed number of hooks”. Japan expressed its opinion that the best solution is to use sets to compute the official coverages stipulated in 11/04

### ***Consideration of Resolution 16/04 On the implementation of a Pilot Project in view of promoting the Regional Observer Scheme of IOTC***

The SC **NOTED** the request of the WPDCS that when finer-grained information is available to the ROS (e.g., the number of observed hooks in the case of longline fisheries) this should be provided to the IOTC Secretariat and preferred for the estimation of the actual level of coverage of ROS data submissions. Japan noted that to apply this method officially, Res 11/04 needs to be revised

The SC **NOTED** that the ROS pilot project had been paused throughout 2020 and most of 2021 due to the inability of the Contractors to travel to the participating countries and provide the necessary training. The Secretariat informed the SC that the project had subsequently resumed, with additional training documentation being developed by the contractors as well as virtual training sessions being conducted for the target countries.

### **Outcomes of S26 relevant to the IOTC ROS and its pilot project**

The Commission **ADOPTED** the following Conservation and Management Measures:

- (...)
- Resolution 22/04 *On a Regional Observer Scheme*

### **ROS Pilot Project: progress update**

#### ***Observer training programme and minimum standards***

A vast array of observer initiatives, with different training curricula, data collection methods and procedures has been developed across the Indian Ocean by a range of organisations, both prior to and since the implementation of Resolution 11/04. As a result, an assortment of data of varying quality is being collected and reported, with many inconsistencies and gaps, and overall, a lack of standardisation in the procedures employed by national observer schemes and of conformity with IOTC mandatory data requirements.

#### **Minimum standards for the ROS**

The issues associated with this variety of standards, programmes and lack of coordination have already been identified in some areas such as the southwest Indian Ocean region and resulted in increasing number of requests being addressed to the Secretariat for clarification of standards and for formal accreditation or recognition that national or sub-regional programmes are adhering to IOTC standards. However, no formal mechanism was in place through which to do this or a concrete and auditable set of standards against which programmes could be assessed.

During 2018, funds were obtained, and a consultancy was developed for an expert to comprehensively review the *ad-interim* data collection and reporting requirements and set out the minimum standard for the scheme in a clear and concise format. A full project report was developed that includes a revised set of data fields and programme standard, and an

expert consultation workshop – involving a working group of selected experts from each of the main fleets (longline, purse seine, pole and line, gillnet, and handline) from the eastern and western Indian Ocean as well as from other oceans – took place in Seychelles from 24-28 September 2018.

The workshop-specific objectives focused on the revision of proposed ROS standards, data collection fields and reporting requirements, with participants that were invited to review the relevance and practical applicability of existing and proposed standards, data collection fields and reporting requirements.

The final set of standards recommended by this expert group was then presented to the WPDCS14 for review and to the SC21 for approval and triggered several significant updates to the ROS e-tools that were eventually finalized.

### **ROS training package**

In 2019, a project to develop a complete training package for the IOTC ROS has been awarded to CapMarine: this is based on the finalised standards and include training materials for observer coordinators as well as observers, both on-line (e-learning tools) and on paper.

The newly developed tools and materials will be implemented in four countries (Sri Lanka, Tanzania, Kenya, and Indonesia<sup>5</sup>) and the IOTC Executive Secretary secured high level commitment for the support of this project in each country. Due to the insurgence of the CoViD pandemic and the consequent health risks and travel restrictions implemented at national levels, the project was suspended for reasons of *force majeure*, as was the deployment of ROS scientific observers in the IOTC area of competence. The project restarted in 2021 with necessary modifications to allow for the online training of observers and observer coordinators.

The project is wrapping up now (end of November 2022). Two site visits were performed in Indonesia, Tanzania, and Kenya and three in Sri Lanka.

In Indonesia, full training (comprehensive theoretical, practical and safety training along with written tests to assess the competence of trainees) was completed and some pilot deployments have begun. Debriefings have been carried out from these deployments and data from these will be made available to the Secretariat.

In Kenya full training has been completed and three pilot deployments have been successfully completed. Debriefings have been carried out from these deployments and data from these will be made available to the Secretariat.

In Sri Lanka and Tanzania, full training was completed but no pilot deployments took place within the project lifespan, so no data have been made available from this CPC yet.

A package of training manuals and supporting documents and forms prepared by the service provider were presented at the WPDCS 17 and included the following items:

- Observer Logistics Coordinator (OLC) training curriculum
- OLC Manual
- Scientific Field Observer (SFO) training curriculum
- Draft SFO training manual
- Observer workbooks (for purse seine / longline / gillnet)
- Observer data collection forms (for purse seine / longline / gillnet)

### ***Electronic data collection and reporting***

The IOTC has developed a set of electronic tools to support data collection and reporting of ROS data, specifically aimed at observers and observer coordinators.

Two different tools were developed with this purpose:

- the **ROS e-collection tool**, to support observers in their task of compiling observed data in electronic format, and verify that the ROS minimum data collection requirements are met

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<sup>5</sup> Due to issues with many CPCs being unable to meet the requirements set out for participating in the Regional Observer Scheme, the number of participating countries has been reduced from the six that were originally planned down to four.



- the **ROS national database**, to help observer coordinators collate all data produced with the ROS e-collection tool (for observers deployed on vessels from a given flag state), analyze their content, and submit the data to the ROS regional database

Both tools are designed to be platform-independent (they can run on Windows, Mac OS, and Linux), have minimum HW / SW requirements, are localized in the two official languages of IOTC and can seamlessly integrate with the IOTC databases to ensure continuous update of all reference codes and core datasets (e.g., the IOTC Record of Authorised Vessels).

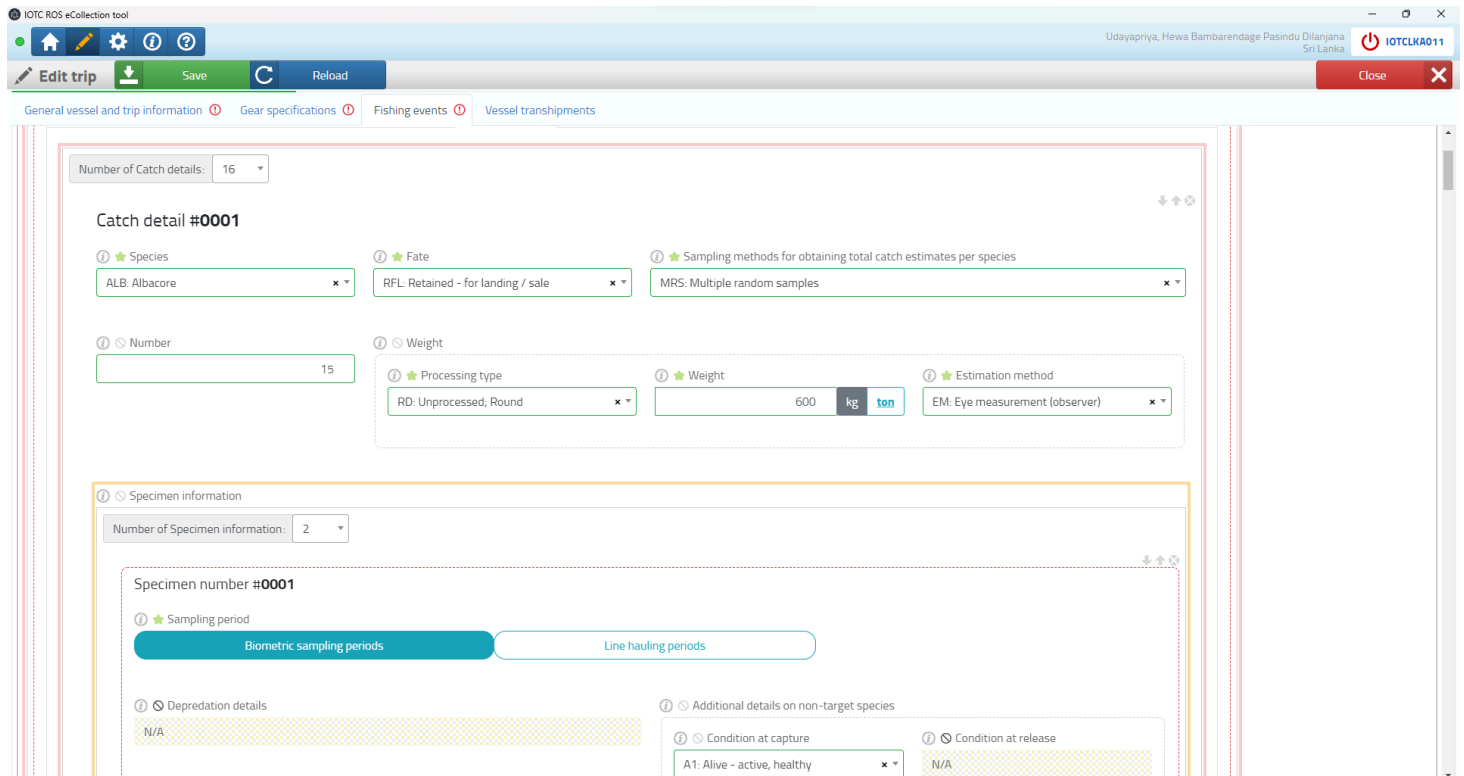
End-users need to authenticate against a list of currently accredited IOTC observers (ROS e-collection) and ROS focal points (ROS national database): for this reason, a formal workflow should be established in IOTC so that CPCs can provide updates to list of their active observers and focal points (see also [Appendix A](#)), and see these reflected in real time within the set of valid ROS credentials.

The ROS e-collection tool does not require internet connectivity to work, and it has been updated to include changes in data collection and reporting requirements emerging from the *ROS expert consultation workshop*, and eventually from the discussions held with the ROS training programme service provider.

The tool is currently undergoing a major revision exercise to accommodate the feedback collected during the practical training sessions delivered by the staff of the IOTC Secretariat and / or by the service provider to various CPCs that include:

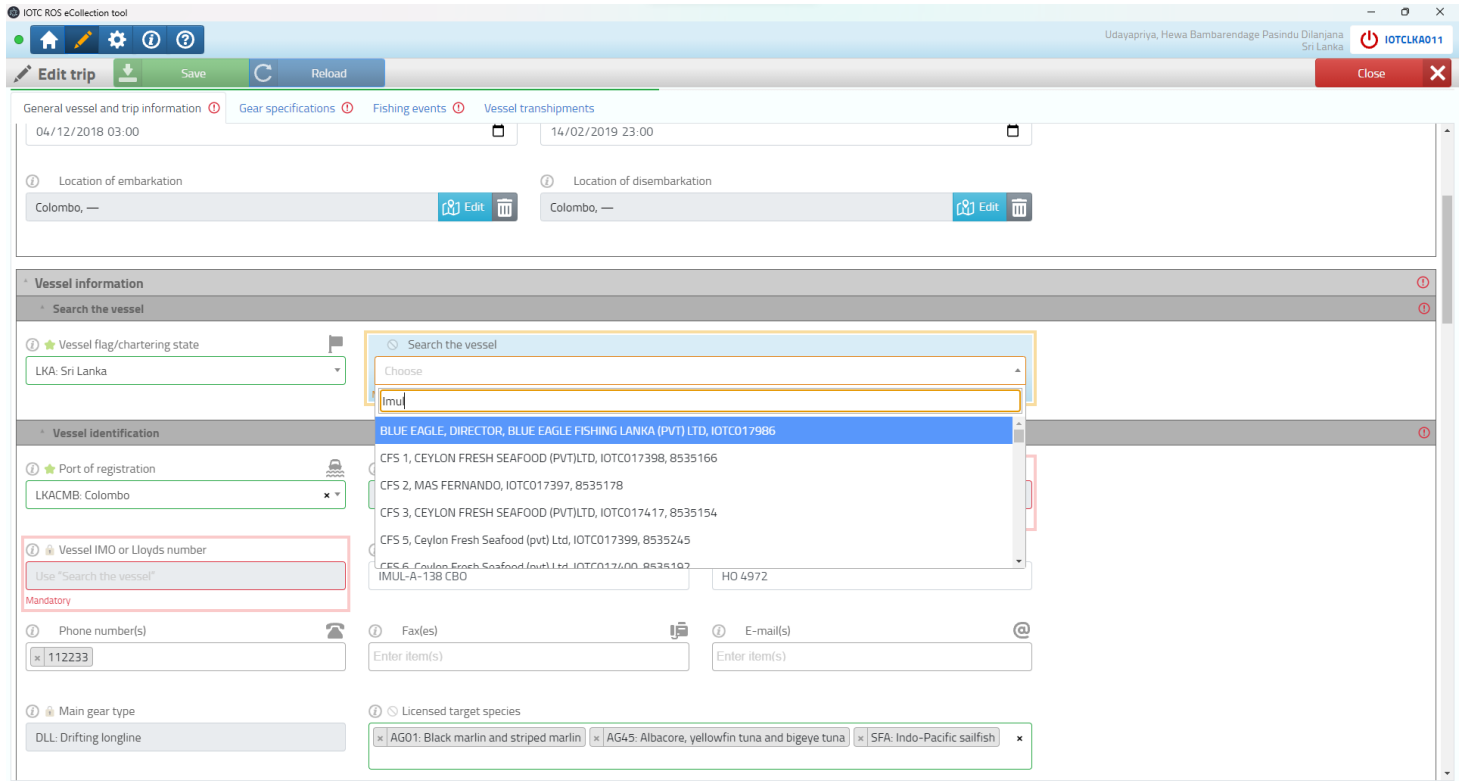
- Sri Lanka and Indonesia (2017, 2018)
- Mauritius (2019)
- Kenya (2020)

with Sri Lanka currently committed to reporting their observer data through the ROS e-collection tool on a regular basis.



The screenshot displays the IOTC ROS eCollection tool interface. The top navigation bar includes 'Edit trip', 'Save', and 'Reload' buttons. The main content area is titled 'Vessel transhipments' and shows a 'Catch detail #0001' form. The form includes fields for 'Number of Catch details' (set to 16), 'Species' (ALB: Albacore), 'Fate' (RFL: Retained - for landing / sale), and 'Sampling methods for obtaining total catch estimates per species' (MRS: Multiple random samples). Below these are fields for 'Number' (15), 'Weight' (600 kg/ton), and 'Processing type' (RD: Unprocessed, Round). The 'Specimen information' section shows 'Number of Specimen information' (2) and 'Specimen number #0001'. Under 'Sampling period', 'Biometric sampling periods' is selected. 'Depredation details' are marked as 'N/A'. 'Additional details on non-target species' includes 'Condition at capture' (A1: Alive - active, healthy) and 'Condition at release' (N/A).

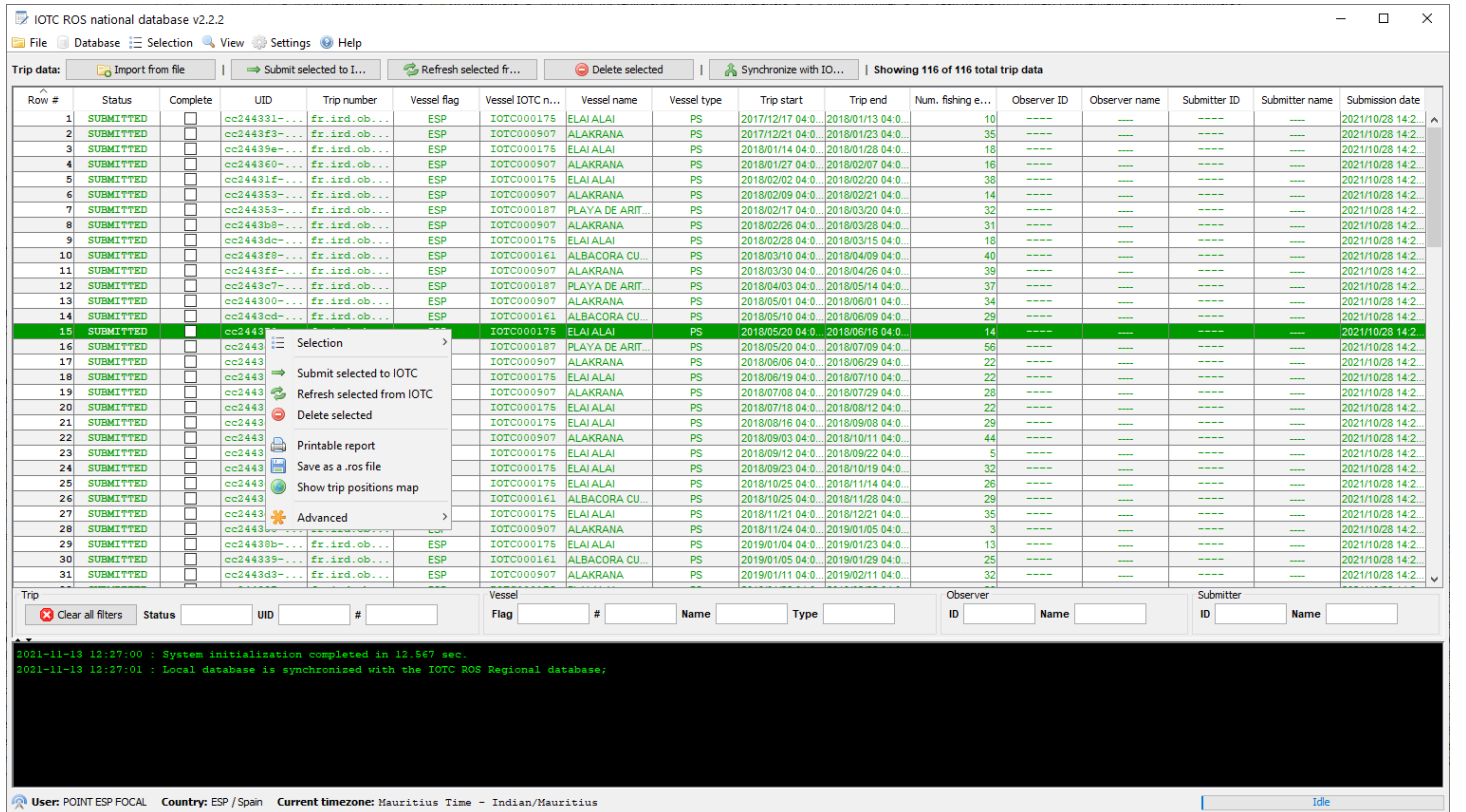
Figure 1.a: the new ROS e-collection tool showing the data-entry process for a specimen's biometric information



The screenshot shows the 'IOTC ROS eCollection tool' interface. At the top, there are navigation buttons: 'Edit trip', 'Save', and 'Reload'. The main area is divided into several sections:
 

- General vessel and trip information:** Includes date and time for the trip (04/12/2018 03:00 to 14/02/2019 23:00) and location of embarkation/disembarkation (Colombo).
- Vessel information:** A search bar for the vessel is highlighted with a yellow box. Below it, a dropdown menu shows search results for 'IMUL', including 'BLUE EAGLE, DIRECTOR, BLUE EAGLE FISHING LANKA (PVT) LTD, IOTC017986' and other vessels.
- Vessel identification:** Fields for 'Vessel flag/chartering state' (LKA, Sri Lanka), 'Port of registration' (LKACMB, Colombo), 'Vessel IMO or Lloyds number' (with a search prompt), 'Phone number(s)' (112233), 'Main gear type' (DLL: Drifting longline), and 'Licensed target species' (AG01: Black marlin and striped marlin, AG45: Albacore, yellowfin tuna and bigeye tuna, SFA: Indo-Pacific sailfish).

Figure 1.b: the new ROS e-collection tool showing the integration of IOTC reference datasets (the IOTC RAV in this case)



The screenshot shows the 'IOTC ROS national database v2.2.2' interface. It features a menu bar (File, Database, Selection, View, Settings, Help) and a toolbar with actions like 'Import from file', 'Submit selected to I...', 'Refresh selected fr...', 'Delete selected', and 'Synchronize with IO...'. The main area displays a table with 116 total trip data entries. A context menu is open over the table, showing options: 'Selection', 'Submit selected to IOTC', 'Refresh selected from IOTC', 'Delete selected', 'Printable report', 'Save as a .ros file', 'Show trip positions map', and 'Advanced'. The table columns include Row #, Status, Complete, UID, Trip number, Vessel flag, Vessel IOTC n..., Vessel name, Vessel type, Trip start, Trip end, Num. fishing e..., Observer ID, Observer name, Submitter ID, Submitter name, and Submission date. The status of all entries is 'SUBMITTED'. At the bottom, there are filters for Trip, Vessel, and Observer, and a status bar showing 'User: POINT ESP FOCAL', 'Country: ESP / Spain', 'Current timezone: Mauritius Time - Indian/Mauritius', and 'Idle'.

Figure 1.c: the ROS national DB showing summary details of all trips reported, and the available management actions

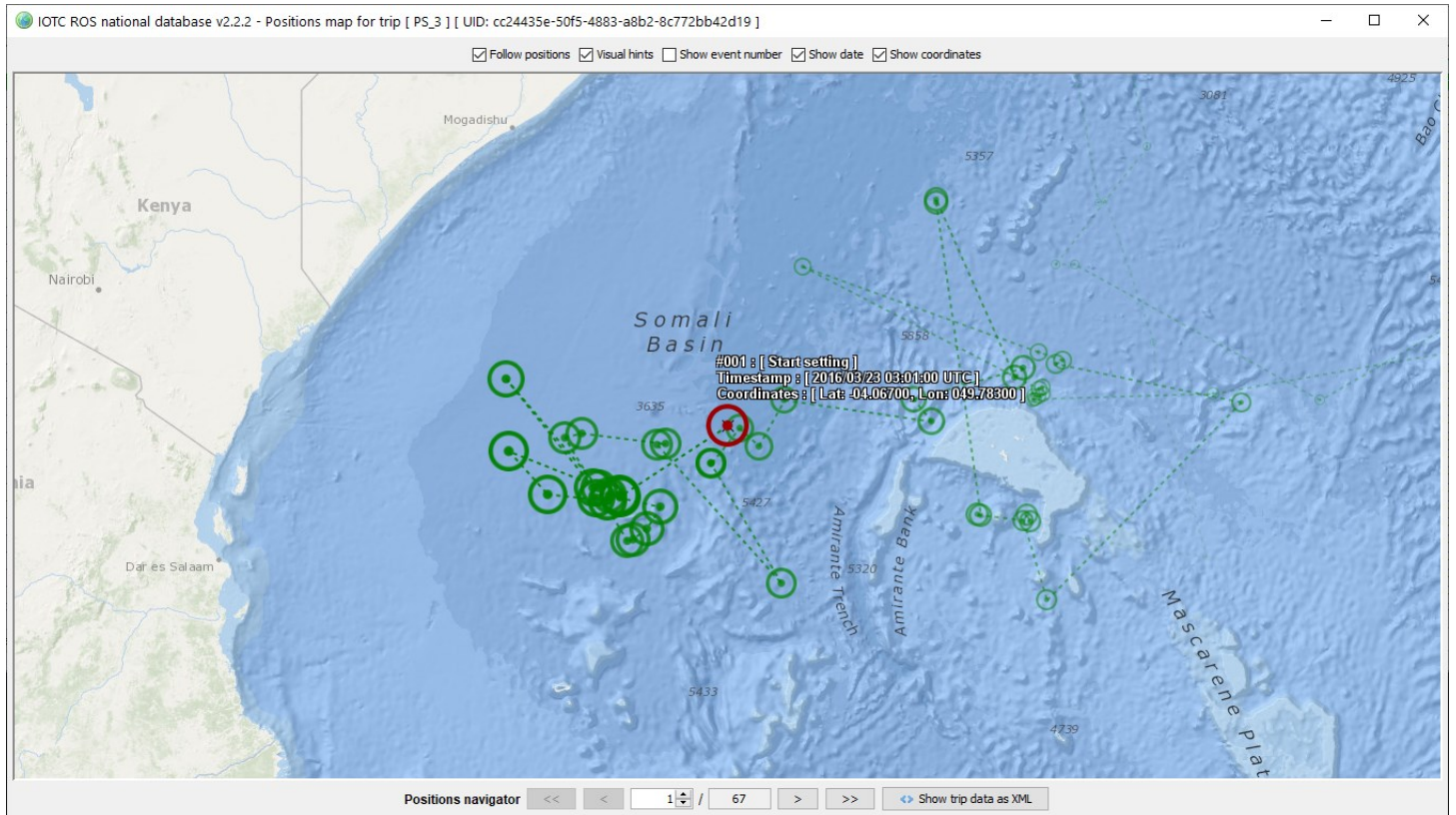


Figure 1.d: the ROS national DB showing all event locations reported for a trip, with details on the event type, timestamp, and coordinates

Row #	Operation type	Year	Month	Grid	Species code	Species name	Iotc species	Type	Sex	Measure type c...	Measure type	Size bin	Num fish
1	PS	2020	1	6100045	CNT	Ocean triggerfish		DI	UNK	TL	Total length (calip...	28	1
2	PS	2020	1	6100045	CNT	Ocean triggerfish		DI	UNK	TL	Total length (calip...	29	2
3	PS	2020	1	6100045	CNT	Ocean triggerfish		DI	UNK	TL	Total length (calip...	30	1
4	PS	2020	1	6100045	CNT	Ocean triggerfish		DI	UNK	TL	Total length (calip...	31	2
5	PS	2020	1	6100045	CNT	Ocean triggerfish		DI	UNK	TL	Total length (calip...	32	3
6	PS	2020	1	6100045	CNT	Ocean triggerfish		DI	UNK	TL	Total length (calip...	33	3
7	PS	2020	1	6100045	CNT	Ocean trig [ R004:C006 ] Ocean triggerfish		DI	UNK	TL	Total length (calip...	34	2
8	PS	2020	1	6100045	CNT	Ocean triggerfish		DI	UNK	TL	Total length (calip...	37	2
9	PS	2020	1	6100045	RRU	Rainbow runner		DI	UNK	FL	Tip of snout-fork ...	56	2
10	PS	2020	1	6100045	RRU	Rainbow runner		DI	UNK	FL	Tip of snout-fork ...	57	1
11	PS	2020	1	6100045	RRU	Rainbow runner		DI	UNK	FL	Tip of snout-fork ...	59	1
12	PS	2020	1	6100045	RRU	Rainbow runner		DI	UNK	FL	Tip of snout-fork ...	61	1
13	PS	2020	1	6100045	RRU	Rainbow runner		DI	UNK	FL	Tip of snout-fork ...	64	1
14	PS	2020	1	6100045	RRU	Rainbow runner		DI	UNK	FL	Tip of snout-fork ...	65	1
15	PS	2020	1	6100045	RRU	Rainbow runner		DI	UNK	FL	Tip of snout-fork ...	67	2
16	PS	2020	1	6100045	RRU	Rainbow runner		DI	UNK	FL	Tip of snout-fork ...	68	1
17	PS	2020	1	6200040	CNT	Ocean triggerfish		DI	UNK	TL	Total length (calip...	27	3
18	PS	2020	1	6200040	CNT	Ocean triggerfish		DI	UNK	TL	Total length (calip...	29	2
19	PS	2020	1	6200040	CNT	Ocean triggerfish		DI	UNK	TL	Total length (calip...	30	4
20	PS	2020	1	6200040	CNT	Ocean triggerfish		DI	UNK	TL	Total length (calip...	32	3
21	PS	2020	1	6200040	CNT	Ocean triggerfish		DI	UNK	TL	Total length (calip...	33	5
22	PS	2020	1	6200040	FAL	Silky shark		DI	UNK	TL	Total length (calip...	93	1
23	PS	2020	1	6200040	FAL	Silky shark		DI	UNK	TL	Total length (calip...	103	1
24	PS	2020	1	6200040	FAL	Silky shark		DI	UNK	TL	Total length (calip...	143	1
25	PS	2020	1	6200040	FAL	Silky shark		DI	UNK	TL	Total length (calip...	159	1
26	PS	2020	1	6200040	RRU	Rainbow runner		DI	UNK	FL	Tip of snout-fork ...	44	7
27	PS	2020	1	6200040	RRU	Rainbow runner		DI	UNK	FL	Tip of snout-fork ...	45	4
28	PS	2020	1	6200040	RRU	Rainbow runner		DI	UNK	FL	Tip of snout-fork ...	48	1
29	PS	2020	1	6200040	RRU	Rainbow runner		DI	UNK	FL	Tip of snout-fork ...	70	2
30	PS	2020	1	6200040	RRU	Rainbow runner		DI	UNK	FL	Tip of snout-fork ...	73	1
31	PS	2020	1	6200045	BUM	Blue Marlin		RC	UNK	FL	Tip of snout-fork ...	173	1
32	PS	2020	1	6200045	BUM	Blue Marlin		RC	UNK	FL	Tip of snout-fork ...	181	1
33	PS	2020	1	6200045	BUM	Blue Marlin		RC	UNK	FL	Tip of snout-fork ...	204	1
34	PS	2020	1	6200045	BUM	Blue Marlin		RC	UNK	FL	Tip of snout-fork ...	247	1
35	PS	2020	1	6200045	BUM	Blue Marlin		RC	UNK	FL	Tip of snout-fork ...	254	1
36	PS	2020	1	6200045	CNT	Ocean triggerfish		DI	UNK	TL	Total length (calip...	27	14
37	PS	2020	1	6200045	CNT	Ocean triggerfish		DI	UNK	TL	Total length (calip...	28	6
38	PS	2020	1	6200045	CNT	Ocean triggerfish		DI	UNK	TL	Total length (calip...	29	17
39	PS	2020	1	6200045	CNT	Ocean triggerfish		DI	UNK	TL	Total length (calip...	30	67

Figure 1.e: the ROS national DB showing its data analysis and extraction capabilities, in this case summarizing all recorded size-frequency data



The adoption of the ROS electronic tools supports the full management lifecycle of data collected under the ROS program for those CPCs that lack established data management systems and can also be a viable option to manage observations collected through other instruments such as EMS.

In this regard, the IOTC Secretariat is currently liaising with EMS providers to verify the feasibility of exporting data in the IOTC ROS format for future integration within ROS national databases of selected CPCs.

The ROS electronic tools are complemented by a revised version of the ROS electronic data reporting forms, which are designed to be used by all those CPCs that already have well-established observer data collection systems in place and need to submit this information to the ROS Regional Database of IOTC.

The ROS electronic data reporting forms provide a tabular representation of the highly structured ROS data reporting requirements, and as such can be programmatically (and automatically) filled by CPCs with limited effort.

The overarching goal of this workstream is to ensure that scientific observer data could be seamlessly transmitted to the IOTC for inclusion within the ROS Regional Database while avoiding a proliferation of different data exchange formats.

These will indeed be limited to two accepted formats only:

- the ROS structured format, i.e., **.ros** files (produced by the ROS e-collection tool and managed by the ROS national databases)
- the ROS data reporting format, i.e., **.xlsx** files (MS Excel workbooks, in tabular form)

and will contribute to increase the coverage of data in the ROS Regional Database and ensure its close-to-real time updates as soon as information is received by the IOTC Secretariat.

### ***Observer database development and historic data collation***

The ROS *e-collection tool* mainly serves as a tool to support data collection on the field: all captured information has to be submitted to a national focal point that will in turn incorporate all observer data within a ROS *national database* (also supplied as a standalone and multi-platform application). The main goal of the ROS national database – besides establishing a central repository for national observer data – is also to submit information to the ROS *regional database*, hosted by IOTC and specifically designed to accommodate all data marked as “*mandatory / optional for reporting*” (according to the revised definitions following the ROS expert consultation workshop).

The ROS national database and the ROS regional database have both been finalised: the regional database is now integrated with the IOTC statistical systems and contains a collation of all ROS data submitted so far in a convenient (from a data extraction and analysis perspective) electronic format – including (but not limited to) the information entered through the various version of the ROS e-collection tool.

Currently, the ROS regional database stores observer data reported by several fleets during different time periods, covering a total of **28,730** sets from **1,664** trips recorded between 2005 and 2021 (see **tables 1.a-c** and **figs. 2.a-b**).

The processed information consists of trip reports provided in the ICCAT ST09 format (for both European longliners / purse seiners and Seychellois purse seiners), trip reports in a custom electronic format (Japan), ROS trip reports entered through the ROS e-collection tool (Sri Lanka) and various purse seiners trip reports (for Rep. of Korea, Mauritius, and Seychelles) originally provided as Word / PDF documents and digitized with the support of a consultant funded by SIOTI<sup>6</sup>.

The data currently available in the IOTC ROS regional database cover **66.5%** of all ROS trip data provided to the Secretariat, with a coverage that increased slightly from the **65.6%** calculated in November 2021.

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<sup>6</sup> The Sustainable Indian Ocean Tuna Initiative (SIOTI) has been jointly established by key governments in the region, major tuna processors, producer organisations and their fishing vessels, with the support of WWF. This FIP is a multi-stakeholder effort, and its goal is to support improvement in the management of tuna fisheries in the Indian Ocean so that in the future, consumers can be assured that the purse-seine tuna they purchase has been harvested sustainably.

A breakdown of all currently available observer data in the ROS regional database (with data as of 22<sup>nd</sup> November 2022) is as follows (**Table 1.a-c**):

Fleet	Gear	Num. trips
EU.ESP	PS	116
EU.FRA	LL	691
EU.FRA	PS	421
JPN	LL	51
KOR*	PS	6
LKA	LL	9
MUS	PS	17
SYC*	PS	354
<b>Total</b>		<b>1,664</b>

**Table 1.a:** Number of available observer trips by fleet and gear (\* includes data entered with support from SIOTI)

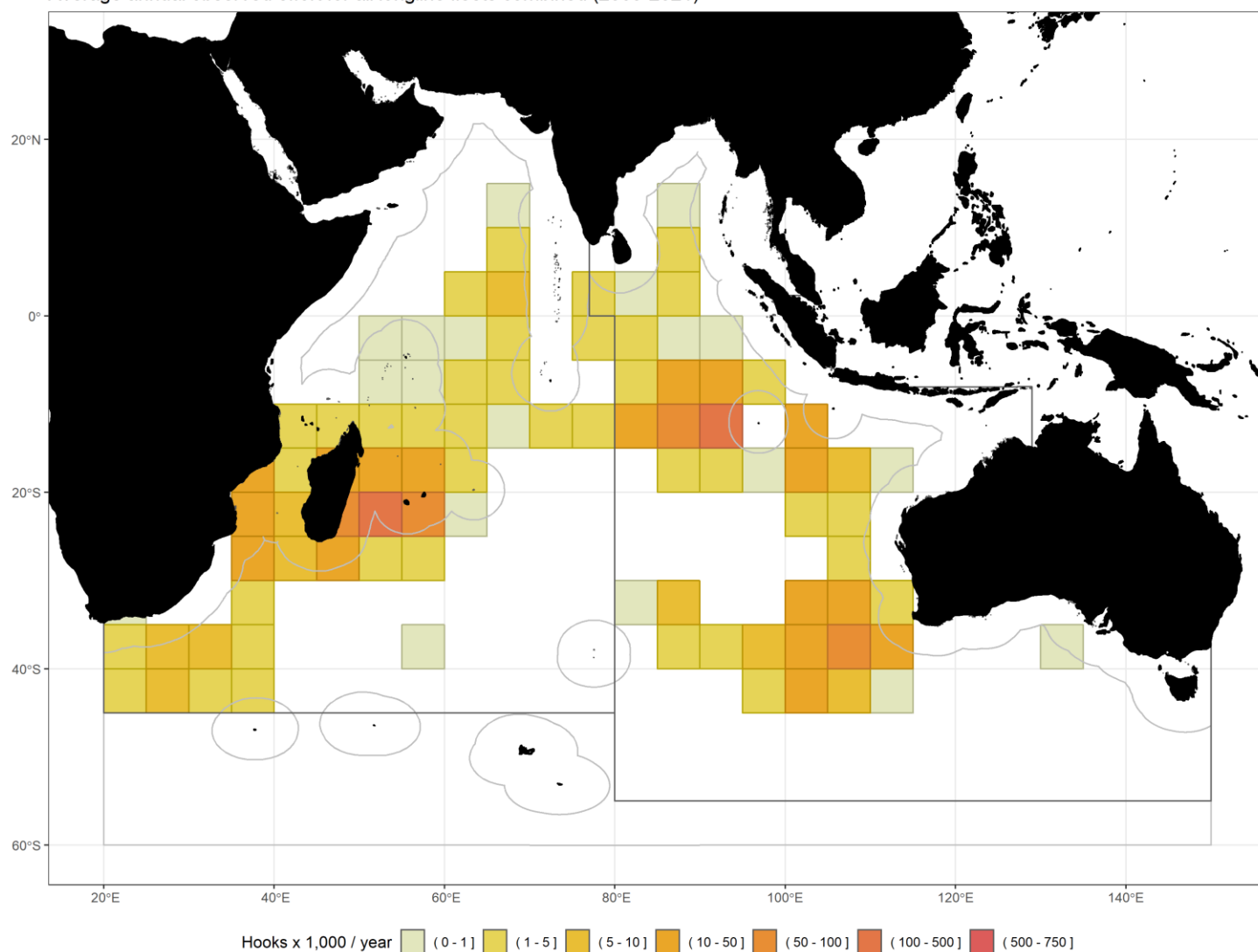
Year	Number of trips	
	PS	LL
2021	26	56
2020	46	47
2019	137	55
2018	179	50
2017	153	61
2016	144	59
2015	122	98
2014	50	87
2013	11	90
2012	7	95
2011	3	42
2010	0	6
2009	3	4
2008	13	0
2007	11	0
2006	8	0
2005	1	0
<b>Total</b>	<b>914</b>	<b>750</b>
	<b>1,664</b>	

Year	Number of sets	
	PS	LL
2021	501	431
2020	1253	439
2019	3526	480
2018	4211	356
2017	3336	377
2016	3616	896
2015	2496	917
2014	981	1283
2013	206	896
2012	156	958
2011	95	219
2010	0	54
2009	137	41
2008	307	0
2007	370	0
2006	168	0
2005	24	0
<b>Total</b>	<b>21,383</b>	<b>7,347</b>
	<b>28,730</b>	

**Table 1.b:** Number of available observer trips by year and gear

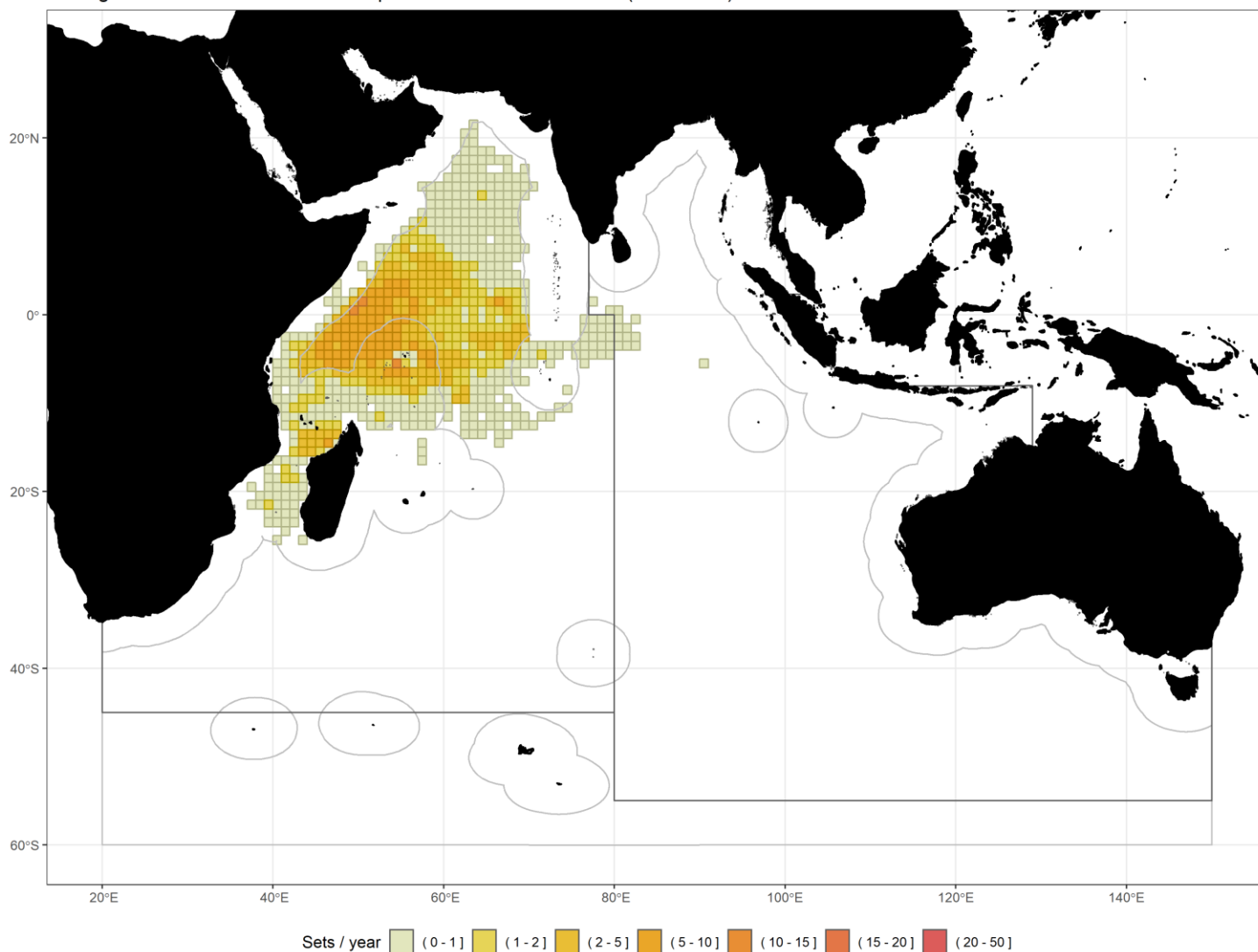
**Table 1.c:** Number of available observed sets by year and gear

Average annual observed effort for all longline fleets combined (2009-2021)



**Figure 2.a:** Average annual effort (in number of hooks by 5x5 degrees grids) reported to the ROS by longline fleet between 2009 and 2021. Includes data from coastal longlines for selected flags.

Average annual observed effort for all purse seine fleets combined (2005-2021)



**Figure 2.b:** Average annual effort (in number of sets by 1x1 degrees grids) reported to the ROS by purse seine fleets between 2005 and 2021.

Once in full operation, the ROS regional database will be regularly and automatically populated with *live* observer data collected through the ROS e-collection tool and managed through dedicated ROS national database instances deployed at country level, increasing the level of compliance and the technical capacity of all participating developing flag states.

Furthermore, and with the goal to incorporate as much historical information as possible, the IOTC is developing custom importers that can generate data in ROS format (for inclusion in the IOTC ROS Regional Database) from data files produced through other well-established platforms such as *ObServe* (EU and Seychelles PS and LL fleets) and the SWIOFP database (IOC countries).

This task is currently ongoing, with increased support from the IOTC Secretariat expected during 2023.

Data extracted from the ROS regional database is still considered to be preliminary and subject to changes in structure and content without prior notice: the scientific community should ask explicit consent from the IOTC Secretariat before publicly disseminating any study or analysis based on this information.



### **Electronic monitoring systems**

This activity aims at improving the quality of data collection and coverage of fisheries where there are practical difficulties in placing scientific observers onboard (e.g., due to safety issues, lack of space, logistics, etc.), particularly in the case of the smaller-scale fisheries under 24 m in length overall.

Since 2017, the IOTC Secretariat conducted field visits to I.R. Iran, Pakistan, and Sri Lanka, to assess the logistical practicalities of implementing EMS onboard their coastal gillnet (and gillnet-longline) vessels.

A proposal was subsequently developed in collaboration with the Sri Lanka Ministry of Fisheries and Aquatic Resources Development (MFARD) to trial EMS on-board six coastal longline/gillnet vessels (between 15 – 24m LOA): funding for this activity has been confirmed, procurement of the EMS equipment has been completed and the equipment has been installed on 4 of the vessels originally identified by the Sri Lankan authorities.

A first round of test trips was performed with the equipment fully deployed onboard: this helped stakeholders to identify some important technical issues (e.g., interference with radio communication equipment, high current drain from the main vessel batteries etc.). Equipment to support the work of “dry observers” (desktop computers, their training material etc.) was also purchased and deployed on site.

The insurgence of the CoViD pandemic has introduced unexpected delays in the finalization of the procurement and deployment processes for this task, which was put on temporary halt for reasons of *force majeure*: furthermore, a field mission to Sri Lanka – originally expected to be undertaken in Q2 2020 by the IOTC Secretariat in collaboration with the providers responsible for the actual installation of the EMS hardware and the training of designated observers – had to be postponed until further notice.

Eventually, in Q3 2021 the service provider confirmed the delivery of the last batch of EMS equipment to Sri Lanka, and requested the local representative and technology provider in the country to ensure onboard NAS (Network Attached Storage) are replaced with IP68-certified waterproof / shockproof external hard drives, to resolve the major issue of electronic interference between the EMS and the radio equipment reported by some of the vessels participating to the pilot study, which is a solution that will also have the beneficial effect of reducing the overall energy consumption of the systems, that was also another major concern.

Considering that travel restrictions were still in place during Q3 2021, the service provider also agreed about delivering remote training sessions to selected Sri Lanka observers and their coordinators, to cover for the basics of the entire EMS data collection and curation workflow, and discussion is still ongoing about the way forward to ensure that data collected through the deployed EMS systems can be properly “enriched” with the mandatory information that will make it fully compliant with the IOTC ROS data requirements, for its future inclusion within the ROS Regional Database.

On a separate note, in April 2020 a *Letter of Agreement* was signed between FAO of the UN and the International Seafood Sustainability Foundation (ISSF) for the provision of services related to “improvements of data-limited methods for assessing Indian Ocean neritic tuna species”. Integral part of this LoA and the expected services to be provisioned is the development of Electronic Monitoring Systems (EMS) minimum standards, including specifications and procedures for the implementation of EMS for IOTC fisheries, as well as an evaluation of EMS capabilities to collect IOTC ROS minimum standards data fields.

The project focuses on EMS standards for purse seiners and longliners (and small-scale fisheries, if possible) that would help standardize EMS implementation (e.g., number and position of cameras, installation, software requirements etc.) as well as data collection, usage, revision, and ownership.

A final report describing the minimum standards was presented to the IOTC Working Party on Data Collection and Statistics (WPDCS) and Scientific Committee (SC) in 2020 for consideration of adoption and recommendation to the Commission.

In line with the outcomes of the IOTC Pilot Project and the work carried on by the IOTC Working Group on Electronic Monitoring Standards (WGEMS), Res. 22/04 includes in its provisions the possibility of further developing – with supervision from the Scientific Committee – modalities to complement and progressively substitute human observer coverage through EMS, providing these systems can meet the minimum mandatory ROS data collection and reporting standards.



To achieve this, EMS may also be complemented by port sampling and / or other Commission-approved data collection methods.

***Observation in-port***

There is currently no funding available for this project component and as such it has not yet been fully developed.

## IOTC Species ID guides

	1. Tuna & like	2. Billfish	3. Turtles	4. Sharks and rays	5. Seabirds
Persian	2	1	1	1	1
Arabic	2	2	2	2	2
Urdu	4				
Bahasa Indonesian	1	3	5	5	5
Swahili		4			
Spanish		5	3	3	3
Portuguese		6	4	4	4
Thai		7			
Sinhala	3	8			
Tamil		8			
Bahasa Malaysia	1				
Hindi	3				

**Table 2.** Summary of priority languages and species groups for translation and printing as identified by the SC16 and SC17 (1=high).

**Green** = translation and printing complete. **Yellow** = in progress; entries in **boldface** represent printed guides not available at the last WPEB.

### Progress to date

- Translation and printing of IOTC species ID guides into Persian has already been completed for tuna, sharks, billfish and turtles and these are now available on the IOTC website<sup>7</sup> (IOTC, IFO and WWF-Pakistan)
- Translation and printing of IOTC species ID guides into Arabic has been completed for tuna and tuna-like species and translation of the others is currently underway (IOTC and WWF-Pakistan)
- Translation and printing of tuna, billfish, turtles and shark ID guides into Urdu is complete and these are now available on the IOTC website (WWF-Pakistan)
- Translation and printing of tuna, billfish and turtles ID guides into Bahasa Indonesian is complete and these are now available on the IOTC website (OFCF)
- Translation of sharks and seabirds ID guides into Bahasa Indonesian and is complete, typesetting has been finalised and cards are ready to print (DGCF and IOTC)
- Translation of turtles ID guides into Spanish is complete and available on the IOTC website (IOSEA & IOTC)
- Translation of tuna and tuna-like species ID guides into Hindi is complete and cards have been typeset for printing (CMFRI and IOTC)
- Translation of tuna and tuna-like species ID guides into Malaysian is complete and card are ready for printing (IOTC)

<sup>7</sup> <https://www.iotc.org/science/species-identification-cards>

- Translation of tuna and tuna-like species ID guides into Sinhala and Tamil has been completed and are available on the IOTC website (NARA, DFAR and FAO)
- Translation of all IOTC species ID guides into Portuguese has been completed and cards have been printed and these are now available on the IOTC website (IIP, IPMA OFCF)
- Translation and printing of all IOTC species ID guides into Maldivian is underway (Ministry of Fisheries and Agriculture, Maldives)
- Translation of tuna and billfish into Thai and Swahili has been completed (OFCF). These require typesetting and finalisation by FAO.
- Translation of billfish and shark ID guides into Sinhalese and Tamil is underway (OFCF). These will require typesetting and finalisation by FAO.

While a number of guides are now ready for printing and funding has been obtained for these, the major administrative hurdle which has delayed further progress is the need for all future publications (including language translations) to proceed through the 12-step FAO approval process which has also caused severe delays with some cards taking >8 months to progress through the system. Nevertheless, the Secretariat is seeking solutions to these issues and, once resolved, progress should be rapid.

## Cetacean ID guides

An Indian Ocean cetaceans ID guide has now been developed with inputs from an expert group of WPEB scientists. This has been translated into ten languages as requested by the WPEB13 (Arabic, French, Hindi, Indonesian, Persian, Sinhalese, Spanish, Swahili, Tamil and Urdu) which are currently undergoing typesetting. Several translations of the guide are now published on the IOTC website, and the Marine Mammal Commission has provided funding for the printing.

### *Progress to date*

- English (**published, printed** and available on the IOTC website)
- French (**published, printed** and available on the IOTC website)
- Spanish (**published, printed** and available on the IOTC website)
- Indonesian (**published, printed** and available on the IOTC website)\*
- Arabic (**published, printed** and available on the IOTC website)\*
- Sinhala (**published, printed** and available on the IOTC website)
- Persian (**published, printed** and available on the IOTC website)\*
- Tamil (**published, printed** and available on the IOTC website)
- Urdu (revisions taking place)
- Swahili (revisions taking place)\*
- Hindi (revisions taking place)\*

\* These guides have been identified as having some issues with translation which are being dealt with by the Secretariat in association with cetacean researchers in the relevant CPCs.

## Appendices

**Appendix A:** [Update on the implementation of the IOTC regional observer scheme](#)

**Appendix B.1:** [Annual total effort and estimated observer coverage for longline fleets \(2017-2021\)](#)

**Appendix B.2:** [Average annual total effort and observer coverage for longline fleets \(2017-2021\)](#)

**Appendix C.1:** [Annual total effort and estimated observer coverage for purse seine fleets \(2017-2021\)](#)

**Appendix C.2:** [Average annual total effort and observer coverage for purse seine fleets \(2017-2021\)](#)



Appendix A: Update on the implementation of the IOTC Regional Observer Scheme

CPCs	Vessels on active list (2021)					Accredited observers		Number of observed trips																						
	LL	PS	GN	BB	Tot	Number	Last update	2012		2013		2014		2015		2016		2017		2018		2019		2020		2021		Totals		
	O	E	O	E	O	E	O	E	O	E	O	E	O	E	O	E	O	E	O	E	O	E	O	E	O	E				
<b>Contracting parties</b>																														
Australia		2		-	-	2	21		3				2	4		11		27		46		30		28		16			167	
Bangladesh		NO INFORMATION RECEIVED																									0			
China	CHN	78	-	-	-	78	4	2020-07	1		1		2		1		4		4		5		4					22		
	TWN, CHN	406	-	-	-	406	54		1		19		18		26		18		31		37		31		16		9	206		
Comoros		-	-	-	-	0	7		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A	0		
Eritrea		NO INFORMATION RECEIVED																									0			
European Union	FRA	21	11	-	-	32	64		16	92	10	92	23	116	24	135		111		121		110		108		69		82	1109	
	ITA	-	1	-	-	1			N/A		N/A		N/A	6		4		1		11								22		
	PRT	2	-	-	-	2	6		1		1		1		1			1		1		1		1				8		
	ESP	8	16	-	-	24	9				1		2		24		15		19		2		3		35		40		23	164
	GBR	-	-	-	-	0	2	2019-09												2		2				N/A		N/A	4	
France (OT)		-	-	-	-	0	N/A	N/A	7		7		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A	14		
India		4	-	-	-	4											N/A											0		
Indonesia		327	107	-	-	434	9					5				6		4		6		9		2		5	37			
Iran, Isl. Rep. of		1	8	1290	-	1299																						0		
Japan		53	-	-	-	53	30			10		6		13		6		2		9		9		11		12		3	81	
Kenya		5	-	-	-	5	5		N/A		N/A		N/A		N/A		1		N/A		6		4		2			13		
Korea, Rep. of		5	2	-	-	7	40		2		3		3		4		11		5		3		3					34		
Madagascar		5	-	-	-	5	7		5		7		7		5													24		
Malaysia		20	-	-	-	20																						0		

CPCs	Vessels on active list (2021)					Accredited observers		Number of observed trips																				
	LL	PS	GN	BB	Tot	Number	Last update	2012		2013		2014		2015		2016		2017		2018		2019		2020		2021		Totals
	O	E	O	E	O	E	O	E	O	E	O	E	O	E	O	E	O	E	O	E	O	E	O	E	O	E		
<b>Contracting parties</b>																												
Maldives	-	-	-	372	372	4												1	2		54							57
Mauritius	-	3	-	-	3	8	2019-04						5	8		4	9	9										35
Mozambique	6	-	-	-	6	11		1		N/A			7	3	2													13
Oman	1	-	-	-	1															N/A								0
Pakistan	-	-	-	-	0	N/A		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0
Philippines	-	-	-	-	0	N/A							N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0
Seychelles	82	13	-	-	95	78						7	66	63	91	83	44											354
Somalia	NO INFORMATION RECEIVED																										0	
South Africa	13	-	-	1	14	30	2019-08	10	13	10	16	5	8	34	18													114
Sri Lanka	729	148	255	-	1132	23					2	2	2				4	7	5	3								25
Sudan	NO INFORMATION RECEIVED																										0	
Tanzania, United Rep.of	1	-	-	-	1									1	N/A	N/A	1											2
Thailand	-	-	-	-	0	30	2019-11													N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0
United Kingdom	-	-	-	-	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0
Yemen	NO INFORMATION RECEIVED																										0	
<b>COOPERATING NON-CONTRACTING PARTIES</b>																												
Liberia	-	-	-	-	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Senegal	-	-	-	-	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	

Year = year in which considered observed trip began with the vessel sailing from its origin port

**Number of observed trips:**

E: number of trips whose observed data are reported in a structured electronic format,

O: number of trips whose observer data are reported in other formats, including non-structured electronic ones)

Observed trips for Madagascar include data collected by observers onboard foreign vessels

11 observed trips reported for EU,ITA in 2018, although no vessel flagged by EU,ITA was officially indicated as active during the year

	Not applicable (N/A) or no information received
	Data provided according to standards
	Data only partially provided according to standards
	Data not provided

### Appendix B.1: Annual total effort and estimated observer coverage for longline fleets (2017-2021)

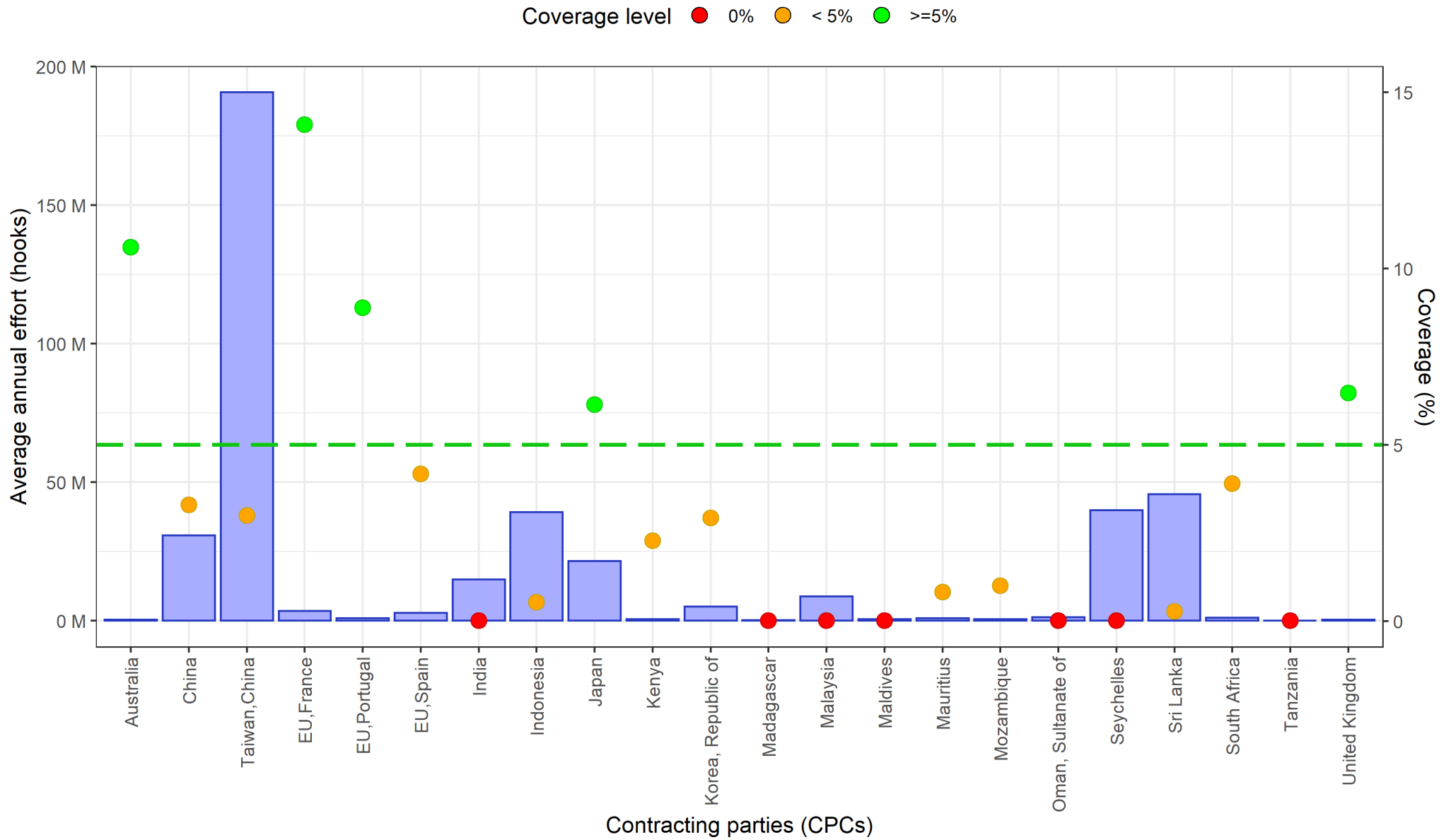
Contracting parties	Total effort (no. hooks, no. sets for Japan)					Observed effort (no. Hooks, no. sets for Japan)					Coverage rate					Average		Trend							
	2017	2018	2019	2020	2021	2017	2018	2019	2020	2021	2017	2018	2019	2020	2021	Effort	Coverage								
Australia	532,396	411,101	373,810	241,225	241,225	62,126	54,010	47,047	27,710	-	11.67%	13.14%	12.59%	11.49%	0.00%	359,951	10.61%								
Bangladesh, People's Republic of	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-							
China	33,070,839	32,987,773	26,380,951	27,858,657	34,043,659	1,584,934	1,681,983	1,814,426	-	-	4.79%	5.10%	6.88%	0.00%	0.00%	30,868,376	3.29%								
Taiwan,China	206,353,760	191,283,729	207,142,582	179,463,473	169,175,506	6,412,309	7,959,058	8,829,597	4,073,449	1,188,663	3.11%	4.16%	4.26%	2.27%	0.70%	190,683,810	2.99%								
Comoros	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-							
Eritrea	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-							
EU,France	3,067,200	3,321,759	4,046,121	3,577,112	3,414,766	534,686	369,011	497,672	496,928	555,825	17.43%	11.11%	12.30%	13.89%	16.28%	3,485,392	14.08%								
EU,Italy	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-							
EU,Portugal	1,624,100	895,800	810,000	593,600	648,200	128,201	138,245	139,600	-	-	7.89%	15.43%	17.23%	0.00%	0.00%	914,340	8.88%								
EU,Spain	3,579,479	2,821,579	2,992,243	2,654,022	2,086,803	401,116	137,877	-	49,686	-	11.21%	4.89%	0.00%	1.87%	0.00%	2,826,825	4.16%								
EU,United Kingdom	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-							
France (OT)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-							
India	8,245,302	23,590,610	17,138,572	11,027,380	14,603,818	-	-	-	-	-	0.00%	0.00%	0.00%	0.00%	0.00%	14,921,136	0.00%								
Indonesia	55,516,676	25,087,522	38,005,639	44,977,691	32,628,995	228,970	251,891	264,421	86,845	199,704	0.41%	1.00%	0.70%	0.19%	0.61%	39,243,305	0.53%								
Iran, Islamic Republic of	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-							
Japan	7,346	6,975	6,572	6,900	7,373	714	885	805	154	-	9.72%	12.69%	12.25%	2.23%	0.00%	7,033	7.27%								
Kenya	-	586,772	849,762	617,318	1,106,072	-	68,807	2,400	682	-	-	11.73%	0.28%	0.11%	0.00%	631,985	2.28%								
Korea, Republic of	6,462,887	6,052,850	5,899,410	4,980,671	2,131,036	251,355	214,244	277,326	-	-	3.89%	3.54%	4.70%	0.00%	0.00%	5,105,371	2.91%								
Madagascar	181,421	143,925	156,463	146,762	137,961	-	-	-	-	-	0.00%	0.00%	0.00%	0.00%	0.00%	153,306	0.00%								
Malaysia	8,202,564	9,402,758	8,883,520	9,319,279	7,874,222	-	-	-	-	-	0.00%	0.00%	0.00%	0.00%	0.00%	8,736,469	0.00%								
Maldives	1,680,871	828,434	165,327	-	-	-	-	-	-	-	0.00%	0.00%	0.00%	-	-	534,926	0.00%								
Mauritius	1,653,981	1,445,477	1,553,466	129,500	-	-	39,200	-	-	-	0.00%	2.71%	0.00%	0.00%	-	956,485	0.82%								
Mozambique	265,808	202,281	205,152	749,074	1,018,379	24,354	-	-	-	-	9.16%	0.00%	0.00%	0.00%	0.00%	488,139	1.00%								
Oman, Sultanate of	1,179,315	1,121,144	1,743,474	817,673	1,041,675	-	-	-	-	-	0.00%	0.00%	0.00%	0.00%	0.00%	1,180,656	0.00%								
Pakistan	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-							
Philippines	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-							
Seychelles	37,137,592	41,498,974	39,953,285	40,551,445	39,851,995	-	-	-	-	-	0.00%	0.00%	0.00%	0.00%	0.00%	39,798,658	0.00%								
Somalia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-							
Sri Lanka	37,262,252	47,033,877	62,812,061	45,085,175	36,399,665	36,294	121,967	185,217	108,738	138,641	0.10%	0.26%	0.29%	0.24%	0.38%	45,718,606	0.26%								
South Africa	1,284,160	1,325,446	1,355,677	572,461	901,104	27,554	24,785	81,112	78,310	-	2.15%	1.87%	5.98%	13.68%	0.00%	1,087,770	3.89%								
Sudan	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-							
Tanzania	-	-	11,663	10,212	10,573	-	-	-	-	-	-	-	0.00%	0.00%	0.00%	6,490	0.00%								
Thailand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-							
United Kingdom	500,300	498,100	621,600	270,000	-	38,688	45,437	38,163	-	-	7.73%	9.12%	6.14%	0.00%	-	378,000	6.47%								
Yemen	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-							
<b>Cooperating non-contracting parties</b>																									
Liberia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-							
Senegal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-							
<b>Total</b>	<b>407,808,249</b>	<b>390,546,886</b>	<b>421,107,350</b>	<b>373,649,630</b>	<b>347,323,027</b>	<b>9,731,301</b>	<b>11,107,400</b>	<b>12,177,786</b>	<b>4,922,502</b>	<b>2,082,833</b>	<b>2.39%</b>	<b>2.84%</b>	<b>2.89%</b>	<b>1.32%</b>	<b>0.60%</b>	<b>388,087,028</b>	<b>2.06%</b>	<b>     </b>							
	Total effort is <b>ESTIMATED</b>					Total effort is <b>AS REPORTED</b>					Observed effort is > total effort					Observed effort is ≤ total effort					Coverage is	Unavailable	= 0%	< 5%	≥ 5%

**Notes:** Data for Japan is expressed in number of sets; data reported by Australia has been collected exclusively through EMS.

**Total effort:** Total number of hooks set by longliners, by vessel flag and year, including:

- **AS REPORTED:** total effort extracted from the yearly submissions of catch-and-effort data for the fleet
- **ESTIMATED:** total effort not originally available, and estimated using the nominal catches available and sampled effort or catch rates from other fleets or year periods

Appendix B.2: Average annual total effort and observer coverage for longline fleets (2017-2021)





### Appendix C.1: Annual total effort and estimated observer coverage for purse seine fleets (2017-2021)

Contracting parties	Total effort (no. fishing days)					Observed effort (no. fishing days)					Coverage rate					Average		
	2017	2018	2019	2020	2021	2017	2018	2019	2020	2021	2017	2018	2019	2020	2021	Effort	Coverage	Trend
Australia	69	115	125	117	-	-	-	-	-	-	0.00%	0.00%	0.00%	0.00%	-	85	0.00%	
Bangladesh, People's Republic of	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
China	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Taiwan,China	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Comoros	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Eritrea	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
EU,France	2,943	1,583	1,469	1,520	1,550	792	802	741	352	352	26.91%	50.66%	50.44%	23.16%	22.71%	1,813	33.52%	
EU,Italy	395	542	349	332	332	42	339	-	-	-	10.63%	62.55%	0.00%	0.00%	0.00%	390	19.54%	
EU,Portugal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
EU,Spain	3,242	3,541	3,397	3,505	2,938	392	946	1,188	643	-	12.09%	26.72%	34.97%	18.35%	0.00%	3,325	19.06%	
EU,United Kingdom	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
France (OT)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
India	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Indonesia	135,396	78,836	107,936	124,637	78,776	-	-	-	-	-	0.00%	0.00%	0.00%	0.00%	0.00%	105,116	0.00%	
Iran, Islamic Republic of	114	61	53	16	6	-	-	-	-	-	0.00%	0.00%	0.00%	0.00%	0.00%	50	0.00%	
Japan	79	32	3	10	-	-	26	-	9	-	0.00%	81.25%	0.00%	90.00%	-	25	28.23%	
Kenya	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Korea, Republic of	336	225	274	220	243	121	-	-	-	-	36.01%	0.00%	0.00%	0.00%	0.00%	260	9.32%	
Madagascar	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Malaysia	-	-	16,013	12,919	-	-	-	-	-	-	-	-	0.00%	0.00%	-	5,786	0.00%	
Maldives	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Mauritius	326	262	358	324	288	44	67	95	-	-	13.50%	25.57%	26.54%	0.00%	0.00%	312	13.22%	
Mozambique	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Oman, Sultanate of	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Pakistan	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Philippines	4	-	-	-	-	-	-	-	-	-	0.00%	-	-	-	-	1	0.00%	
Seychelles	3,269	2,787	2,923	3,222	2,135	1,431	1,218	682	-	-	43.77%	43.70%	23.33%	0.00%	0.00%	2,867	23.24%	
Somalia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Sri Lanka	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
South Africa	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Sudan	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Tanzania	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Thailand	45,794	35,411	36,303	39,901	38,238	-	-	-	-	-	0.00%	0.00%	0.00%	0.00%	0.00%	39,129	0.00%	
United Kingdom	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Yemen	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
<b>Cooperating non-contracting parties</b>																		
Liberia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Senegal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
<b>Total</b>	<b>191,967</b>	<b>123,395</b>	<b>169,203</b>	<b>186,723</b>	<b>124,506</b>	<b>2,822</b>	<b>3,398</b>	<b>2,706</b>	<b>1,004</b>	<b>352</b>	<b>1.47%</b>	<b>2.75%</b>	<b>1.60%</b>	<b>0.54%</b>	<b>0.28%</b>	<b>159,159</b>	<b>1.29%</b>	
	Total effort is <b>ESTIMATED</b>		Total effort is <b>AS REPORTED</b>			Observed effort is <b>&gt; total effort</b>			Observed effort is <b>≤ total effort</b>		Coverage is	Unavailable	= 0%	< 5%	≥ 5%			

**Total effort:** total number of days fished by tuna purse seiners, by vessel flag and year, including:

- **AS REPORTED:** total effort extracted from the yearly submissions of catch-and-effort data for the fleet
- **ESTIMATED:** total effort not originally available, and estimated using the nominal catches available and sampled effort or catch rates from other fleets or year periods

Appendix C.2: Average annual total effort and observer coverage for purse seine fleets (2017-2021)

