IOTC DATA STATUS

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Introduction

The management of tuna and tuna-like species by the Indian Ocean Tuna Commission (IOTC) relies on the availability of scientific data describing the biology and ecology of these species and the activities of the fisheries that target them. Since its inception in 1996, the IOTC has implemented several Conservation and Management Measures (CMMs) that call for the collection and reporting of data by its Contracting Parties and Cooperating Non-Contracting Parties (CPCs) to support scientific analysis, assess stock status, and develop advice for the Scientific Committee (SC). In addition to the main fisheries datasets required to monitor and quantify changes in fishing effort and associated catches, monitoring the numbers, characteristics, and activities of fishing vessels is essential to account for changes in fishing efficiency and prevent excess fishing capacity (FAO 1995). Furthermore, the IOTC data requirements have increased over time to progressively include the collection of information on non-IOTC species (i.e., bycatch species *sensu* IOTC) in order to analyse the ecosystem effects of tuna and tuna-like fisheries and contribute to the conservation of endangered, threatened, and protected (ETP) species such as sharks, rays, cetaceans, seabirds, and turtles that may be incidentally caught by fisheries directed at IOTC species.

The overarching objective of this document is to provide the IOTC Working Party on Data Collection and Statistics (WPDCS) with an overview of the multiple datasets managed at the IOTC Secretariat, including information on their coverage, timeliness of the submissions by the CPCs, and assessment of the quality of the main fisheries datasets with regards to IOTC reporting standards. The document finally provides a list of the main issues affecting the IOTC data and some proposals to address them.

Terminology, definitions, and data requirements

Species

IOTC species

There are currently fifteen medium and large pelagic species under the management mandate of the IOTC which are listed in Annex B of the IOTC Agreement along with southern bluefin tuna (*Thunnus maccoyii*; SBF), this latter species being managed by the Commission for the Conservation of Southern Bluefin Tuna (CCSBT) (**Tab 1**). Data on SBF are collated and managed by both IOTC and CCSBT as high-seas fisheries catching SBF may catch other tuna and tuna-like species in SBF fishing grounds, but data available from CCSBT should be considered more accurate regarding the data consolidation performed by this Commission.

Tab. 1. Category, code, species code, common name, and scientific name of the 16 IOTC species

Species category	Species code	Common name	Scientific name
BILLFISH	BLM	Black marlin	*Istiompax indica*
	SFA	Indo-Pacific sailfish	*Istiophorus platypterus*
	MLS	Striped marlin	*Kajikia audax*
	BUM	Blue marlin	*Makaira nigricans*
	SWO	Swordfish	*Xiphias gladius*
NERITIC	BLT	Bullet tuna	*Auxis rochei*
	FRI	Frigate tuna	*Auxis thazard*
	KAW	Kawakawa	*Euthynnus affinis*
	LOT	Longtail tuna	*Thunnus tonggol*
SEERFISH	COM	Narrow-barred Spanish mackerel	*Scomberomorus commerson*
	GUT	Indo-Pacific king mackerel	*Scomberomorus guttatus*
TEMPERATE	ALB	Albacore	*Thunnus alalunga*
	SBF	Southern bluefin tuna	*Thunnus maccoyii*
TROPICAL	SKJ	Skipjack tuna	*Katsuwonus pelamis*
	YFT	Yellowfin tuna	*Thunnus albacares*
	BET	Bigeye tuna	*Thunnus obesus*

Bycatch species

The IOTC definition for bycatch differs from the one used in other areas and fisheries as bycatch species correspond to all species other than the 16 IOTC species aforementioned, whether caught or interacted with by fisheries for tuna and tuna-like species in the IOTC area of competence. Hence, early juveniles of tropical tunas (<1-1.5 kg) that are generally not marketable are not considered as a bycatch of tuna fisheries, although they may not be targeted. By contrast, oilfish may be targeted by some longline fisheries in the Indian Ocean but they are considered as bycatch for the IOTC. The IOTC Secretariat collates data on all bycatch species but has specific data requirements for turtles, cetaceans, seabirds, and whale sharks as well as for the main elasmobranch species affected by tuna fishing operations (**Tab 2**).

Tab. 2. Category code, species code, common name, and scientific name of the main elasmobranch species interacting with IOTC fisheries

Species category	Species code	Common name	Scientific name
RAYS	RMA	Alfred manta	*Mobula alfredi*
	RMB	Giant manta	*Mobula birostris*
	RME	Longhorned mobula	*Mobula eregoodoo*
	RMK	Shortfin devil ray	*Mobula kuhlii*
	RMM	Devil fish	*Mobula mobular*

Species category	Species code	Common name	Scientific name
	RMT	Chilean devil ray	*Mobula tarapacana*
	RMO	Smoothtail mobula	*Mobula thurstoni*
	PLS	Pelagic stingray	*Pteroplatytrygon violacea*
SHARKS	PTH	Pelagic thresher	*Alopias pelagicus*
	BTH	Bigeye thresher	*Alopias superciliosus*
	FAL	Silky shark	*Carcharhinus falciformis*
	OCS	Oceanic whitetip shark	*Carcharhinus longimanus*
	SMA	Shortfin mako	*Isurus oxyrinchus*
	LMA	Longfin mako	*Isurus paucus*
	POR	Porbeagle	*Lamna nasus*
	BSH	Blue shark	*Prionace glauca*
	SPL	Scalloped hammerhead	*Sphyrna lewini*
	SPK	Great hammerhead	*Sphyrna mokarran*
	SPZ	Smooth hammerhead	*Sphyrna zygaena*

Fisheries

Fishery categories

The type of datasets to be submitted to the Secretariat depends on the categories of fisheries operating within a country. Fleets with limited commercial impact, primarily operating within the Area of National Jurisdiction (ANJ), and vessels smaller than 24 meters, have fewer reporting responsibilities. These fisheries are generally categorized as **coastal fisheries** (or, in some instances, as artisanal fisheries). On the other hand, **industrial fisheries**, which involve large vessels using longline or surface fishing techniques operating on the high seas or beyond national jurisdiction (ABNJ), have more demanding reporting requirements with greater precision. These vessels are also required to be listed on the IOTC Record of Authorized Vessels (RAV; Res. 19/04).

According to Res. 15/02, the IOTC fisheries are defined as follows:

- **Longline fisheries**: fisheries undertaken by vessels in the RAV that use longline gear;
- **Surface fisheries**: all fisheries undertaken by vessels in the RAV other than longline fisheries, in particular purse seine, pole-and-line, gillnet, handline, and trolling fisheries;
- **Coastal fisheries**: fisheries other than longline or surface, as defined above, also called **artisanal fisheries**.

Fishing vessels from longline and surface fisheries authorised to fish for tuna and tuna-like species and having operated on the high-seas shall be reported to the compliance section of the IOTC Secretariat with the reporting templates Record_of_IOTC_AFVs and Active_domestics_vessels, respectively. To complement the information provided by the RAV and AVL for coastal fisheries, the Form 2FC was developed for CPCs to report the numbers and characteristics of their small vessels (<24 m length overall) fishing for tuna and tuna-like species within

territorial waters. The form is voluntary and breaks down the information by type of fishery, vessel type, and vessel size. When vessel information conflicts between the AVL and the Form 2FC, clarification is sought with respect to the discrepancies and preference is given to the AVL when no feedback is provided by the concerned CPC.

Fishery types

Three types of fisheries have been considered in the past to reflect the range of technical characteristics and spatial extent of the vessels fishing for tuna and tuna-like species in the Indian Ocean from the information available on vessel motorisation, size, and area of operation (Moreno and Herrera 2013). However, this classification was found to have some limits considering that small vessels (<15 m LOA) could fall into both artisanal and semi-industrial categories, vessels of semi-industrial type could be or not be reported in the RAV, and the artisanal nature of the vessels may encompass a variability of purposes. To address these issues, a new classification of fishery type has been developed based on the combination of (i) the purpose of the fishery, (ii) the area of operation, and (iii) the vessel length overall (**Tab 3**). This classification is consistent with the new definition of IOTC fisheries (see section Improving IOTC fishery definitions).

Tab. 3. Proposed IOTC classification scheme for fishing vessels depending on purpose, area of operation, length overall (LOA; m), and fishery type. RAV = IOTC Record of Authorized Vessels

Purpose	LOA	Area of operation	Fishery type	RAV
Recreational	< 24 m*	Flag state EEZ only*	Recreational	NO
Subsistence	< 15 m*	Flag state EEZ only*	Subsistence	NO
Commercial	< 15 m	Flag state EEZ only	Small-scale	NO
Commercial	15 – 24 m	Flag state EEZ only	Semi-industrial	NO
Commercial	< 24 m	Includes other EEZs and / or high seas	Semi-industrial (ABNJ)	YES
Commercial	≥ 24 m	Anywhere	Industrial	YES
Scientific	≥ 24 m*	Anywhere*	Exploratory	YES

Artisanal fisheries

The monitoring of artisanal fisheries is essential for the management of IOTC species due to their increasing capacity, their substantial contribution to the overall catch of tuna and tuna-like species in the Indian Ocean, and their socio-economic role for coastal States. However, the terminology of artisanal fisheries may be ambiguous as different authors define artisanal fisheries based of their research scope. FAO describes artisanal fisheries as traditional fisheries involving fishing households with limited capacity, composed of small vessels, and they are often referred to as small-scale fisheries. Other authors describe artisanal fisheries as having a very low level of fishing technology, no engines or low-power engines, traditional fishing gear, with important aspects for the coastal communities (Smith and Basurto 2019). Hence, the IOTC definition of artisanal fisheries differs from those found in the fisheries science literature, which are broader than the IOTC definition. To shed some light on the classification and definition of coastal fisheries, FAO introduced a pilot testing of the Small Scale fisheries Matrix (Funge-Smith 2019), with the aim of providing statistical definition of the small fisheries. The Secretariat did a scoping study of the coastal fisheries since 2021, and several CPCs participated in the study this year, providing details on their various coastal and artisanal fisheries (Secretariat 2024a).

Improving IOTC fishery definitions

In line with the new fishery types (**Tab 3**), the Secretariat is moving towards a new definition of the IOTC fisheries to improve the reporting of statistical data to the IOTC as well as their dissemination. The new fishery is a combination of several factors (mandatory and optional) which determine the nature and unique codification of

the fishery itself and guarantee its identity across the Indian Ocean. During the discussions with the CPCs in the data reporting workshop, several issues were identified, required the Secretariat to review and update the wizard to encompass the issues, for CPCs to be able to use the wizard effectively.

Data requirements

The nature, components, resolution, coverage, and timeline of reporting of the different datasets by the CPCs to the IOTC are defined through several CMMs and vary with the fishery categories, fishing gears, and species caught or interacted with (**Fig. 1** and (**Tab 4**).

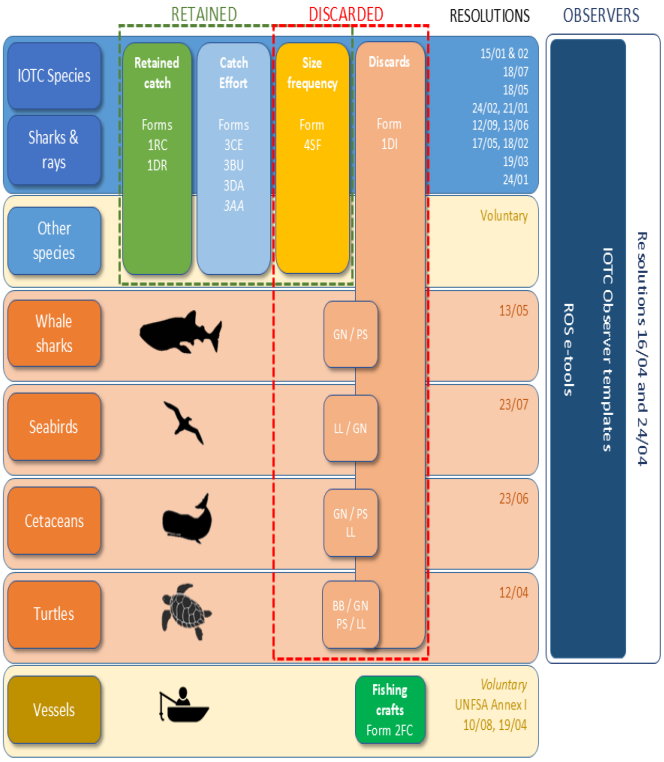

Fig. 1. Overview of the data reporting requirements, including IOTC reporting forms and tools, and Resolutions for the 16 IOTC species and bycatch species caught or interacted with by fisheries for tuna and tuna-like species in the IOTC area of competence. BB = Baitboat; GN = Gillnet; LL = Longline; PS = Purse seine. UNFSA = UN Conference on Straddling Fish Stocks and Highly Migratory Fish Stocks

Tab. 4. Summary of IOTC data requirements applicable to IOTC and bycatch species. M = mandatory; V = voluntary; [UNFSA](https://www.un.org/depts/los/convention_agreements/texts/fish_stocks_agreement/CONF164_37.htm) = UN Conference on Straddling Fish Stocks and Highly Migratory Fish Stocks. * indicates the form is under review

Data	Resolutions	Reporting	Forms	Artisanal fisheries	Longline and surface fisheries
Retained catch	15/01, 15/02	M	1-RC	Retained catch (weight) of the 16 IOTC species and the most commonly caught elasmobranch species by major area, gear, species and year	
		V	1-RC	Retained catch (weight) of other bycatch species by major area, gear, species and year	
Discards	15/01, 15/02	M	1-DI	Discard levels of the 16 IOTC species, the most common elasmobranch species, and turtles, cetaceans, and seabirds species by major area, gear, species, and year	
		V	1-DI	Discard levels of all other bycatch species by major area, gear, species, and year	
Fishing crafts	UNFSA	V	2-FC	Number of fishing crafts by fishery, boat type, and year	Individual vessel data for all vessels catching IOTC species
Geo-referenced catch	15/01, 15/02	M	3-CE	Catch by species, fishery, area, and period	Catch by species, fishery, school type, grid area and month strata
Geo-referenced effort	15/01, 15/02	M	3-CE	Effort by fishery, area, and month strata	Effort by fishery, school type, grid area and month strata, including supply vessels
Geo-referenced activities, catch, and effort on dFOBs	15/02, 24/02	M	3-DA	Not applicable	Interactions with drifting floating objects by purse seiners and supply vessels, by vessel, position, date, and time
Geo-referenced activities, catch, and effort on aFADs	15/02, 23/01	M	3-AA*	Fishing activities by position, date, and aFAD	Fishing activities by position, date, and aFAD
Geo-referenced instrumented buoys data	24/02	M	3-BU	Not applicable	Daily positions of active buoys equipping FADs and natural floating objects, by purse seine vessel

Data	Resolutions	Reporting	Forms	Artisanal fisheries	Longline and surface fisheries
Geo-referenced size-frequency	15/01, 15/02	M	4-SF	Individual lengths of IOTC species and the most commonly caught elasmobranch species	
Regional Observer Scheme	16/04, 24/04	M	ROS templates	Samples of catches landed to cover at leat 5% of vessel activities	Samples of catches at-sea to cover at leat 5% of vessel operations
Fish sale price	IOTC Agreement	V	7-PR	Monthly time series of fish sale price	

IOTC datasets and reporting quality

Several fisheries data sets shall be reported to the IOTC Secretariat by the Contracting Parties and Cooperating Non-Contracting Parties (CPCs) as per the IOTC Conservation and Management Measures (CMMs). Particularly, as required by IOTC Res. 15/02 and Resolution 24/06 on a ban on discards of bigeye tuna, skipjack tuna, yellowfin tuna, and non- targeted species caught by vessels in the IOTC record of authorisation that operate in the IOTC area of competence.

The Secretariat is improving the information providing to CPCs to enhance the quality of data reporting. The new online IOTC Reporting guidelines and online detailed IOTC forms, are the latest guiding tools developed by the Secretariat, and at the disposal of all countries operating in the Indian Ocean. The use of the forms for data submission will facilitate data curation and management by the Secretariat.

Main fisheries data sets

Retained catch data

Retained catches, which refer to fish landing weight, FAO Catch and landings, correspond to the total retained catches (in live weight) per year, Indian Ocean major area, fleet, and fishing gear (IOTC Res. 15/02). The retained catch data reporting requirements are described in 1RC form webpage and can be reported through IOTC form 1RC template.

Changes in the IOTC consolidated data sets of retained catches (i.e., raw and best scientific estimates) may be required as a result of:

i. updates received by December 30th each year, of the preliminary data for longline fleets submitted by June 30th of the same year (IOTC Res. 15.02);

ii. revisions of historical data by CPCs following corrections of errors, addition of missing data, changes in data processing, etc.

iii. changes in the estimation process performed by the Secretariat based on evidence of improved methods and/or assumptions (e.g., selection of proxy fleets, updated morphometric relationships) and upon endorsement by the Scientific Committee.

A series of processing steps is applied to derive the best scientific estimates of retained catches for the 16 IOTC species (see **Appendix V** of IOTC (2014)), by implementing the following rules:

a. When retained catches are not reported by a CPC, catch data from the previous year may be repeated or catches may be derived from a range of sources, e.g., partial catch and effort data, the FAO FishStat database, data on imports of tropical tunas from processing factories collaborating with the International Seafood Sustainability Foundation, etc.;

b. For some specific fisheries characterized by well-known, outstanding issues in terms of data quality, a process of re-estimation of species and/or gear composition may be performed based on data available from other years or areas, or by using proxy fleets, i.e., fleets occurring in the same strata which are assumed to have a very similar catch composition, e.g., Moreno et al. (2012) and IOTC Secretariat (2018);

c. Finally, a disaggregation process is performed to break down the catches by species and gear when they are reported as aggregates.

Discard data

The IOTC follows the definition of discards adopted by FAO in previous reports (Alverson et al. 1994; Kelleher 2005) which considers all non-retained catch, including individuals released alive or discarded dead. Estimates of total

annual discard levels in live weight (or number) by Indian Ocean major area, species and type of fishery shall be reported to the Secretariat as per IOTC Res. 15/02 and Resolution 24/06. Nonetheless, descriptions of the discarded data requirements are explained in 1DI form webpage, and data can be submitted through 1DI form template. The final data should be extrapolated to represent the total level of discards by fisheries, fleet, species concerned, including turtles, cetaceans, and seabirds for the year.

Nevertheless, discard data reported to the Secretariat through the 1DI form template are generally scarce, not raised, and not complying with all IOTC reporting standards. For these reasons, the most accurate information available on discards comes from the IOTC Regional Observer Scheme (IOTC Res. 24/04) that aims to collects detailed information (e.g., exact location in space and time of the sets and interactions, including the fate of observed individuals) on discards of IOTC and bycatch species for industrial fisheries (see below). The latest regional observer scheme resolution, makes provision for CPCs to supplement the on-board observer data with Electronic Monitoring System (EMS) on board vessels to improve the coverage.

Geo-referenced catch and effort data

Catch and effort data refer to finer-scale data, usually from logbooks, reported in aggregated format and stratified per year, month, grid, fleet, gear, type of school, and species (IOTC Res. 15/02). The reporting requirements for the catch and effort are described in 3CE form webpage, if for submission of all fisheries through the 3CE form template. Otherwise for updated submissions, descriptions in 3CE form update, and submission through 3CE form update webpage. Furthermore, CPCs with surface fisheries should collect and report geo-reference on the use of fish aggregating devices (FADs), depending on the type of FAD used. Activities related to anchored FADs the requirements are described in 3DA form webpage and submission through the 3DA form template. Whereas for activities on drifting floating objects, detailed description of the requirements are in 3DA form webpage, and submission through 3DA form template

To enhance the reporting of efforts from support vessels assisting industrial purse seiners, CPCs should utilize the 3CE form template, which includes the necessary fields for recording geo-referenced effort data.

Buoy position data

As a consequence of the entry in force of Res. 24/02, IOTC CPCs with fishing vessels using drifting FOBs have now the obligation to report daily information (since January 1st 2020) on all active FADs monitored at sea with satellite-tracked buoys. The information to report to the Secretariat shall follow the structure and formats of IOTC Form 3BU and contain the date, instrumented buoy ID, assigned vessel and daily position of each monitored buoy, which shall be compiled at monthly intervals, and reported to the IOTC Secretariat with a time delay of at least 60, but no longer than 90 days. Detailed description of the requirements are in 3BU form webpage.

Size-frequency data

The size composition of catches can be derived from individual body length or weight data collected at sea and during the unloading of fishing vessels. Detailed descriptions of the reporting requirements for size frequency data are available on the 4SF form webpage, which outlines for the full data submission process for all fisheries and species through the 4SF from template. Additionally, CPCs can provide updated information for various reasons, as specified on the 4SF form update webpage, and submit the updated data using the 4SF form update template. This new format allows CPCs to report several aspects related to size frequency, as requested by IOTC Res. 15/02, including data type, whether the catch was retained or discarded, the source of data (logbook, research institutions, or observers), and the sex of the species.

Socio-economic data

Fisheries are essential to ensure food security and support economic growth of the rim countries of the Indian Ocean. This is particularly true for small island developing states (SIDS) which strongly depend on the blue economy. In this context, socio-economic statistics are key to inform decisions on the management of fisheries and assess their performance and economic contribution to the countries (Bennett 2021). The analysis of the socio-economic data in fisheries management are proven useful particularly in setting-up fishing quota, as indicated in the TCAC document (IOTC 2024) in the Indian Ocean. In 2024 IOTC held the first Working party meeting on socio-economic, back to back with the TCAC. During the meeting requests were made to the Secretariat (i) A document containing suggested indicators will be distributed by the Secretariat for CPC review and comment; and (ii) to work closely with other organisation (WCPFC/FFA)to understand the requirement of the socio-economic data fields. Currently on the price of fish, from the local market or trading are collected through the IOTC Form 7PR. Few CPCs were collecting data on the market prices of the tuna species annually reporting through the 7PR form (namely Malaysia). In 2024, for the statistical year 2023, alongside Malaysia, eight CPCs, namely Bangladesh, Indonesia, Kenya, Madagascar, Mauritius, Sri Lanka, Tanzania and Thailand, provided data on the fish prices using the 7PR form, which are from local markets, export or wholesale outlets.

On an annual basis, the Secretariat received data from FFA, on fuel prices, which have an impact on the cost of high seas fisheries (Sala and Giakoumi 2018).

Observer data

(IOTC Res. 24/04) *"On a Regional Observer Scheme"* makes provision for the development and implementation of national observer schemes among the IOTC CPCs starting from July 2010 with the overarching objective of collecting *"verified catch data and other scientific data related to the fisheries for tuna and tuna-like species in the IOTC area of competence"*. The ROS aims to cover *"at least 5% of the number of operations/sets for each gear type by the fleet of each CPC while fishing in the IOTC Area of competence of 24 meters overall length and over, and under 24 meters if they fish outside their EEZs shall be covered by this observer scheme"*. The revised resolution further provide alternative data collection methods to meet the required coverage of 5% (para 4). Human observer may be *complemented or substituted by means of an EMS* and *the EMS shall be complemented by port sampling and/or other Commission approved data collection methods*. The requirements for ROS data collection and reporting are defined in the ROS data fields and reference codes.

The Secretariat provides an annual update on the status, coverage, and data collected as part of the ROS during the SC. However, the document (Secretariat 2024b), review the data gap of at the Secretariat, and additionally, provide the latest status of the ROS data reported. Although incomplete and characterized by a large variability in coverage between fisheries and over space and time, observer data include information on the fate of the catches (i.e., retained or discarded at sea) as well as on the condition of the discards. Observer data are also the main source of spatial information on interactions between IOTC fisheries and seabirds, marine turtles, cetaceans, as well as any other species encountered.

Despite the fact that ROS programme started over 10 years ago, the Secretariat has not been able to have a comprehensive repository for the data collected and submitted for several reasons:

(i) variation in the data submitted;
(ii) reporting of summarised ROS data;
(iii) data reporting format (word, pdf, excel summary table);
(iv) constant/frequent review of the data reporting requirements.

To date, the ROS Regional Database contains some information for the sets and trips of commercial fishing trips made during the period 2005-2021 from 7 fleets: Japan, EU,France and Sri Lanka for longline fisheries and EU,Spain, EU,France, Korea, Mauritius, and Seychelles for purse seine fisheries. In addition, observer reports have been submitted to the Secretariat by some CPCs (e.g., Taiwan,China) but data sets were not provided in a format

suitable for data extraction at operational level as required by the ROS standards. There are progress in the quality and format of ROS data reported following the introduction of the new reporting templates. Countries with high coverage like Taiwan,China is implementing the new reporting system, although not fully to the reporting requirements (Secretariat 2024b) .

Biological data

The IOTC Secretariat is responsible for the periodical update of the morphometric relationships (i.e., length-length and length-weight equations) and conversion factors that may be required to standardize the size data submitted by the CPCs and estimate the catch in live weight equivalent when some processing occurs (e.g., gilled and gutted). In addition, information on sex-ratios, maturity, or any other biological data required for the assessments of IOTC and shark species should be made available by the CPCs for transparency and re-use of the data.

Few biological data have been provided to the IOTC Secretariat and data available are of variable quantity and quality (IOTC 2013). Recently, the Secretariat has initiated a comprehensive review of the morphometric relationships available for the 16 IOTC species and main elasmobranch species caught in tuna and tuna-like fisheries. In addition, the Secretariat has started collating morphometric data from CPCs and NGOs (e.g., International Game Fish Association) to analyse the variability in species-specific relationships between morphometric measurements and update the IOTC reference relationships when required (e.g., IOTC Secretariat et al. 2022).

The Secretariat is now in the process of designing a new database aimed at hosting morphometric and other biological data collected by the CPCs to foster comparative analysis across fisheries and species and build regional datasets which are required to determine the factors of variability of the relationships (e.g., space, time, sex, fishing gear).The document (Secretariat 2024b) provides an update development of the biological database.

Tagging data

Dart tags

Since 2002, the Secretariat has been coordinating and supervising the Indian Ocean Tuna Tagging Programme (IOTTP). The specific objective of the programme was to reinforce the scientific knowledge of tropical tuna stocks and the rate of exploitation in the Indian Ocean by obtaining the crucial model parameters for stock assessment. The programme was implemented through a combination of a main tagging project, the Regional Tuna Tagging Project in the Indian Ocean (RTTP-IO), funded by the EU (9th EDF, DG-Dev), and several pilot and small-scale tuna tagging projects that took place in Maldives, India, Mayotte, and Indonesia and were funded by the DG-Fish (ex DG-Mare) and the government of Japan. In 2012, the data from past projects implemented in Maldives in the 1990s were added to the tagging database at the Secretariat. In total, 218,239 tropical tunas were tagged between 1990 and 2009. All the tagging and recapture data are hosted at IOTC Secretariat and available upon request to the Executive Secretary.

As of November 2023, a total of 34,193 tags deployed on tropical tunas had been recovered. The large range of information collected throughout the IOTTP has been used to better understand the population dynamics of the three tropical tunas (i.e., growth, mortality, and movements; Murua et al. (2015)) and is routinely included in the assessment models of the three species since 2008 (e.g., Fu 2020).

In order to improve the management of the tagging data collected throughout the IOTTP, the Secretariat has started a collaboration with IRD to better describe the contents of the database with standard metadata.

Satellite tags

Following a request from the Working Party on Billfish, the Secretariat has conducted a literature review on research activities involving the use of satellite tags on tuna and tuna-like species (Tolotti et al. 2017; Carlisle et al. 2019; Rohner et al. 2020, 2021; Filmalter et al. 2021; Nieblas et al. 2023) to complement previous review work

conducted on billfish (Romanov 2016). The Secretariat contacted the lead-scientists of the projects to collate and manage the metadata describing the data collected through the tag deployments in order to make them available to the IOTC scientific Community. The overarching objective of the initiative is foster collaborations and enhance research supporting the conservation and management of tuna and tuna-like species in the Indian Ocean (IOTC Secretariat 2022). To date, the Secretariat managed to get information from a total of 201 satellite tags deployed on 10 IOTC and shark species (**Tab 5**). Work is ongoing to describe the dataset through a shinyApp building on the work developed by Ifremer based on a suite of metadata elements specific to satellite tags (Sequeira et al. 2021).

Tab. 5. Number of satellite tags deployed on IOTC species and pelagic sharks and recovered after at least 1 day at large. FLOPPED = Project 'Finding Large Oceanic Pelagic Predators Environnemental Distribution' led by Ifremer; IGFA = International Game Fish Association; TOPP = 'Tagging of Pacific Predators' programme led by the University of Stanford

Species code	Common name	Scientific name	Project	N
MLS	Striped marlin	*Kajikia audax*	FLOPPED	4
			MARINE MEGFAUNA	40
BUM	Blue marlin	*Makaira nigricans*	FLOPPED	36
			IGFA/TOPP	12
			TOPP	2
BLM	Black marlin	*Istiompax indica*	FLOPPED	11
			IGFA/TOPP	12
			MARINE MEGFAUNA	34
			TOPP	1
SWO	Swordfish	*Xiphias gladius*	FLOPPED	3
			TOPP	1
SFA	Indo-Pacific sailfish	*Istiophorus platypterus*	FLOPPED	17
			TOPP	2
YFT	Yellowfin tuna	*Thunnus albacares*	TOPP	5
FAL	Silky shark	*Carcharhinus falciformis*	IRD	1
			TOPP	4
BSH	Blue shark	*Prionace glauca*	IRD	1
OCS	Oceanic whitetip shark	*Carcharhinus longimanus*	IRD	1
RMA	Alfred manta (reef manta ray)	*Mobula alfredi*	TOPP	14

Data reporting quality

A scoring system has been designed to assess the reporting quality of the retained catch, catch and effort, and size-frequency data available at the Secretariat for all IOTC and the most commonly caught shark species as defined in Res. 15/01. The determination of the score varies according to each type of dataset and aims to account for reporting coverage and compliance with IOTC reporting standards (**Tab 6**). Overall, the lower the score, the better the quality. It is to note that the quality scoring does not account for sources of uncertainty affecting the data such as under-reporting and misreporting.

Tab. 6. Key to IOTC quality scoring system

Data set	Criterion	By species	By gear
Retained catch	Fully available	0	0
	Partially available	2	2
	Fully estimated	4	4
Catch and effort	Available according to standards	0	0
	Not available according to standards	2	2
	Low coverage (<30% logbooks)	2	
	Not available	8	
Size frequency	Available according to standards	0	0
	Not available according to standards	2	2
	Low coverage (<1 fish per tonne caught)	2	
	Not available	8	

Availability and timeliness of IOTC data (2012-2023)

The deadline of submission for the retained catch (RC), catch and effort (CE), and size-frequency (SF) data is the 30th of June every year, with the possibility of submitting final versions of the data sets for longline fisheries by the 30th of December. Failures or delays in data reporting are a major impediment to the quality of the scientific analyses performed on IOTC fisheries data sets. The timeliness of data submissions to the IOTC Secretariat is essential to provide enough time for the preparation of data sets required for the different Working Parties and Scientific Committee of the IOTC. Therefore, late reporting compromises the validation and verification of data by the IOTC Secretariat, especially when these are submitted close to, or during, Working Party meetings devoted to the stock assessment of IOTC species.

In the case of retained catch for the 16 IOTC species, a standard procedure is used to estimate the missing data by repeating the catch data from the previous year or deriving them from a range of sources, mainly from the FAO FishStat database (see **Appendix V** of IOTC (2014)).

In general, the different types of data sets (i.e., retained catches, geo-referenced catches and efforts, and size-frequencies) are submitted by a CPC at the same date. Upon data reception, standard controls and checks are performed to ensure that the metadata and data submitted to the Secretariat are consistent and include all mandatory fields. The controls depend on each type of data set and may require the submission of revised data from CPCs if the original one is found to be inconsistent (e.g., unknown gear code) or incomplete (e.g., missing CWP spatial grid).

Retained catch data

Availability

In 2024, 4 failed to report retained catch data for 2023: Oman, Somalia, Sudan, and Yemen. With the exception of Somalia, retained catch data for one country were extracted from their online published report, while for the other two countries, the Secretariat used the previous year's catch data. In addition, retained catch data had to be estimated for the following non-members of the IOTC: Bahrain, Djibouti, Egypt, Jordan, Kuwait, Myanmar, Saudi Arabia, Timor Leste and United Arab Emirates, on the other hand, directly responded to the Secretariat with revised catches by species from 2012 to 2022, based on a recent national revision of their catch data.

Overall, the fraction of non-reported retained catches decreased from 13% in 2023 to 6% in 2024 (**Fig. 2**). Notably, Somalia is showing signs of improved data monitoring, as comprehensive information on fisheries and data were presented in Somalia's National report presented to SC27, though the data remains subject to evaluation and the availability of raw data to the Secretariat.

Timeliness

Data submission in 2024 showed significant improvement, with most of the major fleets submitting data for all fisheries before the 30th of June, although not all data sets were complete. This improvement can be largely attributed to CPCs becoming more familiar with the data reporting requirements following the data reporting workshops held in Thailand and Kenya in 2024, which saw participation from most CPCs.

On average, around 94% of retained catch data were available in 2024 for all species groups, a notable increase compared to 63 in 2023. The non-reporting of catches in 2024 was around 10% for neritic tuna species, but lower for other species groups (**Fig. 2**), marking the lowest non-reporting percentage in the time series. Non-reporting for tropical tuna and billfish species was under 6.8%, while the reporting rate for temperate tuna species was over 99%. This trend indicates overall progress in data reporting, especially for key species groups.

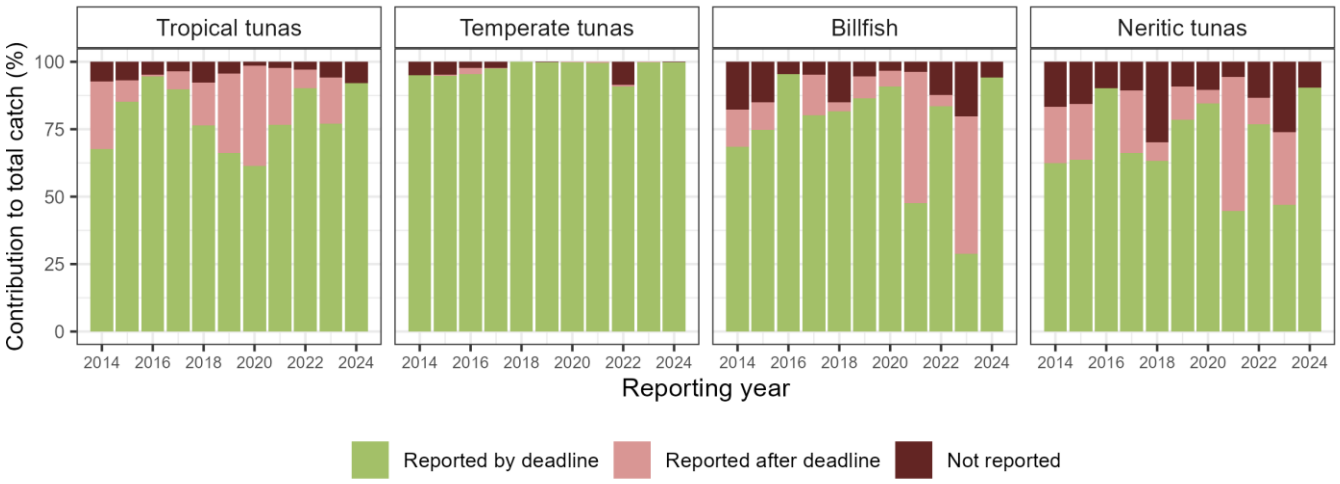

Fig. 2. Annual percentage of total retained catch of each of the IOTC species groups according to the date of submission of the retained catch data by each fleet to the IOTC Secretariat. The submission deadline is the 30th June of each year

Catch and effort data

Availability

Reporting of geo-referenced catch data continues to be a challenge for several CPCs, especially those facing specific issues such as: (i) Lack of proper data management systems; (ii) Low economic importance of tuna and tuna-like species; and (iii) Inadequate monitoring of fisheries. Moreover, the low market value of some species further leads to less funding and fewer resources allocated to data collection efforts (Pita et al. 2019).

Although billfish and neritic tunas captured in industrial fisheries have been reported with quality geo-referenced data, these catches are low compared to those from coastal fisheries. This discrepancy underscores the challenge of ensuring comprehensive data reporting, especially for species caught by smaller-scale coastal fisheries, where monitoring infrastructure and resources are often insufficient.

The availability of catch and effort data varies significantly by species group, with different trends for each category (**Fig. 3**):

- The reporting of tropical tuna catches has improved in recent years. Between 2018 and 2023, CPCs with significant tropical tuna catches, such as I.R. Iran, India, Pakistan, and Oman, often reported their data after the deadline. In 2024, however, nearly all fleets reported their data by the deadline. Despite this, 13% of geo-referenced catches for tropical tunas were not available, indicating that although timeliness improved, some fleets still did not report complete catch and effort data for tropical tunas.
- The reporting of geo-referenced catches for temperate tunas is nearly complete, with 99% of fleets reporting these data in 2024. This mirrors the reporting trend for retained catches of temperate tunas, showing a high level of consistency in data submission and accuracy for this species group.

The availability of geo-referenced catch data for billfish has fluctuated over the years. While there was a significant improvement in 2022, the availability decreased in 2023. However, in 2024 there was a noticeable recovery, 72% of billfish geo-referenced catches reported on time by the deadline. This is attributed to the notable progress made on timely reporting by I.R Iran

- The trend in availability of neritic tuna catches indicate the challenges CPCs with high catch data faced to collect geo-referenced data. There are years where reporting of geo-referenced catches of neritic tuna were below 50%. However, there are slight improvement in recent years, where 66% report in 2024.

However, there has been slight improvement in recent years. In 2024, the availability of geo-referenced catch data for neritic tunas rose to 66%. While the data availability is still below ideal levels, the improvement is a positive sign that CPCs are making efforts to enhance their data collection and reporting systems for this species group.

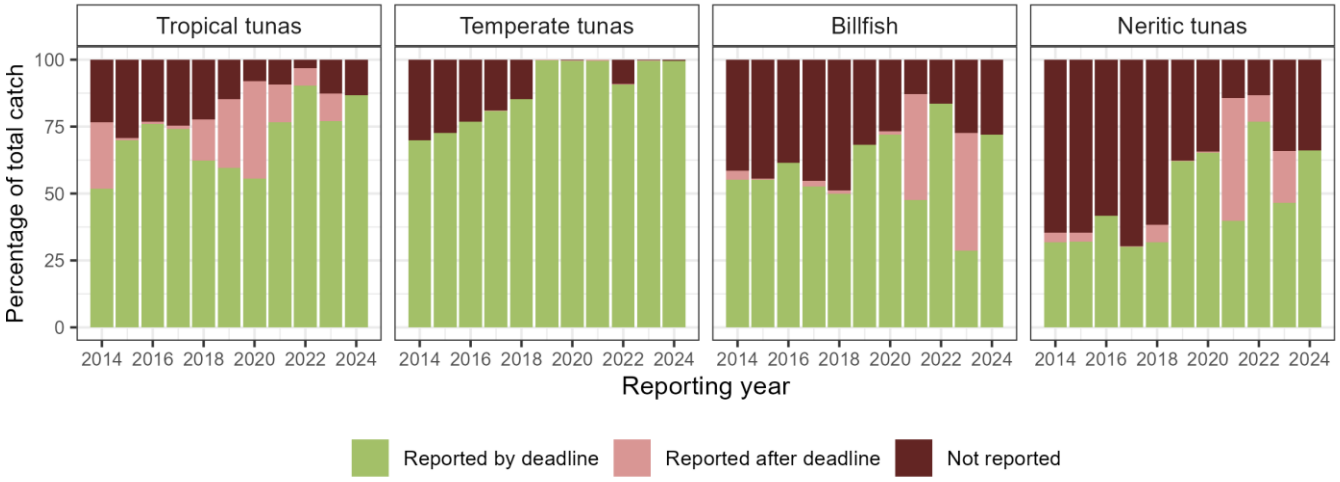

Fig. 3. Annual percentage of total retained catch of each of the IOTC species groups according to the date of submission of the geo-referenced catch and effort data by each fleet to the IOTC Secretariat. The submission deadline is the 30th June of each year

Timeliness

As indicated for the retained catches, in 2024 no fleets reported after the deadline. Although retained catch data are highly available in 2024, reporting of catch and effort lower, averaging 81% for all species groups by the deadline. This reflect an improvement compared to 2023, which was at 63%. CPCs with catches that were reporting late geo-referenced, namely I. R Iran, with significant billfish and neritic tunas catches, reported catches by the deadline in 2024, which is indicated by no catch data reported after the deadline in 2024 (**Fig. 4**).

In 2024, there was a notable improvement in the timely reporting catch and effort data across all species groups. The most significant development was that no fleets reported after the deadline, although some fleets still omit the reporting obligation, which marks a major step forward in timely data submission.

However, the reporting of catch and effort data was slightly lower compared to retained catches, with an average availability of 81% by the deadline across all species groups. While this is an improvement over 2023, when only 63% of catch and effort data were available by the deadline.

A notable achievement in 2024 was that I.R. Iran, which had previously reported late geo-referenced catch data for billfish and neritic tunas, successfully reported all catch data by the deadline.

Size-frequency data

Availability

The availability of size frequency data for IOTC species has been a persistent issue from 2014 to 2024, with an average of 39.8% of data not reported over this period (**Fig. 4**). This indicates a significant gap in the reporting of size-frequency data, which is crucial for understanding the age and size structure of fish populations, especially for management and conservation purposes.

Challenges in Reporting Size Frequency Data:

- A major challenge in reporting size frequency data for billfish species is that many of these species are landed dressed (processed without heads and guts), making it difficult to identify the species accurately at landing sites. This is particularly problematic for fleets with high catches of billfish, as they fish predominantly outside the National Jurisdiction Area (NJA), complicating size-frequency collection. I.R.

Iran, a major contributor to the global billfish catch, does not report size-frequency data for these species. This could be due to the low commercial value of billfish in I.R. Iran (Khorshidi 2023), leading to reduced emphasis on collecting this data. However, improvements are expected, particularly through Sri Lanka's research on identifying dressed billfish species (Bandaranayake et al. 2024), which could serve as a model for other CPCs facing similar challenges.

- Although size frequency data for temperate and tropical tunas remains highly available, it still falls below 80% in 2024. Specifically, the availability of size frequency data for temperate tunas has dropped below 80%, partly due to disruptions such as COVID-19, which hindered sampling activities, particularly for fleets like Japan. For tropical tunas, while availability of size frequency data is relatively better, there is still some underreporting across various CPCs, affecting the overall quality of data.

- The availability of size-frequency data for neritic tunas has seen a significant decline in recent years, with only 26% reported in 2024. This is a worrying trend, especially considering the increased catches of neritic tunas by CPCs like India, Oman, and Pakistan. On the other hand, some CPCs reported some size frequency data, which is not comprehensive enough to meet the reporting requirements, which stipulate one fish per metric tonne for each species.

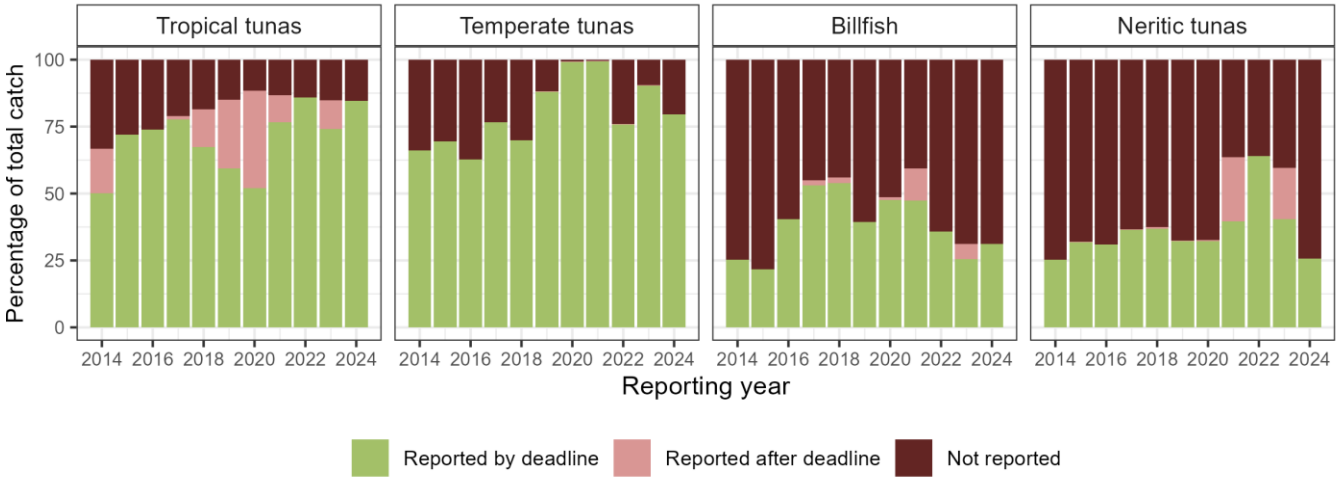

Fig. 4. Annual percentage of total retained catch of each of the IOTC species groups according to the date of submission of the size-frequency data by each fleet to the IOTC Secretariat. The submission deadline is the 30th June of each year

Timeliness

When available, size-frequency data between 2014 and 2024 have been mostly reported by the deadline, noting no delays in reporting in 2024 (**Fig. 4**). Similar to retained and geo-referenced data, reporting of size-frequency data by the deadline depends sensibly on the type of fisheries targeting species from these groups.

- For tropical tunas, which are mostly targeted by industrial fisheries, 72.1% of size-frequency are available on average by the deadline between 2019 and 2024. Although the percentage of size data available by end of June 2024 (84.7%) increased compared to June 2023 (74.1%), in 2024 there were no size data reported after the deadline, as was the case in 2023 (10.6%).

- For temperate tunas, availability by the deadline, averaged 79.7% between 2014 and 2024, the highest compared to other species groups.

- For billfish, availability by the deadline is low, averaging 38.3% between 2014 and 2024, where in 2023, the availability was as low as 25.4%. In 2024, availability by the deadline increase slightly to 31.1%.

- For neritic tunas, availability by the deadline, averaged 36% between 2014 and 2024. Similarly to billfish, continuous decline in recent years, with 25.6% in 2024 reported by the deadline.

The timeliness of size-frequency data from 2014 to 2024 show some notable trends and challenges, particularly with regard to the species groups targeted by different fisheries.Similar to retained and geo-referenced data, reporting of size-frequency data by the deadline depends sensibly on the type of fisheries targeting species from these groups, although data reported after the deadline:

- Timely reporting of tropical tunas was 72.1% for size-frequency data available by the deadline on average between 2019 and 2024. There was a significant improvement in 2024, with 84.7% of size-frequency data reported by the end of June 2024, compared to 74.1% in 2023.No size-frequency data was reported after the deadline in 2024, a marked improvement over 2023, where 10.6% of data was reported late. This improvement in reporting is likely attributed to industrial fisheries, which predominantly target tropical tunas, being more consistent and organized in their reporting.
- The availability of size-frequency data for temperate tunas has consistently been the highest, averaging 79.7% between 2014 and 2024. Although recorded an increased in non-reporting in 2024.
- Size-frequency data availability for billfish remains consistently low, averaging only 38.3% between 2014 and 2024. In 2023, the availability was particularly low with 5.7% after the deadline.
- Similar to billfish, the availability of size-frequency data for neritic tunas has been consistently low, averaging 36% between 2014 and 2024. There has been a decline in the availability of this data in recent years, with only 25.6% of neritic tuna size-frequency data reported by the deadline in 2024.

Overview of the status of the data reported for 2023

Retained catch, catch and effort, and size-frequency data

Retained catch data, geo-referenced catch and effort data, and size-frequency data for the reference year 2023 were reported to the IOTC Secretariat in a timely manner and according to the IOTC reporting standards for the very large majority of the industrial purse seine and longline fisheries, and for some coastal fisheries (**Tab 5**). Nevertheless, there are still some important fleets that have either reported data to sub-standard levels, which prevented their processing, or have not reported the three main datasets to date.

The situation is more articulated when it comes to retained catches for all other fisheries, with a) data accurately reported by major fishing nations such as I.R. Iran, Sri Lanka, Maldives, and Thailand, and b) no data reported by important coastal countries such as Oman, Yemen and Madagascar, In general, little information on catch and effort was provided by several coastal fisheries, except for I.R. Iran, Indonesia, Sri Lanka, Comoros, Maldives, Malaysia, and Thailand (**Tab 5**). Finally, size-frequency data are available for Comoros, Maldives, and Thailand, and some fisheries of Sri Lanka, I.R. Iran, and Indonesia although with a generally low sampling coverage.

Fishery group	CPC	Fleet	Catch (t)	RC	CE	SF
Purse seine	AUS		4,659			
	EU	EUESP	134,640			
		EUFRA	61,769			
		EUITA	6,114			
	IDN		106,484			
	KOR		12,418			
	MOZ		2,033			
	MUS		24,920			
	OMN		8,025			
	SYC		121,200			
	TZA		11,725			
Longline	AUS		203			
	CHN	CHN	20,046			
		TWN	72,835			
	EU	EUESP	7,041			
		EUFRA	2,032			
		EUPRT	1,660			
	IDN		17,022			
	JPN		10,786			
	KEN		443			
	KOR		802			
	LKA		17,089			
	MUS		5,866			
	MYS		3,188			
	OMN		393			
	SYC		11,069			
	TZA		493			
	ZAF		1,584			
Other	AUS		260			
	BGD		15,051			
	COM		9,173			
	GBR		9			
	IDN		371,959			
	IND		200,681			
	IRN		286,576			
	KEN		2,793			
	LKA		147,297			
	MDG		14,015			
	MDV		160,496			
	MOZ		25,344			
	MYS		18,159			
	OMN		123,222			
	PAK		48,589			
	SYC		945			
	THA		24,806			
	TZA		6,547			

Fig. 5. Retained catches (metric tonnes; t) and data reporting quality of the main IOTC datasets by fishery group (industrial purse seine, industrial longline, and all other fisheries) and flag as reported in 2024 (for reference year 2023) for all IOTC species and sharks caught by tuna and tuna-like species in the Indian Ocean. RC = retained catch; CE = catch and effort; SF = size frequencies. Colour key is given in score key table

Discard data collected through form 1DI

Estimates of discards reported to the Secretariat are derived from logbooks or observers, although data on discards reported in the logbook may also be collated from the latter in some cases. In 2024, a total of 15 fleets provided positive reports of discards for the reference year 2023, reported as number or weight in some cases (**Tab** 0). The comparison of discard levels between fleets and fisheries is hampered by the great heterogeneity of the information provided by CPCs, particularly in the levels of sampling coverage and absence of raising for most fisheries. Although IOTC Resolution 15/02 states that discards should be extrapolated to the fishery, the discard levels reported are low and mostly based on the observations of individuals discarded at sea.

Other issues regarding the nature of discard data reporting include email notifications which are focused on specific resolutions requirements (Res. 13/05, Res. 12/06, Res. 13/04, Res. 12/04, Res. 17/05 and Res. 19/03), futhermore, with the intensive use of e-MARIS for reporting, some CPCs only completed matrix table on availability discard. Therefore, the information received is fragmented and does not comply with the IOTC standards. There are several cases were CPCs only provide a summary of information on discards through their National Report.

In 2024, several fleets with coastal fisheries indicated nil report of discards in e-MARIS. Although most of the fisheries of these CPCs are coastal and the very large majority of the bycatch (e.g., sharks) may be retained for local markets, some discarding would still be expected to take place, as for instance observed in the gillnet fishery of I.R. Iran, the swordfish-targeted longline fishery of Reunion, and the Maldivian pole and line fishery to a lesser extent (Sabarros et al. 2013; Shahifar et al. 2013; Miller et al. 2017). The absence of discarding by purse seiner is highly unlikely in light of the non-selectivity of purse seines and the systematic discarding of several unwanted non-IOTC species in the fishery (Ruiz et al. 2018; Grande et al. 2019). With the introduction of a the form 1IN, some industrial CPCS used the form to report any interactions with the fisheries, according the respective resolutions related to ETP species, namely Tanzania, Korea, Mauritius, Seychelles, Taiwan,China, and South Africa.

Tab. 7. Total quantities of discards in numbers and weight (metric tonnes; t) by fleet in 2023 as reported to the IOTC Secretariat

Fleet	Number	Weight (t)
Australia	7,452	0
China	247	0
France (EU)	7,844	504
Indonesia	459	0
Italy (EU)	2	6
Japan	16,874	0
Korea_Republic of	2,111	219
Malaysia	180	0
Mauritius	0	45
Portugal (EU)	771	0
Seychelles	1,671	185
South Africa	3,029	0

Fleet	Number	Weight (t)
Spain (EU)	3,787,591	0
Sri Lanka	3,024	0
Taiwan Province of China	8,994	0

The availability of discarded catches by fisheries indicate that most tunas and tuna-like species are discarded from purse seine fisheries fishing on FOB-associated schools and for sensitive species from longline fisheries. However, several shark species were discarded from both longline and purse seine fisheries. Overall, from the reported discarded catch, the primary discarded species of longline are sharks, purse seine fisheries discarded mainly other species, and gillnet fisheries mostly turtles (**Tabs 8-9**).

Tab. 8. Total discard levels (in number of fish) for the 16 IOTC species by fishery and species category in 2023 as reported to the Secretariat

Fishery	Fishery code	BILLFISH	NERITIC	TEMPERATE	TROPICAL
Purse seine | Other	PSOT	0	0	0	0
Purse seine | FS	PSFS	7	10,616	0	99,555
Purse seine | LS	PSLS	521	975,464	0	2,639,869
Longline | Other	LLO	1,060	0	183	541
Longline | Fresh	LLF	121	0	178	1,563
Longline | Deep-freezing	LLD	752	0	3,177	7,230

Tab. 9. Total discard levels (in weight; t) for the 16 IOTC species by fishery and species category in 2023 as reported to the IOTC Secretariat

Fishery	Fishery code	BILLFISH	NERITIC	TEMPERATE	TROPICAL
Purse seine | Other	PSOT	4	186	0	0
Purse seine | FS	PSFS	1	0	0	18
Purse seine | LS	PSLS	12	136	0	103
Longline | Other	LLO	0	0	0	0
Longline | Fresh	LLF	0	0	0	0
Longline | Deep-freezing	LLD	0	0	0	0

Tab. 10. Total discards (in numbers of individuals) of endangered, threatened, and protected species by fishery and species category in 2023 as reported to the IOTC Secretariat

Fishery	Fishery code	SHARKS	RAYS	SEABIRDS	CETACEANS	TURTLES
Purse seine | Other	PSOT	0	0	0	0	155

Fishery	Fishery code	SHARKS	RAYS	SEABIRDS	CETACEANS	TURTLES
Purse seine | FS	PSFS	376	21	0	0	3
Purse seine | LS	PSLS	60,674	325	0	0	198
Longline | Other	LLO	2,836	718	0	1	20
Longline | Fresh	LLF	6,981	237	11	2	122
Longline | Deep-freezing	LLD	20,464	84	470	6	192
Line | Coastal longline	LIC	389	25	0	0	287
Line | Trolling	LIT	0	0	0	0	30
Line | Handline	LIH	0	0	0	0	36
Gillnet	GN	97	0	0	52	1,683
Other	OT	0	0	0	0	47

Tab. 11. Total discards (in weight; t) of endangered, threatened, and protected species by fishery and species category in 2023 as reported to the IOTC Secretariat

Fishery	Fishery code	SHARKS	RAYS	SEABIRDS	CETACEANS	TURTLES
Purse seine | Other	PSOT	22	0	0	0	0
Purse seine | FS	PSFS	4	2	0	0	0
Purse seine | LS	PSLS	133	7	0	0	0
Longline | Other	LLO	0	0	0	0	0
Longline | Fresh	LLF	0	0	0	0	0
Longline | Deep-freezing	LLD	0	0	0	0	0
Line | Coastal longline	LIC	0	0	0	0	0
Line | Trolling	LIT	0	0	0	0	0
Line | Handline	LIH	0	0	0	0	0
Gillnet	GN	0	0	0	0	0
Other	OT	0	0	0	0	0

Discards of species caught with longlines, purse seines, and gillnets reported through form 1-DI show that most species discarded alive are non-IOTC species. More specifically, the majority of species discarded alive are sharks for the longline fisheries (of which over 50% is constituted of blue sharks), *other* marine species for the purse seine fisheries, and marine turtles for the gillnet fisheries (over 90% of the totals released by the fishery) (**Fig. 6**).

IOTC species may be discarded dead in longline fisheries, although shark species dominate this specific component of the discards at sea and 30% of dead releases are of tropical and temperate tunas. For purse seine and gillnet fisheries the trends are comparable to what identified for the species discarded alive, with *other* marine species and turtles being the main species discarded dead from these two fisheries, respectively (**Fig. 6**).

Despite the scarcity of data on discards, most fleets record the fate of the species released and this indicates a high level of species discarded alive.

Furthermore:

- Discarded data indicate that many rays may be discarded alive in longline fisheries, while most of them are discarded dead in purse seine fisheries (**Fig. 7**).
- Gillnet fisheries are those reporting the highest number of interactions with marine turtles, with data for 2023 indicating that the majority of these were released alive (**Fig. 8**).
- Data for 2023 shows that seabirds interacting with longline fisheries are mainly discarded dead (**Fig. 9**).
- Tuna and tuna-like species from both longline and purse seine fisheries are discarded dead, with a minimal number of individuals released alive reported by longline fisheries.

It is important to recall how the information currently available on discards cannot be used to estimate the magnitude and composition of the phenomenon at regional level. However, these data provide some indication on the occurrence of sensitive species in some fisheries and highlight the gaps that need to be considered to improve the quality of the data for further analysis.

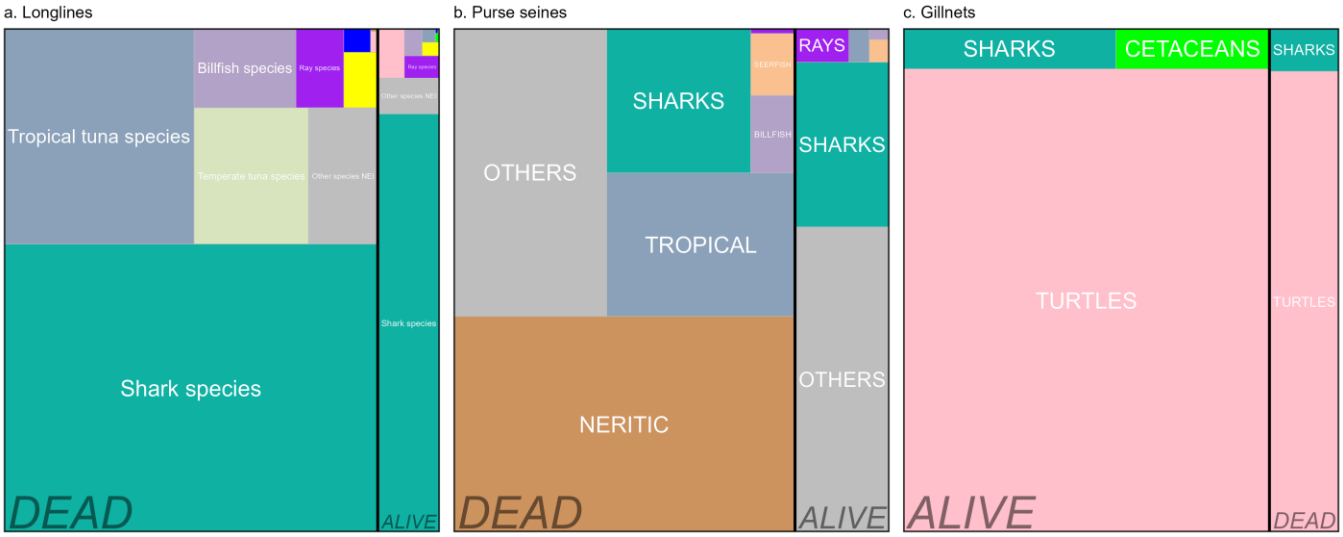

Fig. 6. Composition of all fishing discards by fate (i.e., dead or alive) and species category for the main IOTC fishery groups as reported to the Secretariat for the year 2023 through form 1DI: (a) longline (numbers of fish), (b) purse seine (weight of fish), and (c) gillnet fisheries

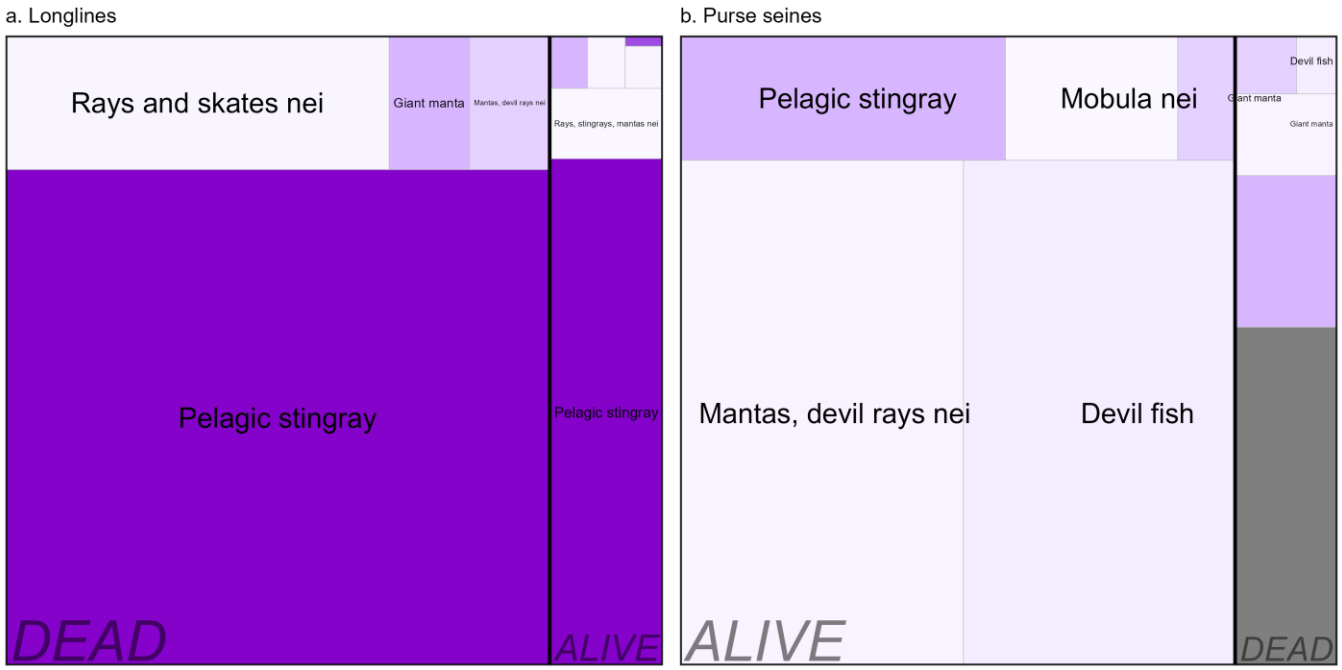

Fig. 7. Composition of fishing discards of rays (in numbers) by fate (i.e., dead or alive) and species in (a) longline and (b) purse seine fisheries as reported to the Secretariat for the year 2023

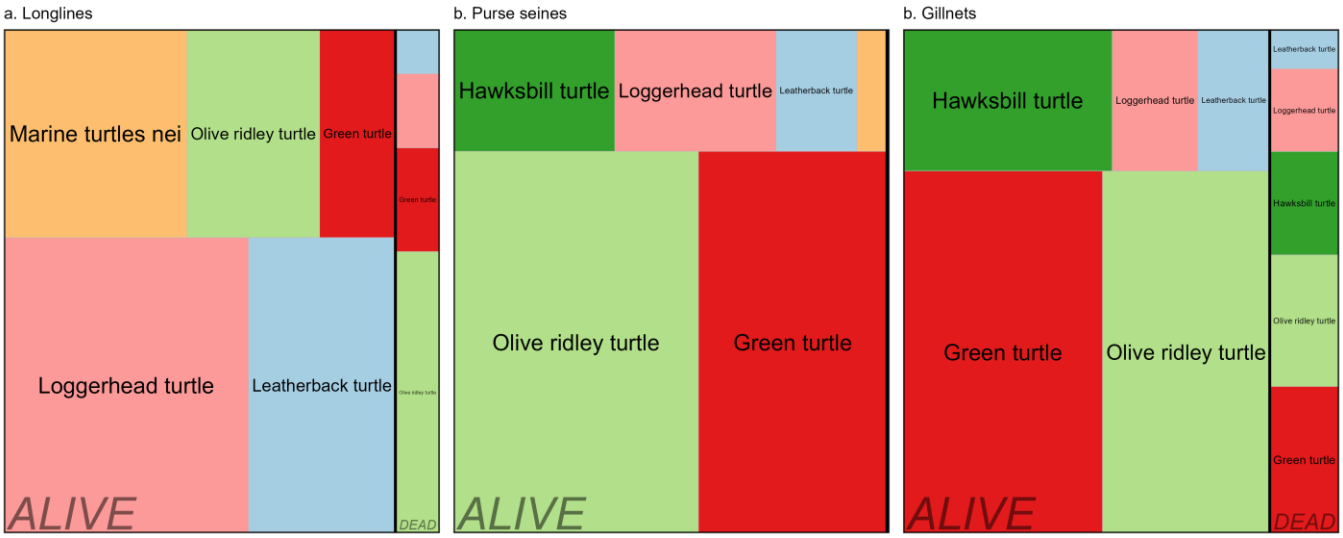

Fig. 8. Composition of fishing discards of turtles (in numbers) by fate (i.e., dead or alive) and species in (a) longline, (b) purse seine, and (c) gillnet fisheries as reported to the Secretariat for the year 2023

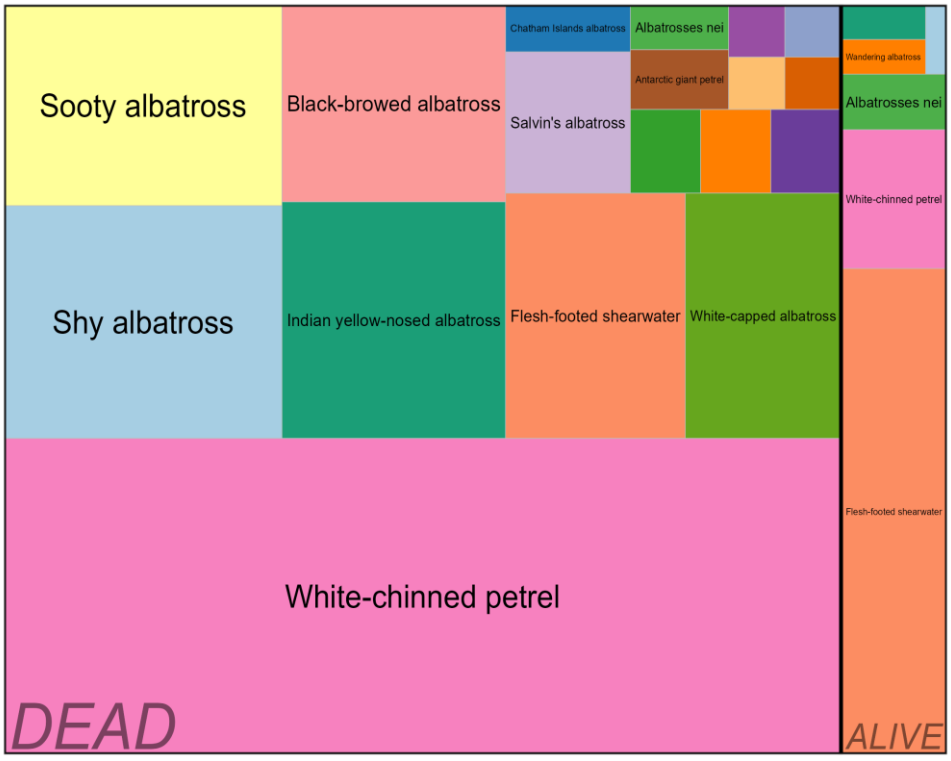

Fig. 9. Composition of fishing discards of seabirds (in numbers) by fate (i.e., dead or alive) and species in longline fisheries as reported to the Secretariat for the year 2023

FAD-related data

Since a comprehensive description of the DFAD-related data available at the IOTC Secretariat covering the period 2013-2022 was made at the 5th IOTC ad hoc Working Group on FADs (WGFAD05), along with the release of the consolidated data sets (IOTC 2023), no further analysis have been made to the data on dFOBs. Following extensive discussions during working groups on fish aggregated device, new reporting formats were available to collect data from both dFOBs and AFAD fisheries. the 3DA and 3AA templates allow CPCs to detailed catches by various aspects of the fisheries, at vessel level. The response for the reporting in 2024 have been positive, through which most fleets fishing on aggregated devices (drifted or anchored) reported data in the respective forms. Korea, on the other hand, used the old reporting format 3FA, and partially provided information (**Tab 12**).

("Indication of present/absence of buoys during fishing by industrial purse seine fleets. dark blue indicates absence")

Tab. 12. Data reporting status of data on interactions with AFADs (form 3AA), dFOBs (form 3DA), and daily buoy positions (3BU) as reported to the IOTC Secretariat. Grey indicates Not Applicable

CPC code	Fleet	3DA	3AA	3BU
EU	EU,France			
	EU,Italy			
	EU,Spain			
OMN	Oman			
KOR	Rep. of Korea			

CPC code	Fleet	3DA	3AA	3BU
MUS	Mauritius			
SYC	Seychelles			
TZA	Tanzania			
MDV	Maldives			
IDN	Indonesia			

Data reported by fisheries in form 3DA, indicated high presence of buoy reported by fleets during fishing activities, proportionally marginal by the capacity of the fleets (**Fig. 10**)

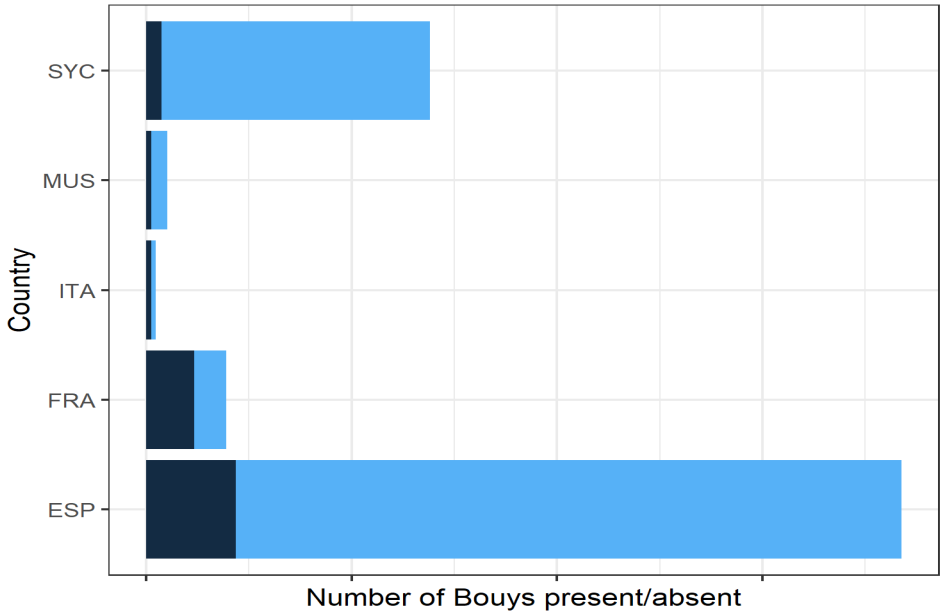

Fig. 10. Indication of present/absence of buoys during fishing by industrial purse seine fleets. dark blue indicates absence

Furthermore, in terms of type of fishing aggregated devices with catches, most of catches were from drifting devices, with minimal catches from human activities. and natural objects (**Fig. 11**).

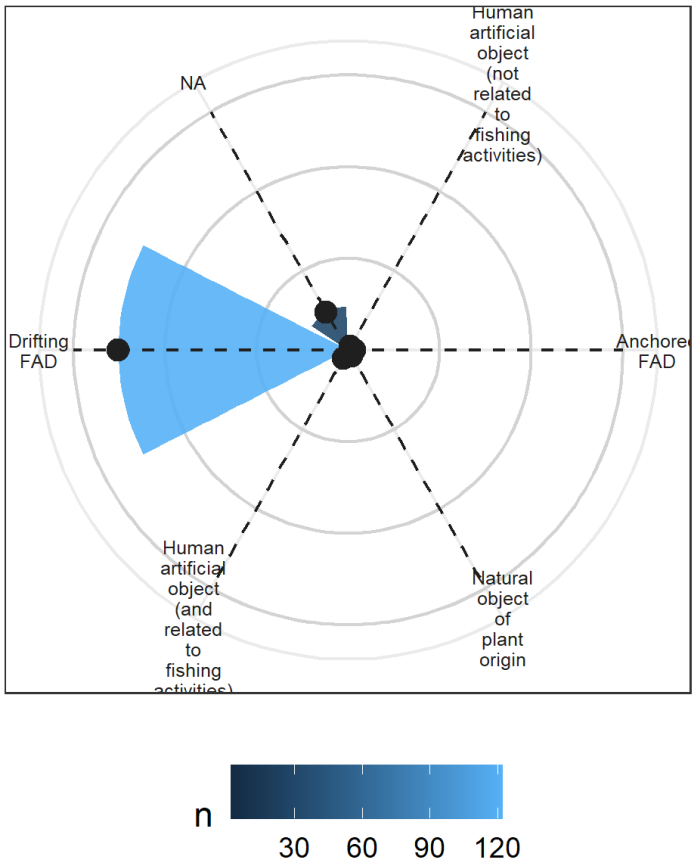

Fig. 11. Proportion of catch data by type of fishing aggregated devices

Appendix I: Availability and reporting quality of IOTC datasets for 2023

Tropical tuna species

Fishery group	CPC	Fleet	Catch (t)	Species	RC	CE	SF
Purse seine	EU	EUESP	133,383	B,S,Y			
		EUFRA	59,759	B,S,Y			
		EUITA	5,913	B,S,Y			
	IDN		98,229	B,S,Y			
	KOR		12,418	B,S,Y			
	MOZ		2,033	B,S,Y			
	MUS		24,353	B,S,Y			
	OMN		8,025	B,S,Y			
	SYC		119,093	B,S,Y			
	TZA		11,350	B,S,Y			
Longline	AUS		81	B,S,Y			
	CHN	CHN	10,500	B,Y			
		TWN	21,525	B,S,Y			
	EU	EUESP	92	B,S,Y			
		EUFRA	598	B,S,Y			
		EUPRT	16	B			
	IDN		13,081	B,S,Y			
	JPN		5,458	B,S,Y			
	KEN		164	B,S,Y			
	KOR		557	B,S,Y			
	LKA		14,189	B,S,Y			
	MUS		4,562	B,S,Y			
	MYS		845	B,S,Y			
	OMN		282	B,S,Y			
	SYC		8,276	B,Y			
	TZA		162	B,S,Y			
	ZAF		802	B,S,Y			
Other	AUS		2	S,Y			
	BGD		167	S			
	COM		8,414	B,S,Y			
	GBR		1	S,Y			
	IDN		129,714	B,S,Y			
	IND		50,236	B,S,Y			
	IRN		111,407	B,S,Y			
	KEN		984	B,Y			
	LKA		59,515	B,S,Y			
	MDG		1,536	B,S,Y			
	MDV		160,372	B,S,Y			
	MOZ		1,794	S			
	MYS		4	S			
	OMN		65582.23	Y			
	PAK		8,575	S,Y			
	SYC		707	B,Y			
	THA		5,565	S,Y			
	TZA		2,182	B,S,Y			

Fig. 12. Retained catches (metric tonnes; t) and availability of the main IOTC datasets by fishery group (industrial purse seine, industrial longline, and all other fisheries) and fleet as reported in 2024 (for reference year 2023) for tropical tunas of the Indian Ocean. B = bigeye tuna; S = skipjack tuna; Y = yellowfin tuna. RC = retained catch; CE = catch and effort; SF = size frequencies. Colour key is given in **Table 5**

Temperate tuna species

Fishery group	CPC	Fleet	Catch (t)	Species	RC	CE	SF
Purse seine	AUS		4,659	S			
	EU	EUESP	27	A			
		EUFRA	11	A			
	IDN		38	A			
	MUS		2	A			
	SYC		14	A			
	TZA		1	A			
Longline	AUS		21	A,S			
	CHN	CHN	3,859	A			
		TWN	24,571	A,S			
	EU	EUESP	3	A			
		EUFRA	356	A			
	IDN		2,622	A,S			
	JPN		4,571	A,S			
	KOR		163	A,S			
	LKA		96	A			
	MUS		560	A			
	MYS		1,971	A			
	OMN		97	A			
	SYC		591	A			
	TZA		35	A			
	ZAF		141	A,S			
Other	AUS		14	A,S			
	COM		45	A			
	EU	EUFRA	144	A			
	IDN		6,726	A			
	LKA		746	A			
	MOZ		230	A			
	MUS			A			
	SYC		1	A			

Fig. 13. Retained catches (metric tonnes; t) and data reporting quality of the main IOTC datasets by fishery group and fleet as reported in 2024 (for reference year 2023) for temperate tunas of the Indian Ocean. A = albacore; S = southern bluefin tuna. RC = retained catch; CE = catch and effort; SF = size frequencies. Colour key is given in **Table 5**

Billfish species

Fishery group	CPC	Fleet	Catch (t)	Species	RC	CE	SF
Purse seine	EU	EUESP	10	F,M			
		EUFRA	23	F,M			
		EUITA	0.56				
	IDN		313	F,M,S			
	SYC		34	M,S			
Longline	AUS		100	M,P,S			
	CHN	CHN	2,447	F,M,S			
		TWN	5,249	F,M,P,S			
	EU	EUESP	3,022	F,M,P,S			
		EUFRA	1039	F,M,P,S			
		EUPRT	743	F,M,S			
	IDN		913	F,M,S			
	JPN		512	F,M,S			
	KEN		224	F,M,S			
	KOR		25	F,M,S			
	LKA		2,496	F,M,S			
	MUS		318	F,M,S			
	MYS		189	F,M,P,S			
	OMN		14	F,M,S			
	SYC		940	F,M,P,S			
	TZA		25	F,M,S			
	ZAF		564	F,M,S			
Other	BGD		2,100	F,M,S			
	COM		418	F,M,S			
	EU	EUFRA	334.85	F,M,S			
	IDN		4,762	F,M,S			
	IND		7,257	F,S			
	IRN		31450	F,M,P,S			
	KEN		293	F			
	LKA		8,464	F,M,P,S			
	MDG		842	F			
	MOZ		156	F,M			
	MYS		25	F			
	OMN		2,997	F,M			
	PAK		4,521	F,M			
	SYC		61	F,M,P,S			
	THA		239	F			
	TZA		712	F,M,S			

Fig. 14. Retained catches (metric tonnes; t) and data reporting quality of the main IOTC datasets by fishery group and fleet as reported in 2024 (for reference year 2023) for billfish species of the Indian Ocean. F = Indo-Pacific sailfish; M = marlins; P = shortbill spearfish; S = swordfish. RC = retained catch; CE = catch and effort; SF = size frequencies. Colour key is given in **Table 5**

Neritic species

Fishery group	CPC	Fleet	Catch (t)	Species	RC	CE	SF
Purse seine	EU	EUESP	13	B,K,X			
		EUFRA	349	K,X			
		EUITA	173	K,X			
	IDN		7,900	B,C,F,G,K,L			
	MUS		330	F,X			
	OMN						
	SYC		25	X			
	TZA		374	F			
Longline	CHN	TWN	61	B,C,F,G,K,L			
	EU	EUESP	1	X			
		EUFRA	3	X			
	IDN		391	B,C,K,L			
	KEN		1	C			
	LKA		24	B,C,F,K,L,X			
Other	AUS		225	C,K,L,X			
	BGD		7,934	B,C,F,G,K			
	COM		254	B,C,F,G,K,L,X			
	EU	EUFRA	61	K,X			
	GBR		6	K,X			
	IDN		205,062	B,C,F,G,K,L			
	IND		113,562	B,C,F,G,K,L,X			
	IRN		133,292	C,F,G,K,L,X			
	KEN		1,216	B,C,K			
	LKA		10,868	B,C,F,G,K,L,X			
	MDG		6,021	B,C,F,G,K,L			
	MDV		114	F,K,X			
	MOZ		16,818	B,C,F,K,X			
	MYS		18,085	B,C,F,G,K,L,X			
	OMN		47,541	L,K			
	PAK		25,322	B,C,F,K,L			
	SYC		40	K			
	THA		19,002	B,C,F,G,K,L			
	TZA		3,565	C,F,G,K,L			

Fig. 15. Retained catches (metric tonnes; t) and data reporting quality of the main IOTC datasets by fishery group and fleet as reported in 2024 (for reference year 2023) for neritic tunas and seerfish of the Indian Ocean. B = bullet tuna; C = narrow-barred Spanish mackerel; F = frigate tuna; G = Indo-Pacific king mackerel; K = kawakawa; L = longtail tuna; X = seerfish. RC = retained catch; CE = catch and effort; SF = size frequency. Colour key is given in **Table 5**

Main shark species

Fishery group	CPC	Fleet	Catch (t)	Species	RC	CE	SF
Purse seine	EU	EUESP	0.07	S			
		EUFRA	0.01	L			
	IDN		4	M			
	SYC		24	S,W			
Longline	CHN	CHN	527	L			
		TWN	3,592	L,S			
	EU	EUESP	3,868	L,M			
		EUFRA	17	L,M			
		EUPRT	895	L,M			
	IDN		14	M			
	JPN		244	L,M			
	KEN		52	L,M,S			
	LKA		228	L,S			
	MUS		19	L,M,O			
	OMN						
	SYC		249	L,O,S			
	TZA		251	L			
	ZAF		66	L,M			
Other	COM		43	L,S,W			
	EU	EUFRA	4	M,L			
	IDN		17,091	L,O			
	IRN		1,511	H,M,O,S,W			
	LKA		884	H,L,S			
	MDG		1,741	O,S			
	MOZ		5,880	H,O,W			
	MYS		45	H,O			
	OMN		5,268	O			
	PAK		664	M,P,S			
	SYC		3	H,L,O			
	TZA		3	L,S			

Fig. 16. Retained catches (metric tonnes; t) and data reporting quality of the main IOTC datasets by fishery group and fleet as reported in 2024 (for reference year 2023) for the most commonly caughts sharks of the Indian Ocean. H = hammerhead sharks; L = blue shark; M = mako sharks; O = other sharks; P = pelagic thresher; S = silky shark; W = oceanic whitetip shark. RC = retained catch; CE = catch and effort; SF = size frequencies. Colour key is given in **Table 5**

Appendix II: Data issues and proposed actions

Tab. 13. Main data issues identified by the WPDCS and actions proposed to address them. RC = retained catch; CE = catch and effort; SF = size frequencies; ROS = Regional Observer Scheme

Dataset	CPCs	Fisheries	Main issues	Proposed actions
RC	**India**	**Coastal fisheries**	Catches are reported for various regions by fisheries, rather than aggregated by main IOTC areas, as required for RC. Aggregated catches of shark species.	The presentation by India during WPDCS19 indicated that an integrated fisheries management system is being developed, which could potentially provide the data required by the resolutions. However, this will entail continued engagement with the Secretariat to assist India in formulating and refining the data
	Indonesia		Interannual variability in official estimates of total catch and species composition, multiple data submissions every year	Continue ad hoc collaboration with institutes involved in fisheries monitoring and reporting and support for sampling of artisanal fisheries (e.g., species identification) and data management
	I. R. Iran, Pakistan	**Drifting gillnet fisheries**	Possible double-counting of catch due to vessels that may be registered in Pakistan and I.R. Iran	Fisheries administrations from Pakistan and I. R. Iran to work closely to identify the vessels that are registered in both countries, and reporting their activities in both countries
	Kenya	**Coastal fisheries, Industrial fisheries**	Lack of knowledge on industrial fisheries activities. Issues with data collection, including catch and effort and size data for coastal fisheries	Liaise with Kenya, to help Kenya to implement the requirement of resolutions 15/01 and 15/02
	Pakistan	**Drifting gillnet fishery**	Additional validation of latest revised catch series.	Liaise with Pakistan in terms of support for appraisal of the data
	Madagascar	**Coastal fisheries, longline fisheries**	Issues with data collection, including catch and effort and size data. Ending of the World Bank project in 2021 led to discontinuation of data collection, where no data for coastal fisheries reported since 2021	Madagascar requested assistance to review and continuation of the sampling of artisanal fisheries(dependent on staff / funds available?). Liaise with FAO to assess possible options for combined interventions in the country
	Somalia	**Coastal fisheries**	Lack of national data collection systems, including catch and effort and size data	Support to national initiatives (e.g., Fisheries Data Collection Working Group) for the validation of databases and data collection programmes

Dataset	CPCs	Fisheries	Main issues	Proposed actions
	Yemen	**Handline fishery**	Retained catches from FAO which have recently updated, which include changes in catches of some IOTC species	Liaise with FAO regional office and Statistics team of the Fisheries Division
CE	**All**	**Most fisheries**	Data either not submitted, or falls short of the IOTC data reporting requirements	Implement minimum data requirements for sharks/species? (noting that those for India are different as it has objected to the logbook Resolution)
		Coastal fisheries	Many CPCs have failed to report catches and effort per month for their coastal fisheries	As a minimum, request CPCs to report catches and fishing by species, gear, and month, in addition to the total numbers of fishing craft operated by gear, and month (or year).
	Oman	**Longline fisheries**	Data either not submitted, or falls short of the IOTC data reporting requirements	Oman held a two-day visit at the Secretariat with the data section to further understand the gaps. Continuous collaboration between Oman and the Secretariat is required to improve the quality of data reported by Oman
	Indonesia	**Industrial longline fisheries**	Inconsistency between logbook and VMS; Low logbook coverage, particularly for small scale fisheries. Irregularities in fisheries catch	IOTC to encourage strengthening management and validation of logbook data – particularly inconsistencies with VMS data and issues of low reporting rates of submitted logbooks (<10% in recent years)
	Oman	**Handline and gillnet fisheries**	Lack of reporting by the requirement standard due to data management	Oman held a two-day visit at the Secretariat with the data section to further understand the gaps. Continuous collaboration between Oman and the Secretariat is required to improve the quality of data reported by Oman
	Pakistan	**Drifting gillnet fishery**	Data not submitted	As part of the IOTC Data Compliance and Support missions, provide assistance to CPCs to understand the IOTC data requirements and processing of information and urge them to implement requirements and report data to the IOTC; for Pakistan gillnetters, appraisal of the capacity of the local crew-based data collection database to provide reliable catch and effort (as well as size-frequency) data to the Secretariat
	Madagascar	**Coastal fisheries**	Issues with data collection, inconsistency and not fully covering all areas. Discontinuation of the world bank project, no data collected in 2022	Madagascar requested assistance to review and continuation of the sampling of artisanal fisheries (dependent on staff / funds available?). Liaise with FAO to assess possible options for combined interventions in the country
SF	**India, Indonesia, Malaysia,**	**Coastal fisheries**	No or very few size frequency data reported	Assist CPCs to understand data requirements, and provide support to pilot sampling and processing of fisheries data and urge them to strictly implement IOTC mandatory data reporting requirements

Dataset	CPCs	Fisheries	Main issues	Proposed actions
	Oman, Yemen			
	I. R. Iran	**Drifting gillnet fishery**	Historical data not by IOTC standards	The IOTC Secretariat to collaborate with I. R. Iran on assessing whether historical (prior to 2023) size data could be reprocessed to be broken down by fishing grounds and fisheries.
	Japan, Taiwan,China	**Longline fisheries**	Catch and effort and size data conflicting over the time series.	Follow-up of recommendations resulting from the consultancy conducted in 2020-2021
	Japan		No sampling since 2021	Follow-up to see why the lack of size data collection
	Pakistan	**Drifting gillnet fishery**	No or very few size-frequency data reported	IOTC Secretariat liaising with Pakistan in terms of possible assistance for data entry, processing and submission of data via the Pakistan government, as data could be collected by observers on board vessels
ROS	**All**	**Longline and surface fisheries**	Low levels of implementation and reporting	Organize ROS training and workshops to assist CPCs with implementation of the ROS data collection and reporting requirements, also under the activities of the ROS Pilot Project (training programme).
			Information reported in formats not suitable for data extraction	Explore ways of facilitating reporting of data using the IOTC ROS electronic tools and data reporting forms
		Coastal fisheries	Low levels of implementation and reporting	Extension of EMS pilot project to other countries besides Sri Lanka
				Strengthen data collection mechanisms at landing sites (in-port observers, alternative data collection mechanisms)
	Sri Lanka	**Coastal and offshore fisheries**	Partial implementation of ROS requirements	IOTC Secretariat to continue supporting the adoption of the ROS standards and tools; possible follow-up on EMS trial projects dependent on funding. Follow-up on the pilot study of EMS in Sri Lanka for coastal fisheries for which there are difficulties placing on-board observers
Socio-Economics	**All**	**All**	Limited data available, and collated within the IOTC database	Following the WPSE01, the Secretariat will work closely with CPCs, in formulating the format for collecting socio-economic data. Furhtermore, liaise with FAO and other institutes (e.g., FFA, World Bank) to access open repositories of fish sale price, import and export data, and national indicators (e.g., Gross Domestic Product). Encourage CPCs to report information of fish prices (local sale, export, import prices)

Appendix III: Status of IOTC fishing vessels

The number of vessels targeting IOTC species in the IOTC Area of Competence is used to:

- derive input-fishing capacity in the Indian Ocean (Moreno and Herrera 2013);
- estimate the catches of fleets that operate under the flags of countries that do not report data to the IOTC;
- assess the completeness of the catches reported by IOTC CPCs and completing those catches when the fleets concerned are not fully monitored by their flag countries.

NEI category: numbers of vessels

The number of vessels operating under the flags of countries that do not report their catches to the IOTC are estimated from data reported by other countries. Those data include:

- IOTC IUU list (IOTC Resolution 11/03);
- identification, dimensions, and other attributes, by vessel, for those foreign vessels that owed fishing licenses to operate within the Economic Exclusive Zone (EEZ) of the reporting country (as specified in IOTC Resolution 14/05);
- identification and total catches unloaded, by species and vessel, for those foreign vessels using ports in the territory of the reporting country (as specified in IOTC Resolution 16/11 & 05/03);
- identification and total catches transshipped, by species and vessel, for vessels participating in the IOTC Transhipment Programme (as specified in IOTC Resolution 17/06);
- data provided by other parties, including data on the imports of tuna for canning, by species and vessel, from processors cooperating with the International Seafood Sustainability Foundation (ISSF) or other initiatives.

The catches for those fleets are estimated by using the estimated vessel numbers (obtained as above) and the catch data for vessels from other (reporting) fleets that operated in the same areas and targeted the same species (i.e., proxy fleets). The catches of this component are recorded under the NEI category.

Partially reported fleets

In addition, the Secretariat estimates catches for countries that report only partial statistics for their fleets, i.e., catches of fleets of IOTC CPCs that are not fully monitored by their flag states. The catches reported by these countries are assumed incomplete because the average catches estimated by vessel by year are significantly lower than those estimated for similar fleets of other countries, on the assumption that both fleets have the same levels of activity.

This applies to the following fleets:

- longline fleet of India: up to 100 longliners have been operating in Indian waters in recent years, including fresh-tuna longliners and deep-freezing longliners;
- longline fleets of Indonesia: Indonesia does not monitor the catches of vessels under its flag that are unloaded in ports outside its territory;

and additional catches estimated for these CPCs are also included into the NEI category.

Fishing craft statistics

General findings

Data from artisanal (small-scale) fisheries are overall scarce and inconsistent in many cases. On the contrary, the statistics of large-scale and medium-scale fleets are thought to be fairly complete:

- Purse seine fisheries:
  - the number of large-scale purse seiners fishing for tropical tunas on the high seas (usually referred to as “industrial”) is well known. At present, these are flagged in countries of the European Union, Seychelles, I.R. Iran, Mauritius, Japan, Oman, Kenya, Republic of Tanzania and the Republic of Korea;
  - there is a large fleet of Indonesian purse seiners operating mostly in the coastal waters of Indonesia, but the industrial component of this fishery (gear code PS) is poorly known, and seems to exclude several vessels of length overall larger than 24 m that should be considered as industrial and reported as such;
  - recent purse seine fleet development in Kenya (since 2020), Oman and Tanzania (2022), but little information is available on the fishing activities of these vessels for which no data have been submitted to the Secretariat so far.
- Longline fisheries:
  - there are many high seas longline fleets fishing tuna in the Indian Ocean, that include a mix of deep-freezing and fresh longline vessels. These fleets fly the flags of Taiwan,China, Seychelles, Indonesia, Sri Lanka, Japan, China, the Republic of Korea, Malaysia, the EU (France, Spain, France, Portugal, and Great Britain), South Africa, Mozambique, Oman, Australia, Madagascar, Mauritius, and Tanzania;
  - there are also very important coastal longline fisheries in the Indian Ocean (which are currently considered of artisanal nature and historically classified under the *line* gear category) which caught more than 120,000 t of tuna and tuna-like species in 2022, mainly in Indonesia, Sri Lanka, I. R. Iran, India, Maldives, Kenya, and in Reunion and Mayotte (France) and Seychelles and Mozambique to a lesser extent;
  - in the past, there were other longliners operating under various flags of non-reporting countries, with the total number of non-reporting longliners estimated by the Secretariat whenever new information was received from third parties (NEI category);
- High seas gillnet fisheries: the number of oceanic gillnet vessels operating in the Indian Ocean is well known for I.R. Iran and poorly known for Pakistan;
- Offshore gillnet/longline fisheries: the number of offshore gillnet/longline vessels that operate under the flag of Sri Lanka is well known;
- Pole-and-line fisheries: the number of pole-and-liners that operate under the flag of Maldives is well known.

Vessels records for 2023

Tab. 14. Number of fishing vessels targeting tuna and tuna-like species in the Indian Ocean by CPC and fishery group as reported in the record of active vessels (industrial fleets) and fishing crafts statistics (artisanal and industrial vessels through form 2FC. Red: FC not available; Grey: not applicable or do not have the fisheries

CPC code	Fleet code	Baitboat	Gillnet	Line	Longline	Other	Purse seine
ARE*							
AUS		1		45	7		6
BGD			25,992	93		3,195	
BHR*							
CHN	CHN				74		
	TWN				240		
COM							
DJI*							
EGY*							
ERI							
EU	EUESP				14		13
	EUFRA						8
	EUMYT			77			
	EUPRT				2		
	EUREU			141	20		
GBR							
IDN		3,253	116,439	79,465	347	16,746	8,890
IND							
IRN			5,649	1,771			
JOR*							
JPN					41		
KEN					6		
KOR					4		2
KWT*							
LKA		55	2,539	5,713	729	43,480	2,318
MDG							
MDV							
MMR*							
MOZ							
MUS					16		5
MYS			10,088	122	16	2,609	361
NEIPS							
OMN							
PAK							
QAT*							
SAU*							
SDN							
SYC					85		13
THA							218
TMP*							
TZA							
YEM							
ZAF					20		

The information available at the IOTC Secretariat on the number of active vessels targeting tuna and tuna-like species in the Indian Ocean is incomplete and sometimes inconsistent between data sources, i.e., (a) the mandatory record of active vessels which covers the industrial fleets (IOTC RAV), (b) the voluntary form 2FC which covers all fleets, and (c) the national reports submitted every year for the Scientific Committee. In 2023, information on fishing crafts was only provided by fifteen (15) fishing CPCs and however, for some CPCs data were compiled from the list of active vessels (**Table 14**).

Compiling the statistics by fishery type (i.e., artisanal vs. industrial) generates some confusion when the information provided by the CPCs is not accurate. Tuna fisheries are not necessarily limited to coastal or offshore areas and the fishery type also depends on the size of the vessels and on the fishing gear. In particular, purse seine and longline vessels can operate in both coastal waters and on the high seas (**Fig. 17**). In recent years, increasing numbers of fisheries known to only operate within EEZ are fishing beyond the EEZ. Namely gillnet, handline, and pole and line, listed in RAV. The fishery type is also unclear for some vessels equipped with pole and line and other gears and reported as industrial, e.g., trawlers less than 24 m from Australia may only operate in coastal areas while they have been reported in the RAV.

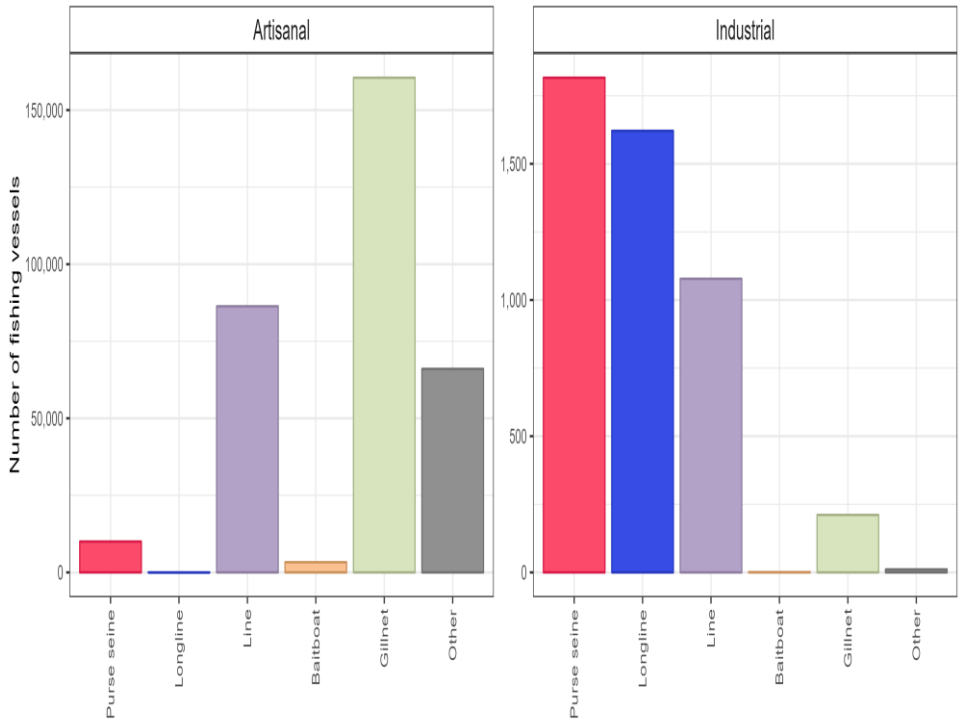

Fig. 17. Number of fishing vessels by fishery group reported to the IOTC Secretariat for the year 2023 for each fishery type

Interannual changes in fishing capacity of the artisanal fisheries of the Indian Ocean catching tuna and tuna-like species cannot be estimated from the information currently available at the Secretariat. In addition to the non-reporting of fishing crafts by many CPCs (e.g., **Table 14** for 2023), the reporting coverage may vary from year to year for others.

Appendix IV: Review of fishing statistics database

Overview of IOTC Fishing Craft Statistics

Fishing Craft Statistics are one of the key datasets collected by the Secretariat on a voluntary basis. The primary objective of this data collection is to appercieve the number of vessels, categorized by size and fishing techniques, that are operational. The Secretariat have other forms of vessel record, namely the Registered Authorized Vessels (RAV) and the Active Vessel List (AVL), which are closely monitored by the Compliance Section of the Secretariat. However, it is important to note that these lists primarily focus on monitoring vessels engaged in industrial fishing operations or those operating in high seas areas. It is important to note that the collection of fishing craft statistics aligns with the requirements set forth in UNFSA Annex 1, which specifies that States should collect vessel data to standardize fleet composition and assess vessel fishing power.

During the 28th Session of the Indian Ocean Tuna Commission (IOTC) in 2024, it was agreed that the reporting of fishing craft statistics would become mandatory. However, this will only be possible once Resolution 15/02 is amended. Additionally, the Secretariat has made efforts to redefine the fishery codes, incorporating several characteristics of the fisheries into these codes. This change will require CPCs to provide more detailed information on their fisheries, based on the characteristics, purpose, target species and area of fishing as some of the variable, splitting the number of vessels for each category.

Upon reviewing the data reported for catch and fishery types, it is clear that meeting the detailed reporting requirements of the new fishery codes may present challenges. These include: (i) many small-scale fisheries do not target specific species, but rather are multi-species; (ii) the same vessels may target different species at various times depending on the season; (iii) vessels may employ multiple gear types on the same trip; and (iv) depending on various factors, the same vessels may operate in both the NJA and the ABNJ areas. Given these complexities, there is a potential for duplication in the reported number of vessels operating in a given year for a CPC.

Although reporting fishing craft statistics is voluntary, several CPCs submit the data on an annual basis using the Reporting Form 2FC. In cases where this is not done, aggregated information on the number of vessels operating is published in the respective National Reports to the Scientific Committee.

The fishing craft database is compiled from a variety of sources, including: (i) reports submitted by liaison officers; (ii) published data; (iii) information from the Active Vessel List (AVL) or Registered Authorized Vessel (RAV) lists; (iv) estimates made by the Secretariat based on secondary information; (v) data published in national reports; and (vi) repeated data from previously reported information (**Tab. 15**).

Tab. 15. Number of CPCs reporting fishing craft statistics by sources and fishery category

TypeOperation	Active Vessel List	Estimated by IOTC	Liaison Officer	National report	National research institutions	Published data	Repetition of previous years data
Artisanal	0	1	14	4	0	2	3
Industrial	5	2	26	0	1	1	1

The fishing craft statistics database records information on the size, type of gear, and number of boats by fishery. In terms of coastal fisheries, many CPCs regularly conduct boat frame surveys for several purposes: (i) to maintain up-to-date information on the fishing boats that are operating; (ii) to use the updated data for estimating catch, especially when raising sampling data; and (iii) to gather socio-economic information on the population engaged in the fishery. These surveys also provide insights into the development and technological evolution of the fishery, such as the shift from non-mechanized boats to those utilizing modern technology. When reported to the Secretariat, this data is recorded in the fishing craft database, which reflects the evolution of the fishing fleet in each CPC.

As mentioned earlier, the fishing craft statistics database is comprised of data from various sources, and it includes incomplete series for several fleets. In the past, some CPCs did not provide information on the active number of boats, particularly from coastal fisheries. While the Secretariat was able to obtain information on industrial vessels, it was not possible to obtain data on the number of boats active in coastal fisheries. Recently, some CPCs, such as Bangladesh and Indonesia, have begun reporting detailed information on coastal fishing boats. Regular updates are also provided by Sri Lanka, Malaysia, Thailand, and Iran for all their fisheries operating in both coastal and industrial waters.

To compensate for the lack of data provided by CPCs through the 2FC form, the Secretariat has sought to compile information from national reports to complete the fishing craft database. In 2024, several CPCs reported fleet information in their National Reports (NR), but the data was not as comprehensive as it should have been through the 2FC form:

- Comoros: The fleet information from Comoros included the number of boats for various years, which might indicate the years in which boat frame surveys were conducted. However, the data remained constant from 2021 to 2023. The size categories were aggregated for all fishery types, and the gear types were reported as proportions, with the total number by mechanized system.

- Oman: Oman's National Report provided the number of boats operating per year for their different fisheries, namely artisanal, coastal, and industrial. However, it was unclear how the artisanal and coastal segments were differentiated, particularly with regard to boats targeting tuna and tuna-like species. Additionally, the report only provided the number of boats per category without details on the size of the vessels, and gear type.

- Bangladesh: In 2024, Bangladesh provided data on fishing craft through the 2FC form. However, to complete the historical data, information from the national report was also used. There were some discrepancies between the two data sources, and fluctuations were observed across the years.

- Tanzania: The data published by Tanzania indicated two sources of boat frame surveys, with fluctuations in the data over the years. This raises concerns about potential duplication. The Zanzibar survey reported a higher number of boats compared to the mainland Tanzania data, suggesting that the Zanzibar survey may have included boats from mainland Tanzania.

Fishing craft statistics data by mechanisation type

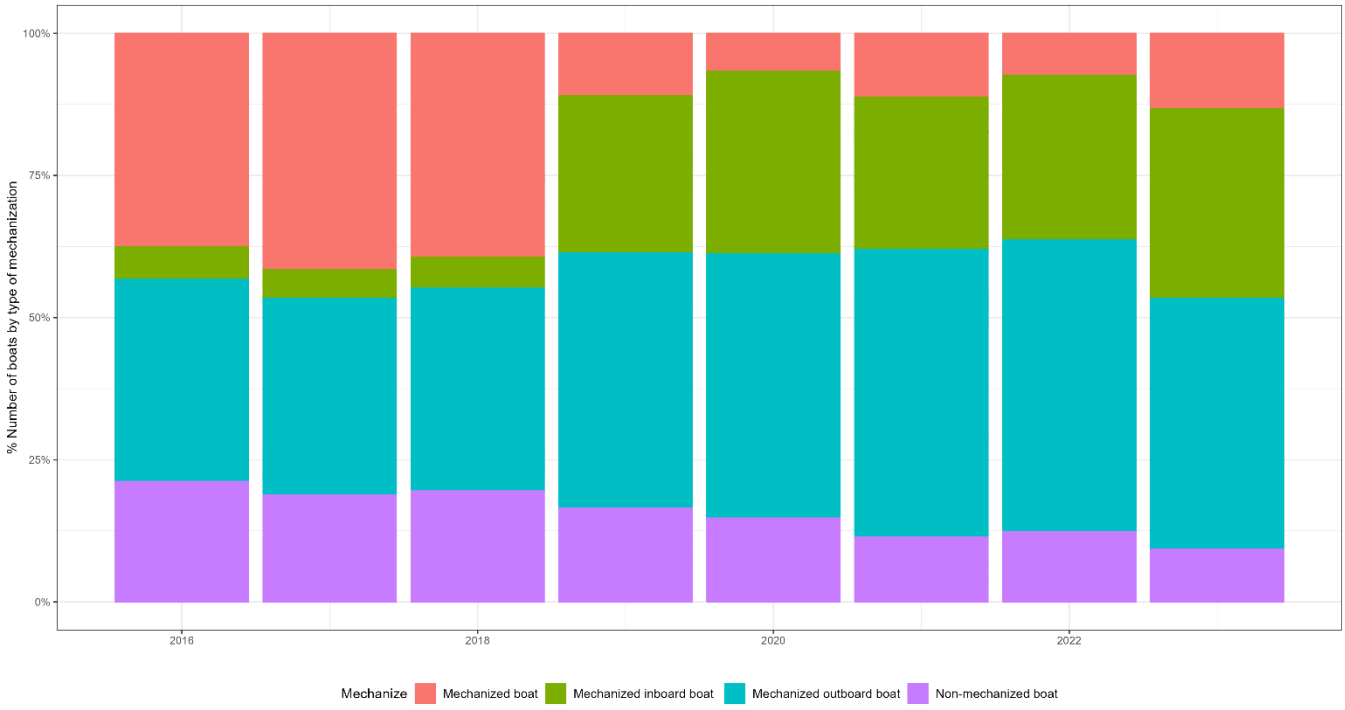

Fig. 18. Percentage number of vessels by Mechanization type for the artisanal fisheries

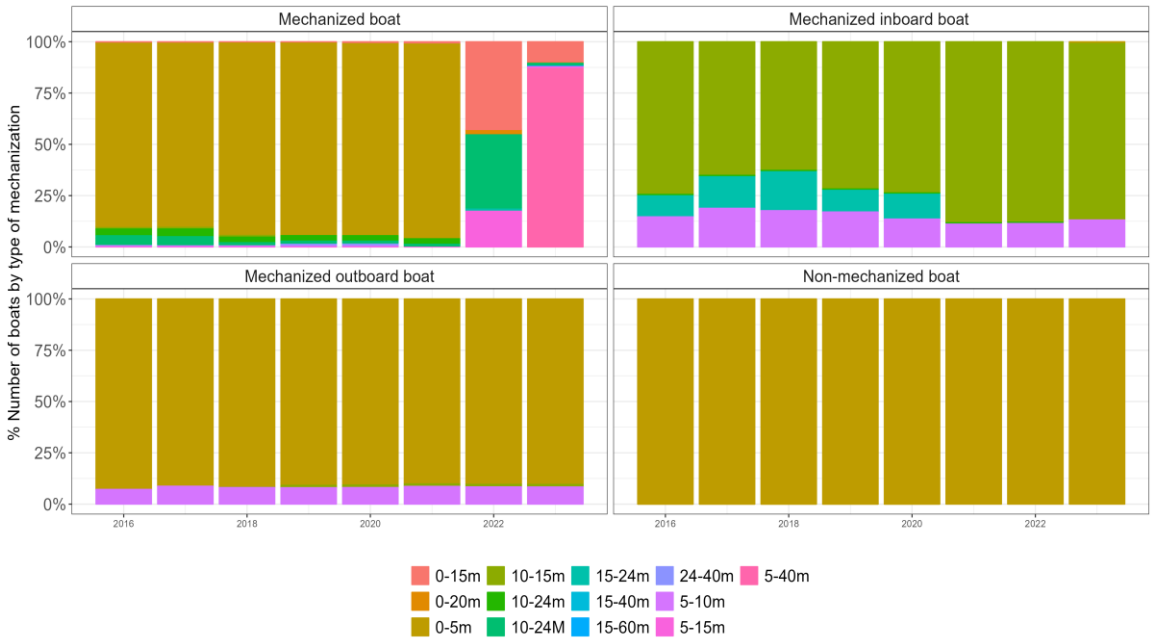

Fig. 19. Percentage number of vessels by Mechanization type and size category (reported in LOA) for the artisanal fisheries

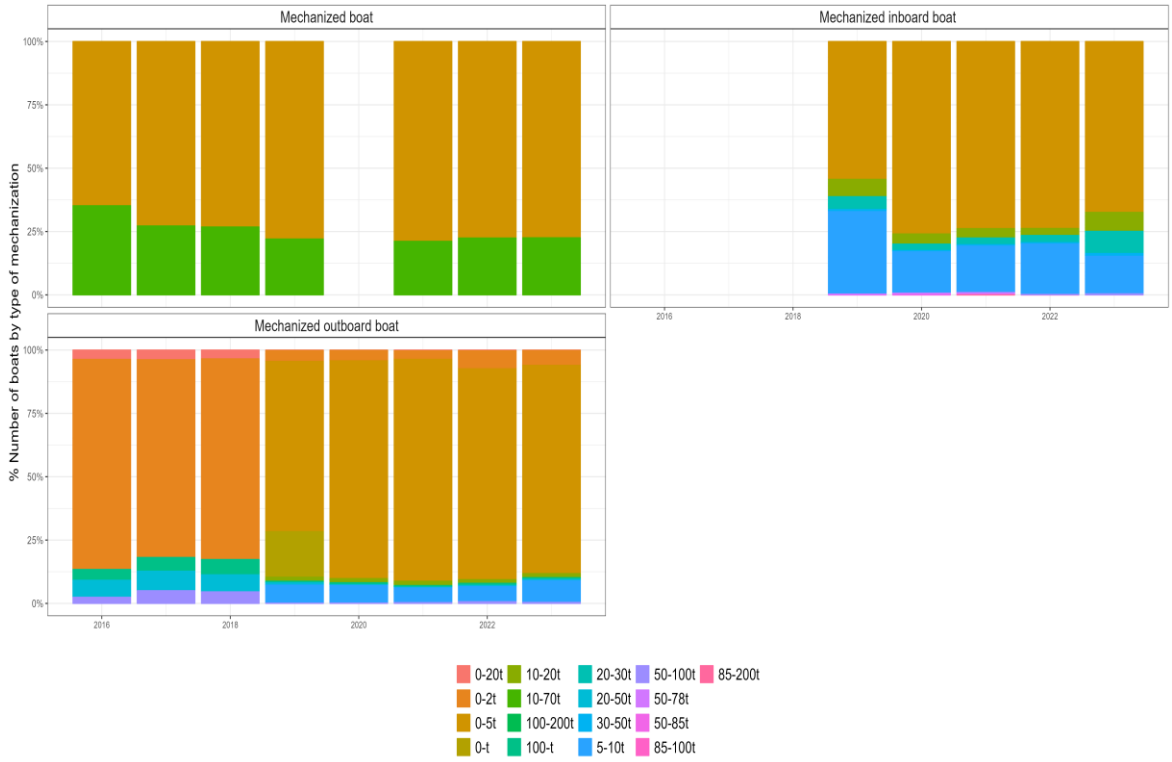

Fig. 20. Percentage number of vessels by Mechanization type and size category (reported in GRT/GT) for the artisanal fisheries

Fishing craft statistics by fishery group type

Fig. 21. Percentage number of vessels by Fishery group type and size category (reported in LOA) for the artisanal fisheries

Fig. 22. Percentage number of vessels by fishery group type and size category (reported in GT/GRT) for the artisanal fisheries

Tab. 16. Fishing craft statistics by fleet, fisheries and size categories (LOA class)

Fleet	Fishery	Size Class Category	2016	2017	2018	2019	2020	2021	2022	2023
AUSTRALIA	Baitboat	15-24m	3	0	0	0	0	0	0	0
	Gillnet	0-20m	7	8	7	4	3	5	2	0
	Line	0-20m	43	41	31	38	40	45	12	18
		15-24m	0	1	0	1	10	11	10	17
	Purse Seine	0-20m	0	0	0	0	0	0	2	0
BANGLADESH	Gillnet	5-40m	0	0	0	0	0	0	0	25,992
	Line	0-15m	0	0	0	0	0	0	0	93
	Other	0-15m	0	0	0	0	0	0	0	2,932
		15-40m	0	0	0	0	0	0	0	78
		15-60m	0	0	0	0	0	0	0	185
EU.FRANCE.MAYOTTE	Line	0-15m	119	120	112	114	94	87	90	0
		0-5m	0	0	0	0	0	0	0	67
		5-15m	0	0	0	0	0	0	0	10
	Longline	0-15m	0	0	0	3	2	0	2	1
EU.FRANCE.REUNION	Line	0-15m	22	24	21	22	20	21	22	23
		5-15m	130	136	131	125	124	109	107	118
INDONESIA	Other	24-40m	0	0	1	0	0	0	0	0
MALDIVES	Baitboat	10-15m	325	356	358	0	0	0	0	0
		24-40m	184	149	147	365	373	0	0	0

Fleet	Fishery	Size Class Category	2016	2017	2018	2019	2020	2021	2022	2023
	Line	0-5m	5	5	5	5	5	0	0	0
		10-15m	7	4	2	0	0	0	0	0
		15-24m	32	33	28	28	0	0	0	0
		24-40m	4	3	0	0	0	0	0	0
		5-10m	9	9	9	9	9	0	0	0
MAURITIUS		0-15m	0	0	0	0	92	149	149	0
OMAN	Gillnet	0-5m	22,720	22,956	23,726	24,336	24,569	25,381	0	0
		10-24m	828	957	688	694	698	721	0	0
SOUTH AFRICA	Line	15-24m	2	3	4	1	0	0	0	0
SRI LANKA	Baitboat	0-5m	0	0	0	0	0	0	0	55
		10-15m	31	0	0	0	0	0	0	0
	Gillnet	10-15m	1,830	1,113	1,226	1,854	906	1,273	1,128	1,124
		15-24m	549	688	527	0	0	0	0	0
	Line	0-5m	0	854	652	729	477	506	498	528
		10-15m	1,258	959	1,601	1,588	3,016	4,142	4,785	4,107
		15-24m	0	15	459	572	855	0	0	0
	Other	0-5m	44,048	39,641	42,886	42,886	42,886	40,084	39,407	39,407
		5-10m	2,625	3,053	3,124	3,124	3,124	3,258	3,235	3,235
	Purse Seine	0-5m	0	10	685	626	616	520	512	512
		10-15m	870	933	472	738	1,386	1,386	728	728

Fleet	Fishery	Size Class Category	2016	2017	2018	2019	2020	2021	2022	2023
THAILAND	Other	10-24M	735	707	0	0	0	0	0	0
	Purse Seine	10-24M	329	286	238	236	228	227	219	218
UK.TERRITORIES	Line	10-24m	4	4	4	4	4	0	0	0
		5-10m	43	43	43	43	43	0	0	0
UNITED KINGDOM		10-24m	0	0	0	0	0	4	1	0
		5-10m	0	0	0	0	0	43	9	0

Tab. 17. Fishing craft statistics by fleet, fisheries and size categories (GGT/GRT class)

Fleet	Fishery	Size Class Category	2016	2017	2018	2019	2020	2021	2022	2023
INDONESIA	Baitboat	0-5t	0	0	0	7,196	8,988	3,744	1,501	2,255
		10-20t	0	0	0	122	69	57	0	8
		20-30t	0	0	0	257	173	161	25	123
		30-50t	0	0	0	14	25	0	0	1
		5-10t	0	0	0	456	208	648	566	576
		50-85t	0	0	0	0	7	0	0	0
	Gillnet	0-5t	0	0	0	95,169	130,360	90,093	49,212	91,485
		10-20t	0	0	0	2,656	3,465	1,865	714	2,465
		20-30t	0	0	0	1,138	703	356	145	1,200
		30-50t	0	0	0	271	105	4	20	0
		5-10t	0	0	0	13,542	17,954	13,768	3,800	13,304
		50-85t	0	0	0	1	115	21	0	0

Fleet	Fishery	Size Class Category	2016	2017	2018	2019	2020	2021	2022	2023
	Line	0-5t	0	0	0	25,884	63,996	89,698	37,529	58,409
		0-t	0	0	0	24,883	0	0	0	0
		10-20t	0	0	0	2,552	1,117	1,270	868	4,197
		100-200t	0	0	0	0	0	0	0	5
		20-30t	0	0	0	1,183	767	502	588	3,706
		30-50t	0	0	0	193	157	78	31	267
		5-10t	0	0	0	7,293	6,503	7,576	7,132	7,225
		50-100t	0	0	0	0	0	0	0	50
		50-85t	0	0	0	97	287	470	44	45
		85-100t	0	0	0	0	0	0	4	0
	Other	0-5t	0	0	0	16,645	18,474	14,381	2,920	9,102
		10-20t	0	0	0	2,010	864	1,643	279	1,196
		20-30t	0	0	0	988	541	298	327	1,943
		30-50t	0	0	0	390	169	94	119	7
		5-10t	0	0	0	19,273	4,923	3,195	897	3,213
		50-100t	0	0	0	0	0	0	0	18
		50-85t	0	0	0	27	205	57	0	1
		85-200t	0	0	0	0	0	4	0	0
	Purse Seine	0-5t	0	0	0	1,263	1,322	1,739	691	2,107
		10-20t	0	0	0	1,451	1,742	1,040	431	1,531

Fleet	Fishery	Size Class Category	2016	2017	2018	2019	2020	2021	2022	2023
		20-30t	0	0	0	1,882	1,158	1,241	266	2,259
		30-50t	0	0	0	396	71	206	138	715
		5-10t	0	0	0	986	1,175	750	1,378	1,218
		50-100t	0	0	0	0	0	0	45	322
		50-78t	0	0	0	197	183	234	0	0
IRAN ISLAMIC REP.	Gillnet	0-20t	258	239	226	258	229	437	191	208
		0-2t	3,319	2,758	3,168	3,319	3,751	2,694	2,775	4,437
		100-t	283	326	377	283	486	246	248	246
		20-50t	391	318	271	391	215	254	255	279
		50-100t	171	316	297	171	246	506	461	479
	Line	0-2t	2,490	2,144	1,969	2,045	1,900	1,771	1,771	1,771
		100-t	14	14	14	20	0	0	0	0
		20-50t	80	165	165	184	0	0	0	0
MALAYSIA	Gillnet	0-5t	5,011	9,003	9,000	11,419	0	10,463	10,185	10,088
	Line	0-5t	1,213	100	100	154	0	113	133	122
	Other	10-70t	3,072	3,072	3,000	2,777	0	2,416	2,671	2,609
	Purse Seine	10-70t	305	330	330	497	0	420	315	361

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