REPORT ON IOTC DATA COLLECTION AND STATISTICS

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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) (**Table 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.

Table 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 (**Table 2**).

Table 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*
	RMT	Chilean devil ray	*Mobula tarapacana*
	RMO	Smoothtail mobula	*Mobula thurstoni*

Species category	Species code	Common name	Scientific name
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 nature and resolution of datasets to be reported to the Secretariat vary according to the category of fishery operating in the IOTC area of competence. The IOTC considers two main categories of fisheries whose classification relies on the listing of the participating fishing vessels in the IOTC Record of Authorized Vessels (RAV; Res. 19/04): (1) **authorised fishing vessels** (also commonly referred to as industrial) which have to be recorded in the RAV are fishing vessels of 24 m overall length and over, and under 24 meters if they fish outside national Exclusive Economic Zones (EEZ) and (2) **coastal fishing vessels** (also commonly referred to as artisanal) which are vessels of less than 24 m length overall that only operate within national EEZs and do not require to be recorded in the RAV.

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 (**Table 3**). This classification is consistent with the new definition of IOTC fisheries (see section Improving IOTC fishery definitions).

Table 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. First results of the application of the matrix to some IOTC fisheries showed the interest of the approach to better describe the IOTC small-scale fisheries (IOTC 2022a), and some work is ongoing with several CPCs to apply the matrix to their fisheries.

Improving IOTC fishery definitions

In line with the new fishery types (**Table 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 region, eliminating potential ambiguities to the maximum extent possible (IOTC 2022b). Each fishery emerges from the combination of the following factors: fishery purpose, fishing grounds, vessel size, gear and gear configuration, fishing mode, and species or groups of species targeted. The IOTC fisheries identification wizards is an interactive tool developed by the Secretariat to assist the CPCs with defining their fisheries following the new concept. Technical workshops are planned for 2024 to transit to the new fisheries and collaboration with the CPCs will also be instrumental to implement the concept to the historical data managed by the Secretariat which span over seven decades.

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 the fishery categories, fishing gears, and species caught or interacted with (**Fig. 1** and (**Table 4**).

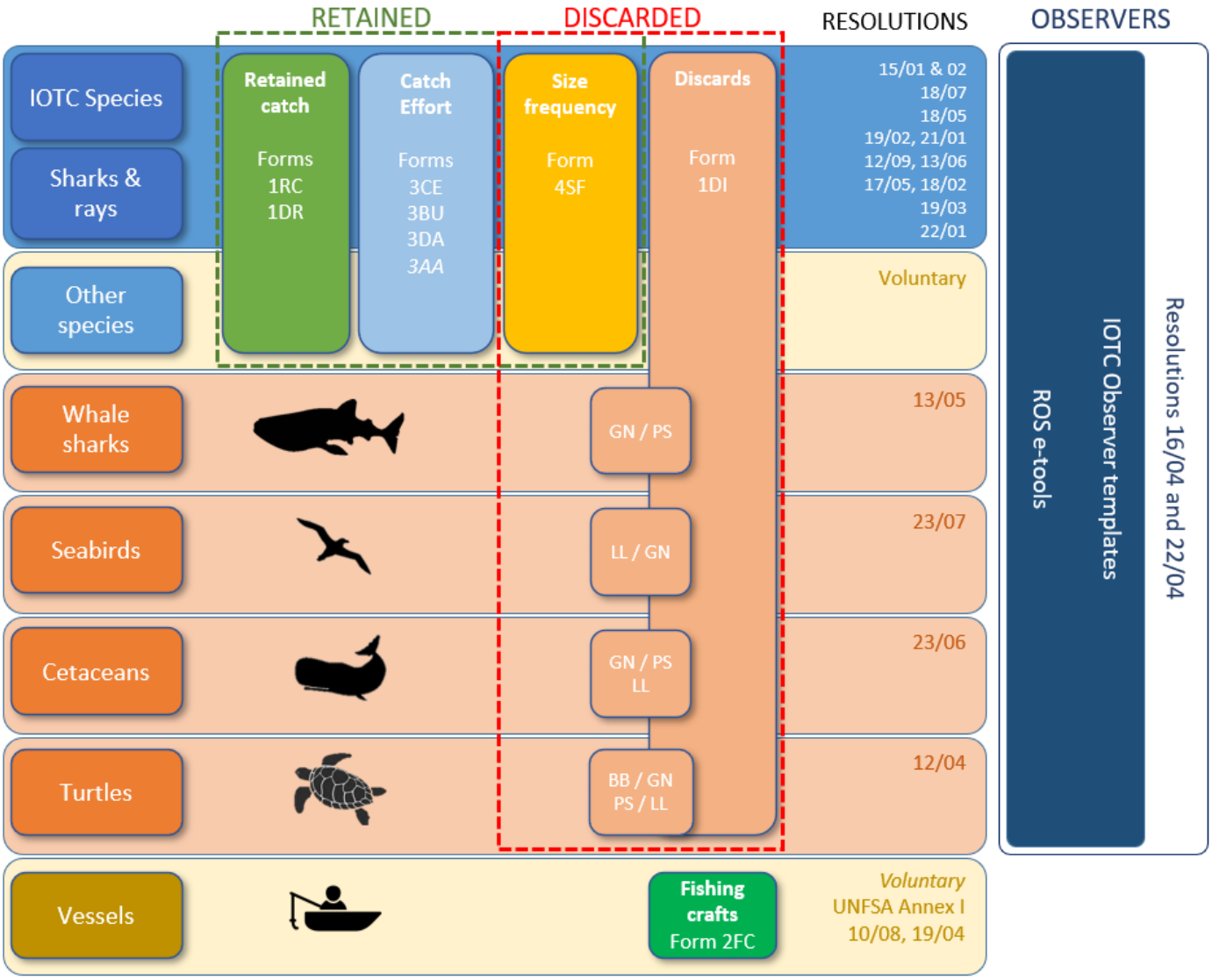

Figure 1: Overview of the data reporting requirements, including IOTC reporting forms and tools, and Resolutions for the 16 IOTC species and bycatch species caught or interacted with by fisheries for tuna and tuna-like species in the IOTC area of competence. BB = Baitboat; GN = Gillnet; LL = Longline;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

Table 4: Summary of IOTC data requirements applicable to IOTC and bycatch species. M = mandatory; V = voluntary; UNFSA = 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, 19/02	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	19/02	M	3-BU	Not applicable	Daily positions of active buoys equipping FADs and natural floating objects, by purse seine vessel
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, 22/04	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

Data sets shall be reported to the IOTC Secretariat following the standards and formats defined in the IOTC Reporting guidelines. Although not mandatory, the use of the IOTC forms is recommended to report the data to the Secretariat as they facilitate data curation and management.

Main fisheries data sets

Retained catch data

Retained catches correspond to the total catches (in live weight) of retained fish estimated per year, Indian Ocean major area, fleet, and gear (Res. 15/02) and can be reported through IOTC Form 1RC. In addition, and in order to support the monitoring of the catch limits implemented as part of the rebuilding plan for yellowfin tuna, Res. 19/01, which applies to CPCs who objected the superseded resolution 21/01, requests CPCs to submit their catches of yellowfin tuna, from 2019 onward, explicitly disaggregated by vessel length and area of operation (i.e., for vessel of 24 m overall length and over, and for those under 24 m if they fish outside the Exclusive Economic Zone (EEZ) of the flag state) (Form 1RC-YFT).

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 (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

Discarded catches refers to the catches of species returned to the sea, not kept on board for several reasons, including legal requirements, market demand, or condition of fish (FAO 1996; EC 2019). 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 Res. 15/02. The IOTC Form 1DI has been designed for the reporting of discards and the data contained shall be extrapolated at the source to represent the total level of discards for the year, gear, fleet, Indian Ocean major area and species concerned, including turtles, cetaceans, and seabirds.

Nevertheless, discarded data reported by CPCs to the Secretariat through IOTC Form 1DI are generally scarce, not raised, and do not comply with all IOTC reporting standards. For these reasons, the most accurate information available on discards comes from the IOTC Regional Observer Scheme (Res. 11/04, superseded by Res. 22/04) that aims to collect detailed information (e.g., higher spatio-temporal resolution, fate) on discards of IOTC and bycatch species for authorized fisheries and at landings for artisanal fisheries, at the minimum coverage requirement of 5% of the vessel activity.

Catch and effort data

Catch and effort data refer to finer-scale data, usually from logbooks, reported in an aggregated format and stratified by year, month, CWP[1] grid, fleet, fishery, type of school, and species (IOTC Res. 15/02). The current Form 3AR and Form 3CE designed for reporting geo-referenced catch and effort data vary according to the gear and artisanal/industrial nature of the fishery, i.e., coastal, surface, and longline fisheries. In addition, information on the use of fish aggregating devices (FADs) and the activity of the support vessels that assist industrial purse seiners also has to be collected and reported to the Secretariat through IOTC Form 3FA and Form 3SU.

The IOTC Secretariat has recently developed a new version of the forms to report catch and effort data, which will be comprehensive and account for the reporting of information for all types of fisheries (both industrial and coastal), including support vessels. Furthermore, the new forms will allow for the reporting of multiple fisheries at the same time, reducing the burden of compiling separate forms for each fishery. Further details are available in IOTC (2023).

DFAD-related data

The entry in force of Res. 15/08 (September 15th 2015), combined with the new requirements expressed by Res. 15/02, called all CPCs with vessels fishing on Fish Aggregating Devices (FADs) to report to the Secretariat (in agreement with the annual statistical data submission cycle of IOTC) all data elements specific to activities on drifting and anchored FADS, possibly with the support of the recommended IOTC Form 3FA.

Data providers have highlighted a number of limitations and issues with form 3FA, including difficulties with the interpretation of the FOB activity classification. For this reason, and to respond to requests from the IOTC Working Group on FADs (WGFAD), the Secretariat in collaboration with a group of experts on the matter has developed a revised list of data requirements for fisheries on drifting floating objects, with higher data resolution to better reflect the data requirements set by 15/02 and 19/02. These requirements were further endorsed by the WPTT during its 25th session and the Secretariat has eventually developed a new form (3DA), which has been presented at the WPDCS in 2023 and that will replace the obsolete form 3FA starting with the 2024 data reporting cycle (i.e., for the statistical year 2023).

Buoy position data

As a consequence of the entry in force of Res. 19/02, 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.

Size-frequency data

Individual body lengths and/or weights collected at sea and during the unloading of fishing vessels are instrumental to derive the size composition of catches. IOTC Form 4SF provides all fields requested for reporting size-frequency data to the Secretariat following a stratification by fleet, year, gear, type of school, month, CWP grid and species as required by Res. 15/02. While the great majority of size data reported through IOTC Form 4SF concerns retained catches, some size data on fish discarded at sea may be collected through onboard observer programs and reported to the Secretariat as part of the Regional Observer Scheme (see below).

Socio-economic data

The Secretariat has attempted to collate some socio-economic data on a voluntary basis through the IOTC Form 7PR developed to report fish prices of tuna and tuna-like species per type of product and market. To date, very little information on the socio-economics of tuna and tuna-like fisheries has been reported with the notable exception of time series of monthly prices by species, fishing gear, and area reported by Oman during 2005-2021.

[1] FAO Coordinating Working Party on Fishery Statistics, see also its tools and resources

Since 2020, the Secretariat has liaised with the Pacific Islands Forum Fisheries Agency (FFA) to collate and make available time series of crude oil prices and import prices for tuna which provide insight into the general costs and and turnover of high-seas tuna fisheries (IOTC 2021). In addition, the Secretariat has been in contact with FAO to collate data on production, imports, and exports of tuna and tuna-like products, food balance sheets, as well as some national economic indicators such as the Gross Domestic Product. Such data will be essential for the Working Party on socio-economics aimed at assessing the impact of management measures on the CPCs' socio-economics IOTC (Res 23/10).

Observer data

Resolution 22/04 on a *Regional Observer Scheme* (ROS) 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"*.

Observer data collected as part of the ROS include: (i) fishing activities and vessel positions, (ii) catch estimates with a view to identifying catch composition and monitoring discards, bycatch, and size frequency, (iii) gear type, mesh size and attachments employed by the master, and (iv) information to enable the cross-checking of entries made to the logbooks (i.e., species composition and quantities, live and processed weight and location). A first technical description of the ROS data requirements is available in the reference document IOTC Regional Observer Scheme (ROS) Data Collection Fields.

Observer data are in particular, complementary to the geo-referenced catch and effort datasets as they include information on the fate of the catches (i.e., retained or discarded at sea) as well as on the condition of the discards. Furthermore, they are also the main source of spatial information on interactions between IOTC fisheries and seabirds, marine turtles, cetaceans, as well as any other bycatch species encountered.

To date, the ROS Regional Database contains information for a total of 29,724 sets from 1,699 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. The document IOTC-WPDCS19-10 provides an update on the status of ROS.

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 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).

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 2022c). To date, the Secretariat managed to get information from a total of 201 satellite tags deployed on 10 IOTC and shark species (**Table 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).

Table 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

Species code	Common name	Scientific name	Project	N
			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 (**Table 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.

Table 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 (2012-2022)

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 2023, seven (7) CPCs did not report retained catch data for 2022: Eritrea, India, Madagascar, Pakistan, Somalia, Sudan, and Yemen. Except for Somalia, where the current status of fisheries is unknown but catches of tuna and tuna-like species from coastal fisheries are assumed to be negligible, the retained catch data for one country were extracted from their online published report, and for the five other countries, the Secretariat repeated the catches from previous year. Besides these non-reporting CPCs, Tanzania and Indonesia submitted various versions of retained catch data for their fisheries. 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, and Timor Leste. United Arab Emirates, on the other hand, directly responded to the Secretariat with revised catches by species from 2012 to 2021, based on a recent national revision of their catch data. Overall, the fraction of non-reported retained catches increased from 9% in 2022 to 12% in 2023 (**Fig. 2**).

Timeliness

Information collated on data submission to the IOTC Secretariat reporting during the period 2014-2023 (i.e., statistical years 2013-2022), shows signs of improvement in the reporting levels for all IOTC species over time. Although the levels of reporting vary according to the species groups, the fraction of non-reported retained catches increased in 2023 for all species groups, with the exception of temperate tuna (**Fig. 2**). Hence, the proportion of late reporting and non-reporting catch combined, for all major species groups increased from 7% in 2022 to 19% in 2023. This is mainly due to the late reporting by Oman and I.R Iran, and the absence of explicit reporting by India and Pakistan, which together contributed around 30% of the total IOTC catch data available for ŸL.

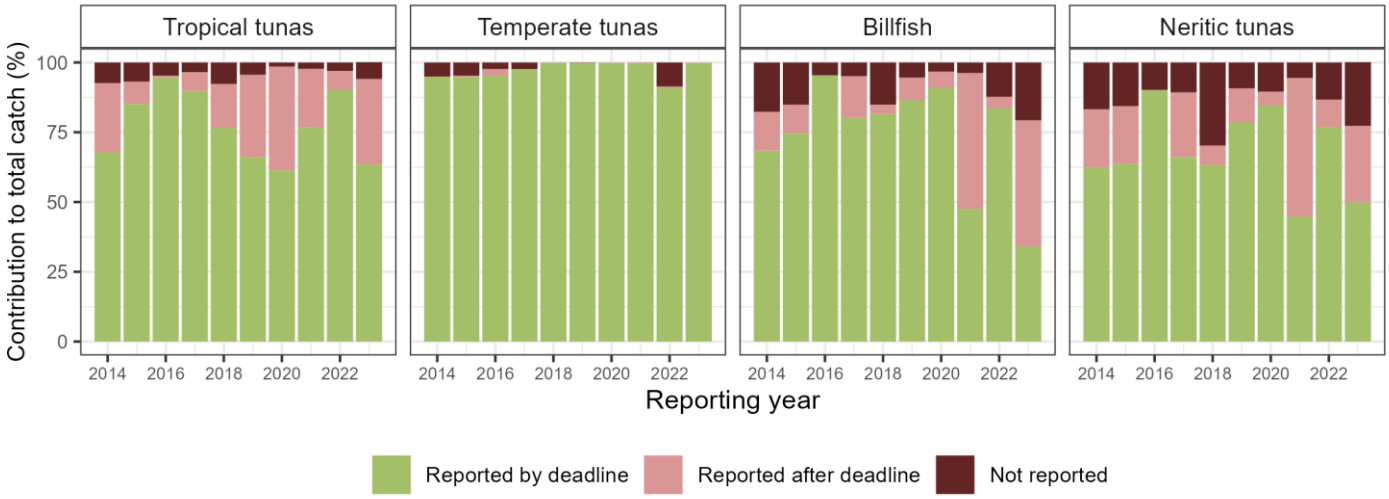

Figure 2: Annual percentage of total retained catch of each of the IOTC species groups according to the date of submission of the retained catch data by each fleet to the IOTC Secretariat. The submission deadline is the 30th June of each year

The timeliness of reporting of retained catch data differs by species groups as the target of the species are not necessarily the same for fisheries operation in the Indian Ocean.

- The availability of tropical tuna catches by the deadline remains above 50% as the species are mainly caught by industrial fisheries, which have proper data collection systems, mostly in electronic form, which make it feasible to collate the data on time. In 2023, however, the percentage retained catches of tropical tuna available by the deadline declined by 26% compared to 2022 (**Fig. 2**).
- The availability of temperate tuna catches by the deadline remains high at above 90% since 2014, reaching 100% in 2023 despite the high level of unavailability for other species groups in the same year (**Fig. 2**).
- The availability of billfish catches by the deadline substantially declined, from 84% in 2022, to 34% in 2023 (**Fig. 2**). Around 42% of billfish catches are reported by I.R Iran, whereby the I.R Iran data were available after the deadline.
- Catches for neritic tuna are generally the worst in terms of availability and timeliness. Fisheries targeting neritic species are mostly from fleets that operated within the territorial waters, comprising many small vessels and catching a large diversity of species (Pita et al. 2019). Most countries do not devote mamy resources towards the monitoring of artisanal fisheries due to their small-scale nature, resulting in lack of of attention and resources for data collection (Samy-Kamal and Teixeira 2023). This impacts the level of information collected for neritic tuna species. Between 2014 and 2023, there was a significant decline in catch reported by the deadline from 77% in YL, to 50% in 2023 (**Fig. 2**).

Catch and effort data

Availability

The availability of geo-referenced catch and effort data is lower than that of retained catch data. Although the reporting of geo-referenced data from fisheries targeting tropical and temperate tunas improved over time, the collection and reporting of geo-referenced catches by fisheries targeting billfish and neritic tunas, is continuously hindered by various factors, such as less resources due to low market values of the species, leading to fewer data collected (Pita et al. 2019). Despite the record of billfish and neritic tunas captured in industrial fisheries, which reported quality geo-referenced data, catches are low compared to the level of billfish and neritic tunas caught by coastal fisheries.

As of November 2023, 20% of catch and effort related to retained catch have not been reported, compared to 10% in 2022. Percentage availability of catches by respective species group in 2023, were 87%, 100%, 73%, and 61% for tropical tunas, temperate tunas, billfish, and neritic tunas, respectively (**Fig. 3**). Despite the low reporting of catch data

in 2021 due to the impact of CoViD-19 pandemic, the level of reporting of geo-referenced data in 2023 was found to be lower by 11%.

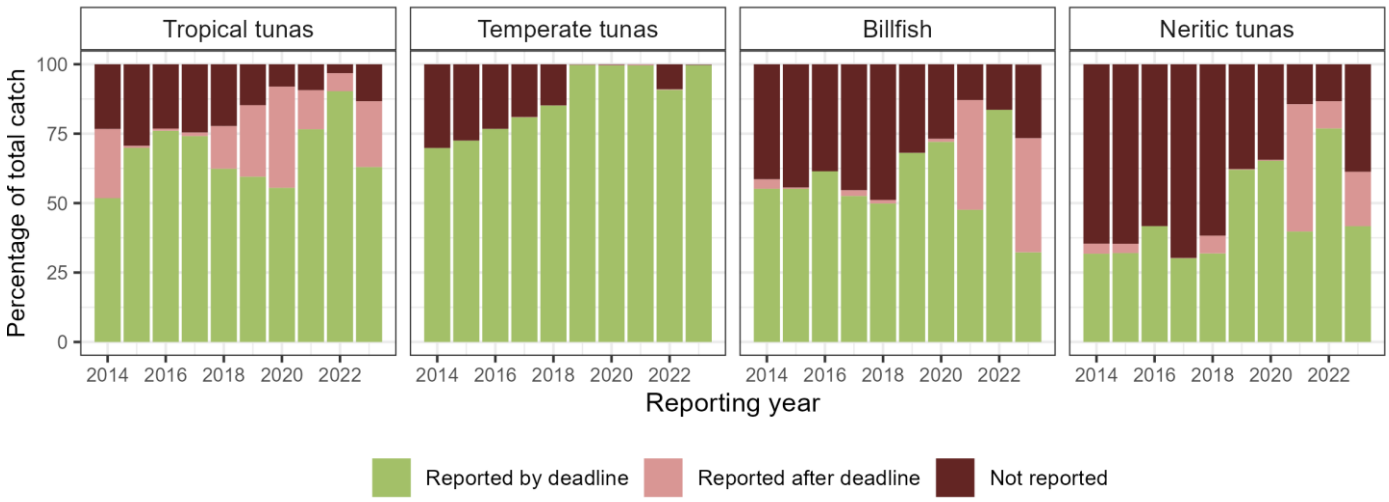

Figure 3: Annual percentage of total retained catch of each of the IOTC species groups according to the date of submission of the geo-referenced catch and effort data by each fleet to the IOTC Secretariat. The submission deadline is the 30th June of each year

Timeliness

Considerable amount of geo-referenced catch and effort data for tropical and temperate tunas submitted to the Secretariat have been mostly reported by the deadline of June 30th between 2014 and 2023 (**Fig. 3**), with the exception of tropical tunas, for which 20.3% of the total retained catches have their corresponding geo-referenced catch and effort data submitted after the deadline for the years between 2018 and 2023. Late submission of geo-referenced catch and effort data for most species deteriorated from 4.1% in 2022 to 21.1% in 2023. Late submission of I.R Iran data was due to national updates in the data collection process, including the introduction of an integrated fishery information systems. Other CPCs did not provide any explanation for the delay in reporting.

Likewise, timeliness in the reporting of catch and effort data differs by species group, same as the retained catch, but with far less availability:

- The availability of tropical tuna catch and effort data by the deadline declined in 2023, reaching less than the availability in 2021, hence the lowest in the last three years, that is 63% in 2023, compared to 90.3% and 76.6% in 2022 and 2021, respectively.
- The availability of temperate tuna catch and effort data corresponding to retained catch were fully available by the deadline hence, 100% in 2023
- The availability of billfish geo-referenced data by the deadline was mainly affected by the late reporting of I.R Iran hence, 32% in 2023 compared to 84% in 2022 .
- The availability of geo-referenced data for neritic tunas corresponding to retained catch are usually far less by the deadline compared to other species groups. Then again, similarly to other species groups, the availability by the deadline in 2023 dropped to 42% as opposed to 77% in 2022.

Size-frequency data

Availability

Limited information is available on the size composition of the retained catches of several IOTC species, with 39.3% not reported on average between 2014 and 2023, and far less available for the billfish species in 2023 (**Fig. 4**). I.R Iran as the main fleet catching billfish and contributing on average 23% to the catches of billfish for the same period, does not report size-frequency data of billfish species, which could be due to the non-commercial value of the species in I.R Iran (Khorshidi 2023). Furthermore, fewer industrial fisheries have been catching billfish species in recent years.

On the contrary, the availability of size-frequency data for neritic species improved in recent years and went from covering 32.4% of the retained catches for the species reported between 2014 and 2019 to 55.4% between 2020 and 2023. In recent years, besides reports of size-frequency data from fisheries targeting neritic tunas, industrial purse seine fisheries have also sampled the species, either through scientific observers or directly in their logbook, although overall catch remained negligible.

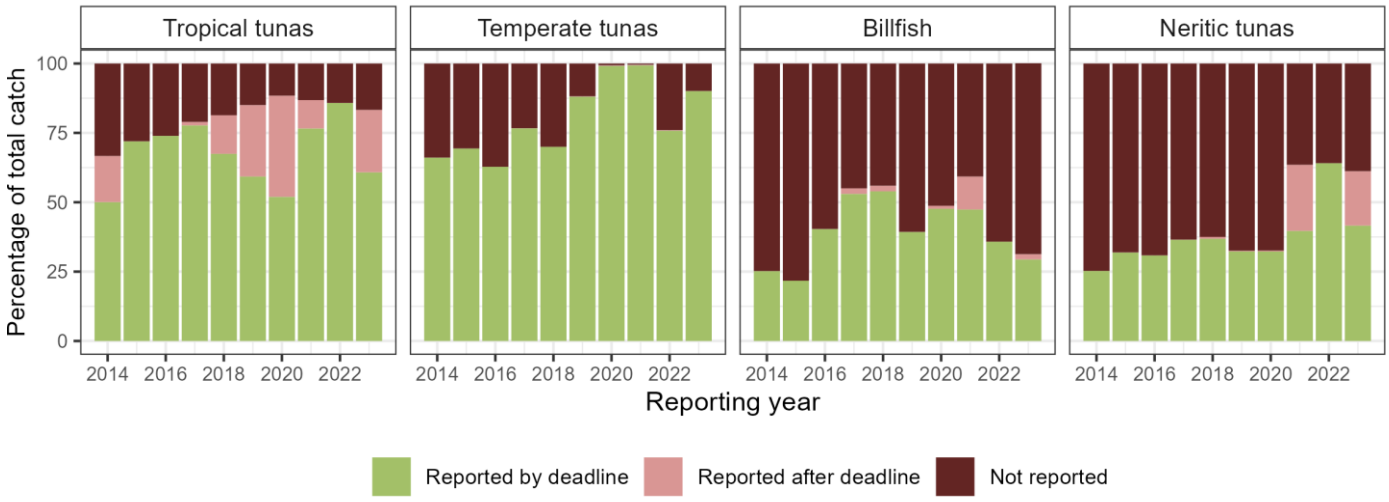

Figure 4: Annual percentage of total retained catch of each of the IOTC species groups according to the date of submission of the size-frequency data by each fleet to the IOTC Secretariat. The submission deadline is the 30th June of each year

Timeliness

When available, size-frequency data between 2014 and 2023 have been mostly reported by the deadline, although there are delays in recent years for tropical and neritic tunas with 22.5% and 19.6% of data for tropical and neritic tunas reported after the deadline in 2023, respectively (**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, 66.9% of size-frequency are available on average by the deadline between 2019 and 2023. Although the percentage of size data available by end of June 2023 (60.8%) decreased compared to June 2022 (85.8%), in 2022 there were no size data reported after the deadline, as was the case in 2023 (22.5%). In this case, the late reporting was mainly accounted for by I.R Iran.
- For temperate tunas, with almost 100% retained and geo-referenced catch data available by the deadline, only 90.1% of size data were available by the deadline in 2023.
- For billfish, availability by the deadline is low, averaging 39.4% between 2014 and 2023, where in 2023, the availability was as low as 29.4%, with no size-frequency data reported after the deadline.
- For neritic tunas, availability by the deadline, averaged 37.1% between 2014 and 2023. Contrary to billfish, an improvement in recent years, with 44.4% between 2020 and 2023 reported by the deadline.

Overview of the status of the data reported for 2022

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 2022 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 (**Table 7**). 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, b) no data reported by important coastal countries such as Yemen and Madagascar, and c) multiple data submissions received from some CPCs, with significant differences in catches between submissions. In general, little information on catch and effort was provided by several coastal fisheries, except for Comoros, Maldives, Malaysia, and Thailand (**Table 7**). 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.

Table 7: 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 2023 (for reference year 2022) 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 **Table 5**

Fishery group	CPC	Fleet	Catch (t)	RC	CE	SF
Purse seine	AUS		4,881			
	EU	EUESP	147,982			
		EUFRA	73,240			
		EUITA	5,887			
	IDN		106,502			
	KOR		16,493			
	MUS		25,805			
	SYC		120,642			
	TZA		12,282			
Longline	AUS		145			
	CHN	CHN	15,589			
		TWN	66,805			
	EU	EUESP	4,130			
		EUFRA	1,776			
		EUPRT	1,408			
	IDN		32,141			
	JPN		9,920			
	KEN		1,025			
	KOR		812			
	LKA		11,235			
	MOZ		159			
	MUS		3,385			
	MYS		2,042			
	SYC		10,987			
	TZA		113			
	ZAF		1,303			
Other	AUS		238			
	BGD		28,166			
	COM		14,107			
	GBR		8			
	IDN		378,965			
	IRN		316,252			
	KEN		3,250			
	LKA		139,091			
	MDV		154,756			
	MOZ		90,039			
	MUS		179			
	MYS		8,308			
	OMN		160,027			

Fishery group	CPC	Fleet	Catch (t)	RC	CE	SF
	SYC		3,434			
	THA		19,377			
	TZA		3,162			
	YEM		37,857			

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 2023, a total of 15 fleets provided positive reports of discards for the reference year 2022. 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). 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 2023, six fleets submitted nil reports of discards: EU-Italy, Kenya, Maldives, UK, I.R. Iran, and Thailand. 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 the Italian 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).

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 (**Tables 8-9**).

Table 8: Total discard levels (in number of fish) for the 16 IOTC species by fishery and species category in 2022 as reported to the Secretariat

Fishery	Fishery code	BILLFISH	NERITIC	SEERFISH	TEMPERATE	TROPICAL
Purse seine | Other	PSOT	0	0	0	0	0
Purse seine | FS	PSFS	45	0	0	0	0
Purse seine | LS	PSLS	249	0	0	0	0
Longline | Other	LLO	810	0	0	130	238
Longline | Fresh	LLF	83	0	0	357	2,162
Longline | Deep-freezing	LLD	25	0	0	2,536	13,387
Line | Coastal longline	LIC	0	0	1	0	2
Line | Trolling	LIT	0	0	0	261	0

Table 9: Total discard levels (in weight; t) for the 16 IOTC species by fishery and species category in 2022 as reported to the IOTC Secretariat

Fishery	Fishery code	BILLFISH	NERITIC	SEERFISH	TEMPERATE	TROPICAL
Purse seine | Other	PSOT	6	22	0	0	13
Purse seine | FS	PSFS	5	35	0	0	50
Purse seine | LS	PSLS	10	369	0	0	645
Longline | Other	LLO	0	0	0	0	0
Longline | Fresh	LLF	0	0	0	0	0
Longline | Deep-freezing	LLD	0	0	0	3	0
Line | Coastal longline	LIC	0	0	0	0	0
Line | Trolling	LIT	0	0	0	0	0

Table 10: Total discards (in numbers of individuals) of endangered, threatened, and protected species by fishery and species category in 2022 as reported to the IOTC Secretariat

Fishery	Fishery code	SHARKS	RAYS	SEABIRDS	CETACEANS	TURTLES
Purse seine | Other	PSOT	890	0	0	7	78
Purse seine | FS	PSFS	90	47	0	0	0
Purse seine | LS	PSLS	13,303	56	0	6	72
Longline | Other	LLO	1,847	728	0	0	22
Longline | Fresh	LLF	6,894	186	121	11	200
Longline | Deep-freezing	LLD	13,667	3	101	4	9
Line | Coastal longline	LIC	264	0	0	22	156
Line | Trolling	LIT	0	0	0	0	8
Line | Handline	LIH	0	0	0	0	15
Gillnet	GN	31	0	0	65	1,294
Other	OT	0	0	0	24	23

Table 11: Total discards (in weight; t) of endangered, threatened, and protected species by fishery and species category in 2022 as reported to the IOTC Secretariat

Fishery	Fishery code	SHARKS	RAYS	SEABIRDS	CETACEANS	TURTLES
Purse seine | Other	PSOT	64	5	0	0	0
Purse seine | FS	PSFS	13	1	0	0	0
Purse seine | LS	PSLS	125	104	0	0	0
Longline | Other	LLO	0	0	0	0	0

Fishery	Fishery code	SHARKS	RAYS	SEABIRDS	CETACEANS	TURTLES
Longline | Fresh	LLF	0	0	0	0	0
Longline | Deep-freezing	LLD	0	58	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. 5**).

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. 5**).

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. 6**).
- Gillnet fisheries are those reporting the highest number of interactions with marine turtles, with data for 2022 indicating that the majority of these were released alive (**Fig. 7**).
- Data for 2022 shows that seabirds interacting with longline fisheries are mainly discarded dead (**Fig. 8**).
- 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.

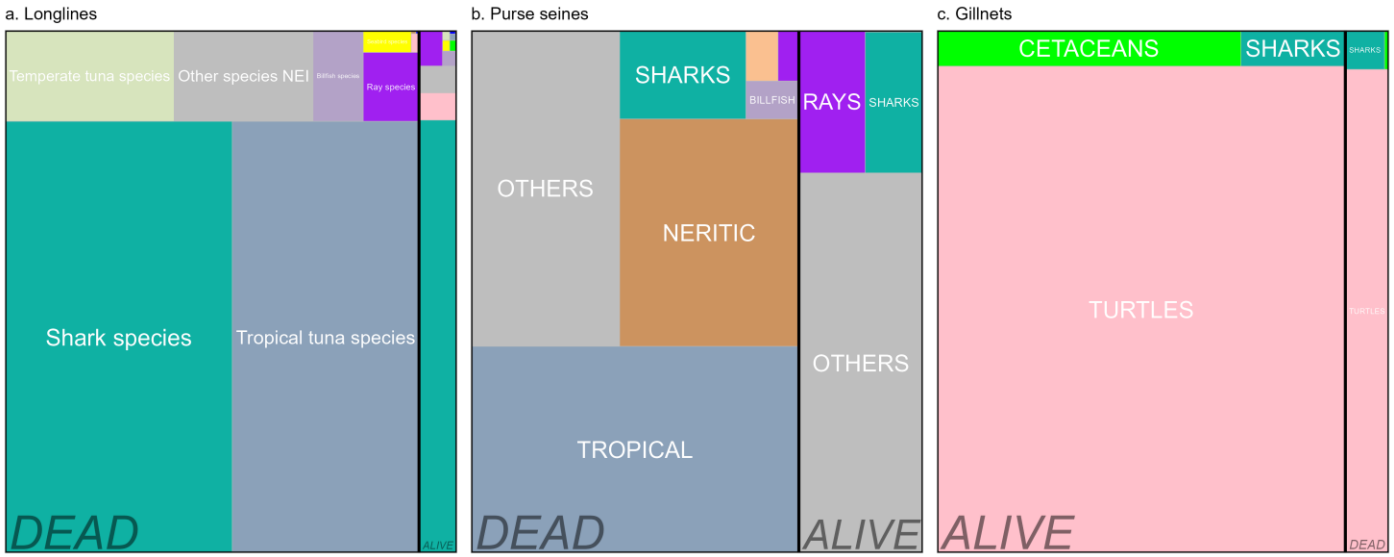

Figure 5: Composition of all fishing discards by fate (i.e., dead or alive) and species category for the main IOTC fishery groups as reported to the Secretariat for the year 2022 through form 1DI: (a) longline (numbers of fish), (b) purse seine (weight of fish), and (c) gillnet fisheries

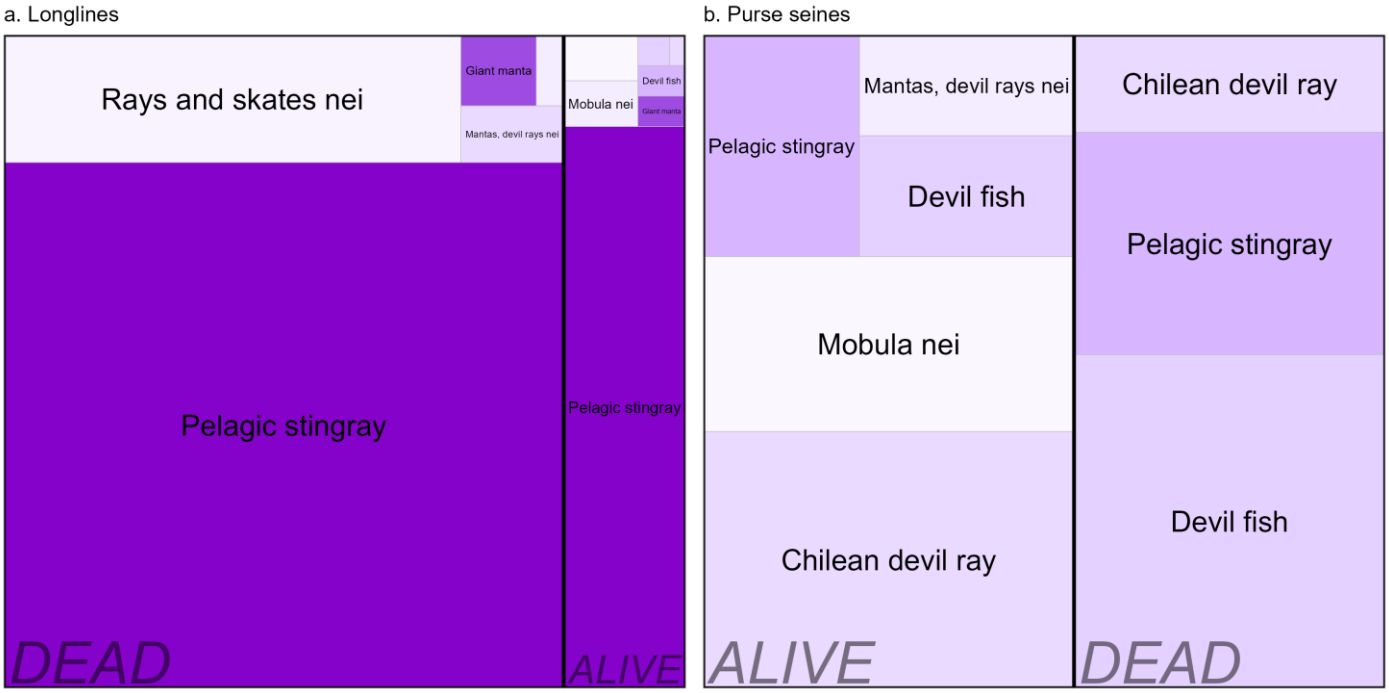

Figure 6: Composition of fishing discards of rays (in numbers) by fate (i.e., dead or alive) and species in (a) longline and (b) purse seine fisheries as reported to the Secretariat for the year 2022

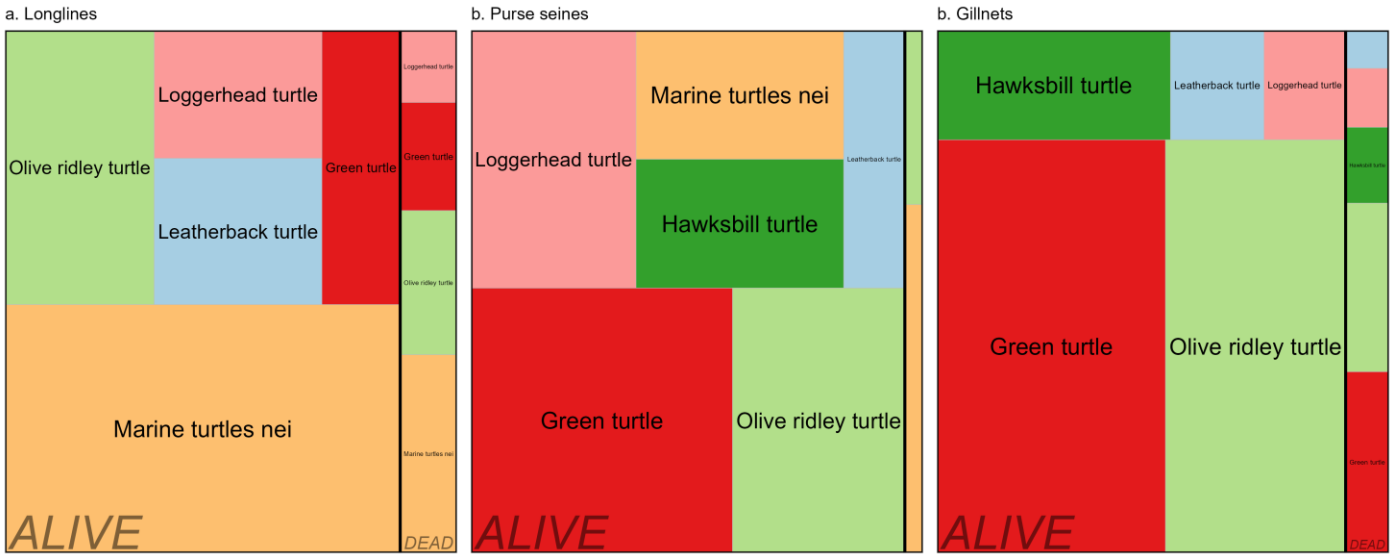

Figure 7: Composition of fishing discards of turtles (in numbers) by fate (i.e., dead or alive) and species in (a) longline, (b) purse seine, and (c) gillnet fisheries as reported to the Secretariat for the year 2022

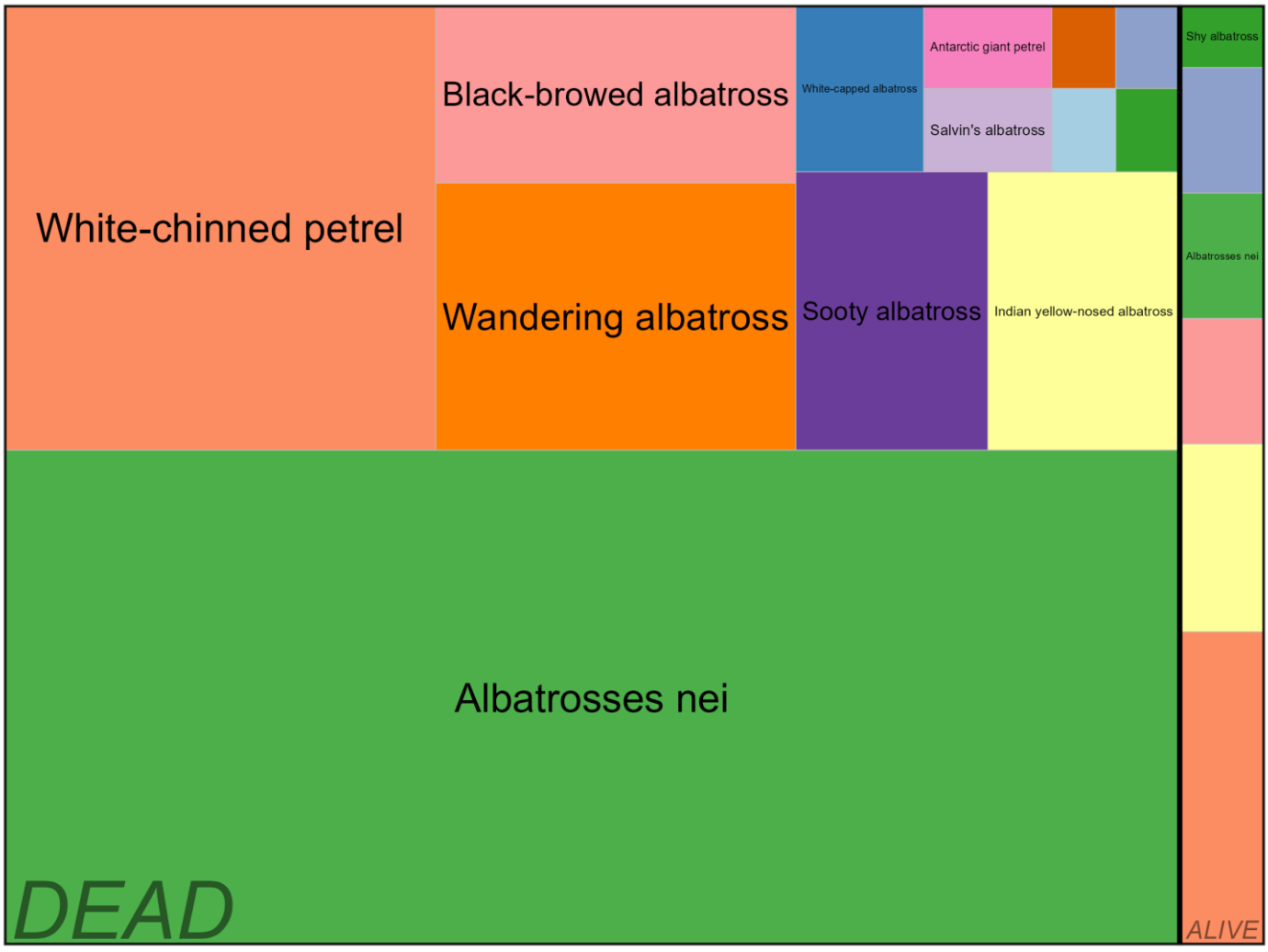

Figure 8: Composition of fishing discards of seabirds (in numbers) by fate (i.e., dead or alive) and species in longline fisheries as reported to the Secretariat for the year 2022

FAD-related data, including the activities of support vessels

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 (WGFAD05 2023). Despite some recent improvements, issues on the data on interactions with DFADS remained for the year 2022 (*Table 12*). In addition, Oman and Tanzania did not report any DFAD-related data for 2022 although the now both have an industrial purse seine fishery operating in the Indian Ocean. The development of the new 3DA and 3AA forms respectively focusing on drifting (IOTC-2023-WPDCS19-16) and anchored floating objects (IOTC-2023-WPDCS19-17) aaddresses the issues encountered with form 3FA and the data requirements of IOTC Resolution 23/01.

Except for Tanzania, data on fishing effort exerted by the support vessels in 2022 have been fully reported to the Secretariat as the total number of days spent at sea stratified by flag, year, month, and 1°x1° CWP grid within the IOTC area of competence (**Table 12**).

Table 12: Data reporting status of data on interactions with DFADs (form 3FA), effort of support vessels (form 3SU), and daily buoy positions (3BU) for 2022 as reported to the IOTC Secretariat. Colour key is given in **Table 5**. Grey indicates Not Applicable

CPC code	Fleet	3FA	3SU	3BU
EU	EU,France			
	EU,Italy			
	EU,Spain			
OMN	Oman			
KOR	Rep. of Korea			
MUS	Mauritius			
SYC	Seychelles			
TZA	Tanzania			

Appendix I: Availability and reporting quality of IOTC datasets for 2022

Tropical tuna species

Table 13: 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 2023 (for reference year 2022) 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**

Fishery group	CPC	Fleet	Catch (t)	Species	RC	CE	SF
Purse seine	EU	EUESP	147,319	B,S,Y			
		EUFRA	66,216	B,S,Y			
		EUITA	5,838	B,S,Y			
	IDN		75,004	B,S,Y			
	KOR		16,490	B,S,Y			
	MUS		25,366	B,S,Y			
	SYC		119,302	B,S,Y			
	TZA		12,282	B,S,Y			
Longline	AUS		35	B,S,Y			
	CHN	CHN	7,504	B,S,Y			
		TWN	23,466	B,S,Y			
	EU	EUESP	107	B,Y			
		EUFRA	393	B,S,Y			
		EUPRT	26	B			
	IDN		17,025	B,S,Y			
	JPN		4,095	B,S,Y			
	KEN		293	B,Y			
	KOR		493	B,S,Y			
	LKA		9,493	B,S,Y			
	MOZ		86	B,Y			
	MUS		2,541	B,S,Y			
	MYS		443	B,S,Y			
	SYC		7,827	B,Y			
	TZA		100	B,Y			
	ZAF		645	B,S,Y			
Other	AUS		3	B,S,Y			
	BGD		592	B,S,Y			
	COM		12,926	B,S,Y			
	GBR		2	S,Y			
	IDN		132,455	B,S,Y			
	IRN		118,435	B,S,Y			
	KEN		1,781	Y			
	LKA		54,538	B,S,Y			
	MDV		154,693	B,S,Y			
	MOZ		1,887	B,S			
	MUS		62	S,Y			
	OMN		74,800	S,Y			
	SYC		924	B,Y			
	THA		4,318	S,Y			
	TZA		996	B,S,Y			
	YEM		20,160	S,Y			

Temperate tuna species

Table 14: Retained catches (metric tonnes; t) and data reporting quality of the main IOTC datasets by fishery group and fleet as reported in 2023 (for reference year 2022) 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**

Fishery group	CPC	Fleet	Catch (t)	Species	RC	CE	SF
Purse seine	AUS		4,881	S			
	EU	EUESP	4	A			
		EUFRA	23	A			
		EUITA	1	A			
	IDN		286	A			
	KOR		3	A			
	MUS		10	A			
Longline	AUS		26	A,S			
	CHN	CHN	5,930	A			
		TWN	23,409	A,S			
	EU	EUESP	1	A			
		EUFRA	400	A			
		EUPRT	1	A			
	IDN		6,504	A,S			
	JPN		4,974	A,S			
	KOR		245	A,S			
	LKA		90	A			
	MUS		513	A			
	MYS		1,258	A			
	SYC		708	A			
	ZAF		115	A,S			
Other	AUS		14	A,S			
	BGD		21	A			
	COM		18	A			
	IDN		7,331	A			
	LKA		11	A			
	MOZ		74	A			
	MUS		102	A			
	SYC		2	A			

Billfish species

Table 15: Retained catches (metric tonnes; t) and data reporting quality of the main IOTC datasets by fishery group and fleet as reported in 2023 (for reference year 2022) 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**

Fishery group	CPC	Fleet	Catch (t)	Species	RC	CE	SF
Purse seine	EU	EUESP	8	M			
		EUFRA	1,133	F,M			
	IDN		272	F,M,P,S			
	SYC		18	M,S			
Longline	AUS		83	M,P,S			
	CHN	CHN	1,668	F,M,P,S			
		TWN	5,925	F,M,P,S			
	EU	EUESP	1,674	F,M,P,S			
		EUFRA	944	F,M,P,S			
		EUPRT	550	F,M,S			
	IDN		2,795	F,M,S			
	JPN		549	F,M,S			
	KEN		554	F,M,S			
	KOR		34	M,S			
	LKA		1,463	F,M,S			
	MOZ		20	F,M,P,S			
	MUS		173	F,M,S			
	MYS		180	F,M,P,S			
	SYC		1,223	F,M,P,S			
	TZA		9	F,M,S			
	ZAF		455	M,S			
Other	COM		600	F,M,S			
	IDN		5,400	F,M,P,S			
	IRN		34,139	F,M,S			
	KEN		403	F,S			
	LKA		5,013	F,M,S			
	MDV		2	F			
	MOZ		142	F,M			
	OMN		2,772	F,M,S			
	SYC		77	F,M,S			
	THA		37	F			
	TZA		239	F,M,S			
	YEM		1,982	F,S			

Neritic species

Table 16: Retained catches (metric tonnes; t) and data reporting quality of the main IOTC datasets by fishery group and fleet as reported in 2023 (for reference year 2022) 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**

Fishery group	CPC	Fleet	Catch (t)	Species	RC	CE	SF
Purse seine	EU	EUFRA	456	K,X			
		EUITA	29	F,K,X			
	IDN		30,569	B,C,F,G,K,L			
	MUS		139	F,X			
	SYC		3	X			
Longline	CHN	CHN	13	X			
		TWN	81	B,C,F,G,K,L			
	EU	EUESP	1	X			
		EUFRA	3	X			
	IDN		4,337	B,C,F,G,K,L,X			
	LKA		3	B,F,K,L,X			
Other	AUS		200	C,L,X			
	BGD		1,947	B,C,F,G,K,L			
	COM		299	C,K,L,X			
	GBR		6	K,X			
	IDN		207,862	B,C,F,G,K,L			
	IRN		129,132	C,F,G,K,L			
	LKA		8,420	B,C,F,K,L,X			
	MDV		51	F,K,X			
	MOZ		44,044	C,F,K,X			
	MUS		2	X			
	MYS		8,307	B,C,F,G,K,L			
	OMN		49,336	C,F,K,L,X			
	THA		15,022	B,C,F,K,L			
	TZA		1,584	B,C,F,G,K,L,X			
	YEM		9,067	C,F,G,K,L			

Main shark species

Table 17: Retained catches (metric tonnes; t) and data reporting quality of the main IOTC datasets by fishery group and fleet as reported in 2023 (for reference year 2022) 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**

Fishery group	CPC	Fleet	Catch (t)	Species	RC	CE	SF
Purse seine	IDN		8	L			
	SYC		8	S,W			
Longline	CHN	CHN	148	L			
		TWN	2,795	L,O,S			
	EU	EUESP	2,312	L,M			
		EUFRA	11	L,M			
		EUPRT	823	L,M			
	IDN		877	L,O,S,W			
	JPN		302	L,M			
	KEN		157	L,M,S			
	LKA		142	L,S			
	MUS		6	L,M			
	SYC		377	L,O,S			
	ZAF		85	L,M			
Other	AUS		2	M,O			
	COM		90	L,O,S,W			
	IDN		17,223	L,O,S			
	IRN		2,500	O,S,W			
	KEN		617	H,O			
	LKA		372	H,L,S			
	OMN		3,782	H,O			
	SYC		4	H,L			
	TZA		209	A,H,O,S			

Appendix II: Status of the main IOTC datasets

All gears

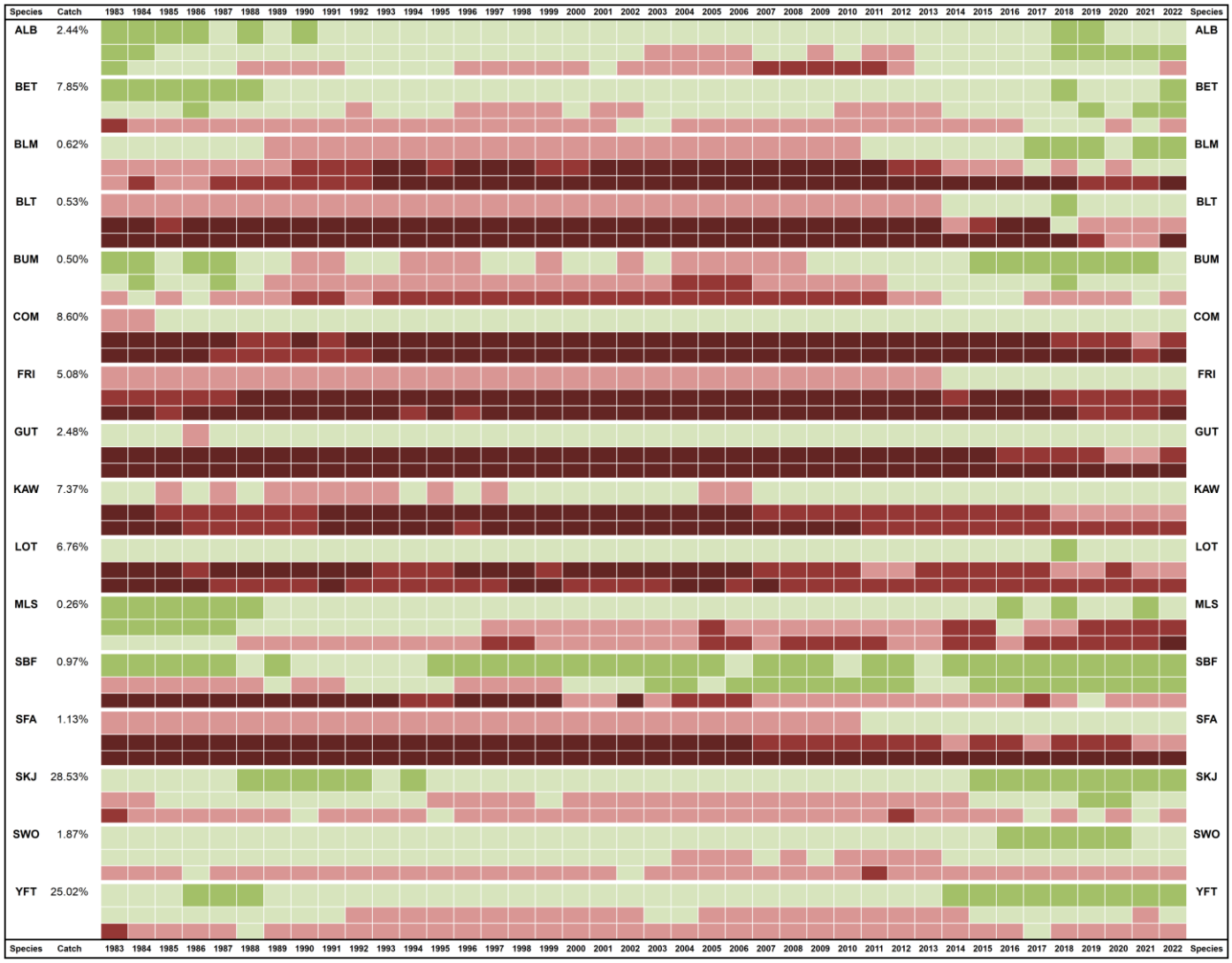

Figure 9: Reporting status of retained catch (RC), catch and effort (CE), and size-frequency (SF) data for the 16 IOTC species, by year and species (1983-2022). Percentage (%) of catch indicates the contribution of the catches of each species to the total catches of all IOTC species between 1983 and 2022. For each species, the first, second, and third rows correspond to RC, CE, and SF data, respectively. Colour key is given in **Table 5**

Purse seine

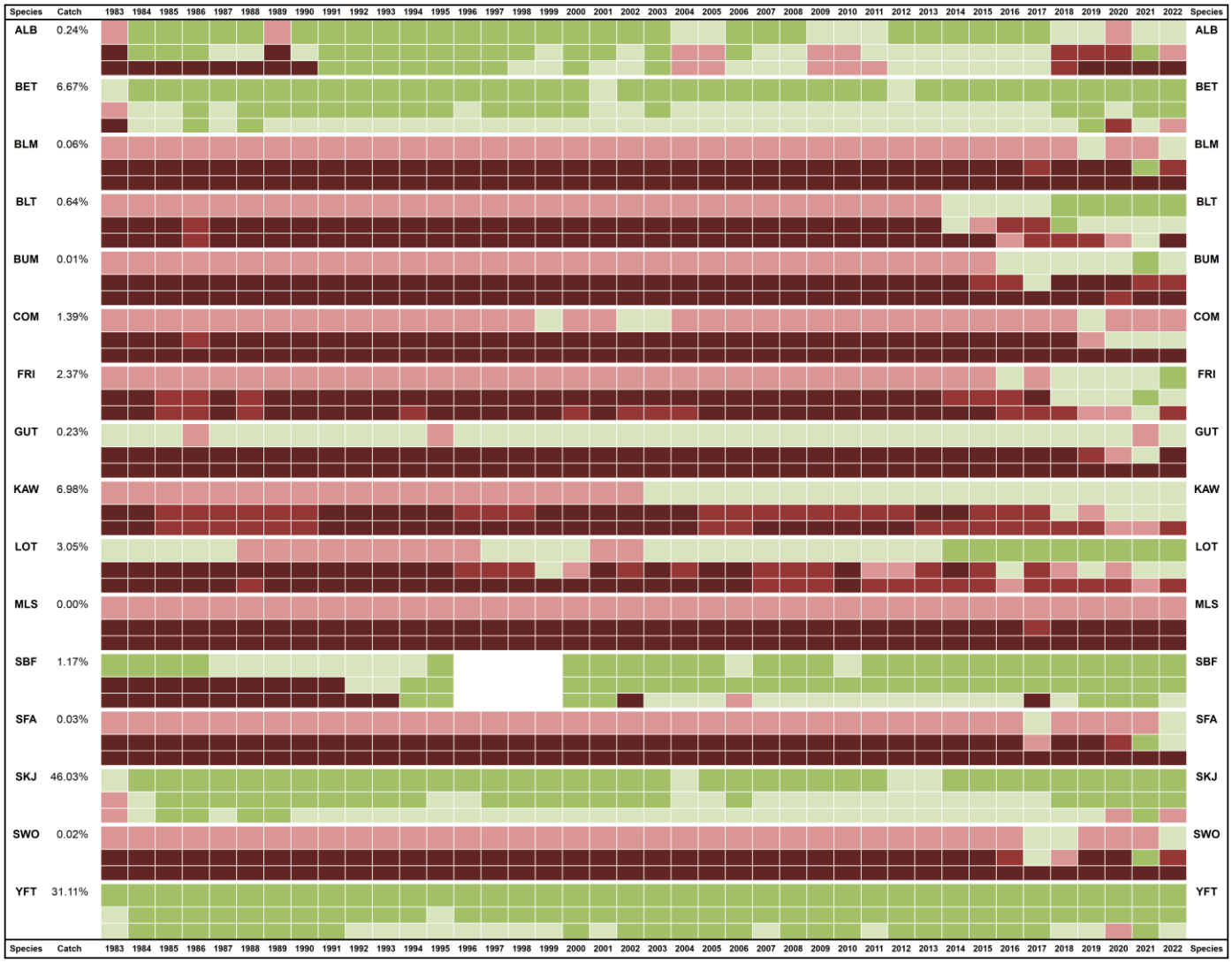

Figure 10: Reporting status of retained catch (RC), catch and effort (CE), and size-frequency (SF) data for the 16 IOTC species caught with purse seines, by year and species (1983-2022). Percentage (%) of catch indicates the contribution of the catches of each species to the total catches of all IOTC species between 1983 and 2022. For each species, the first, second, and third rows correspond to RC, CE, and SF data, respectively. Colour key is given in **Table 5**

Pole and line

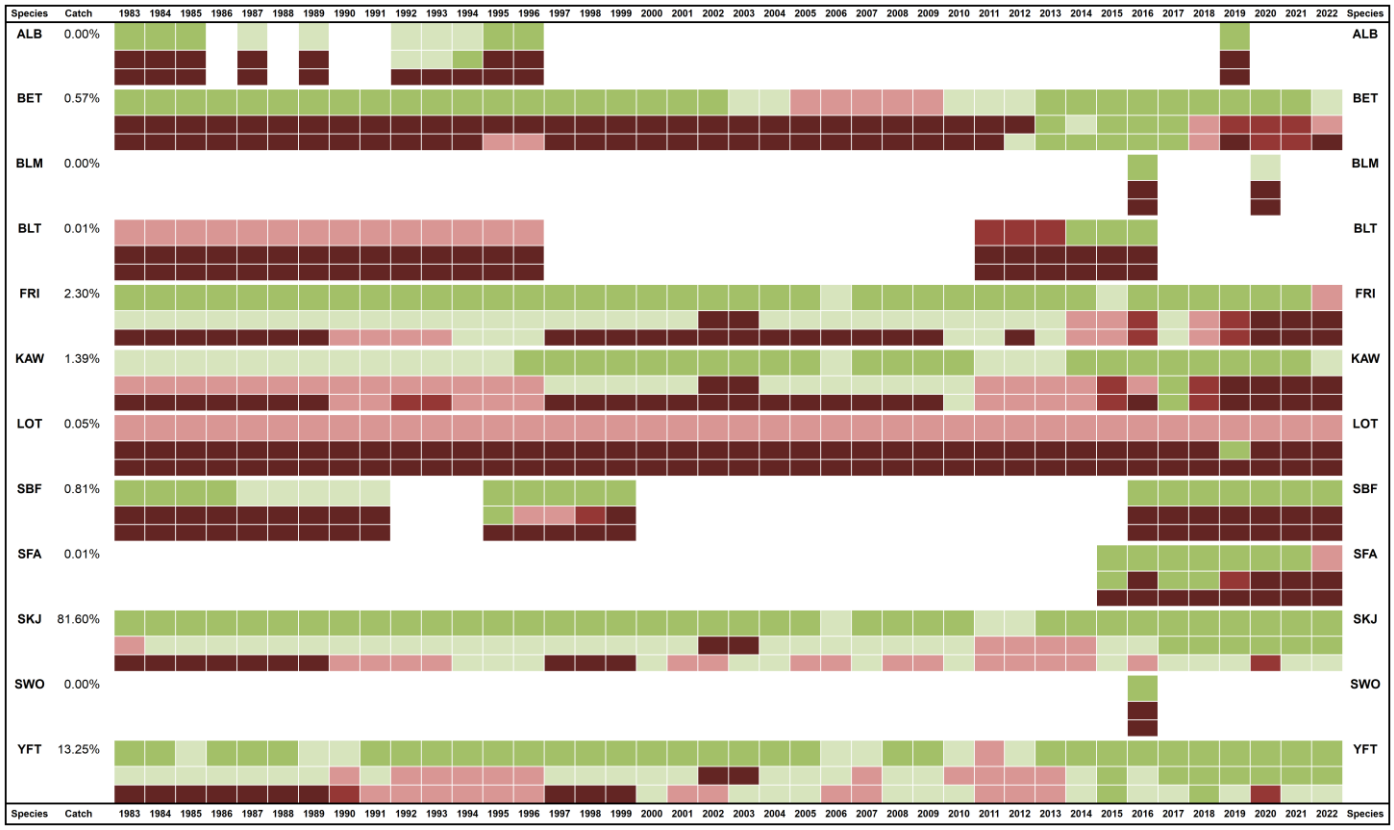

Figure 11: Reporting status of retained catch (RC), catch and effort (CE), and size-frequency (SF) data for the 16 IOTC species caught with pole and lines, by year and species (1982-2022). Percentage (%) of catch indicates the contribution of the catches of each species to the total catches of all IOTC species between 1982 and 2022. For each species, the first, second, and third rows correspond to RC, CE, and SF data, respectively. Colour key is given in **Table 5**

Gillnet

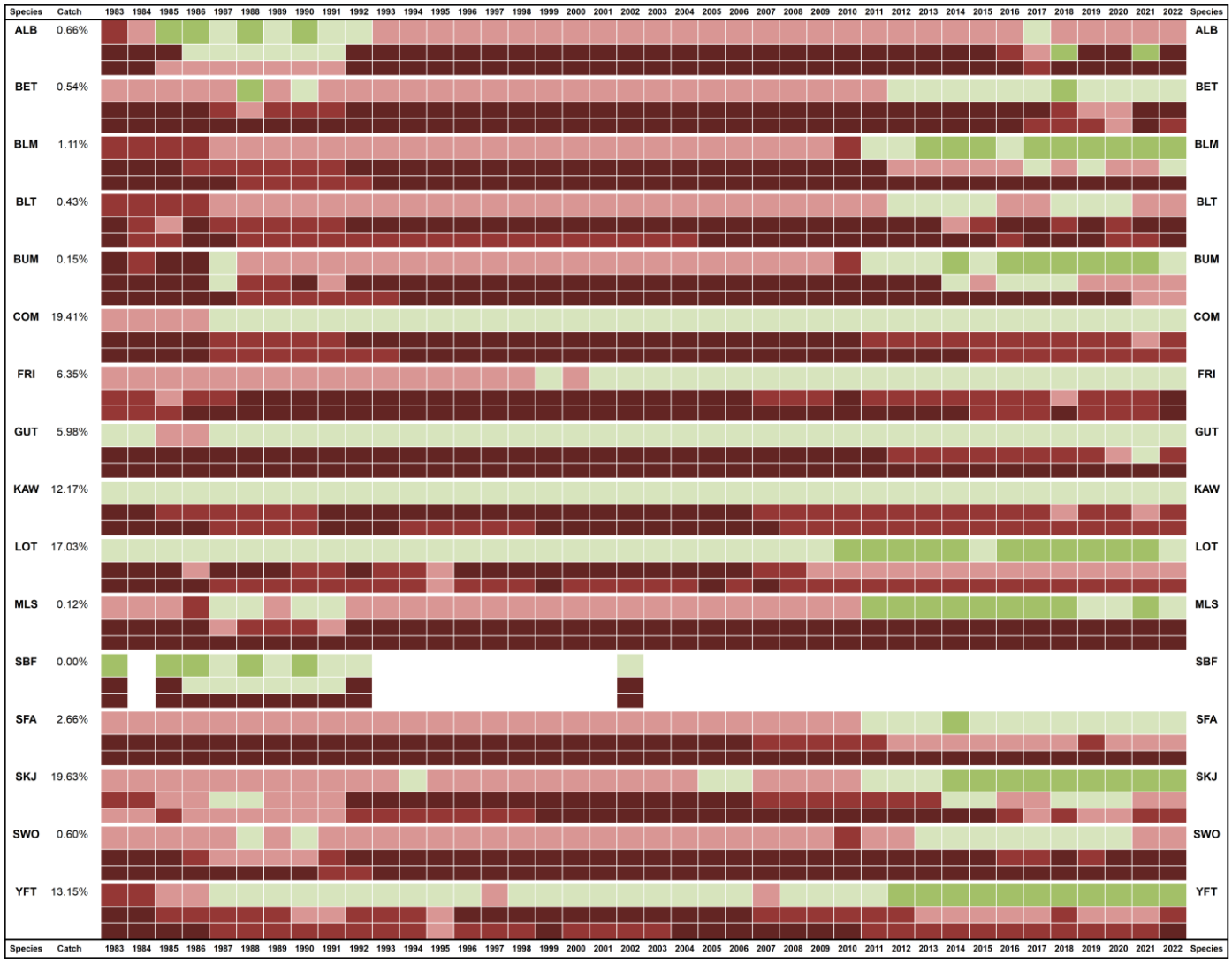

Figure 12: Reporting status of retained catch (RC), catch and effort (CE), and size-frequency (SF) data for the 16 IOTC species caught with gillnets, by year and species (1982-2022). Percentage (%) of catch indicates the contribution of the catches of each species to the total catches of all IOTC species between 1982 and 2022. For each species, the first, second, and third rows correspond to RC, CE, and SF data, respectively. Colour key is given in **Table 5**

Longline

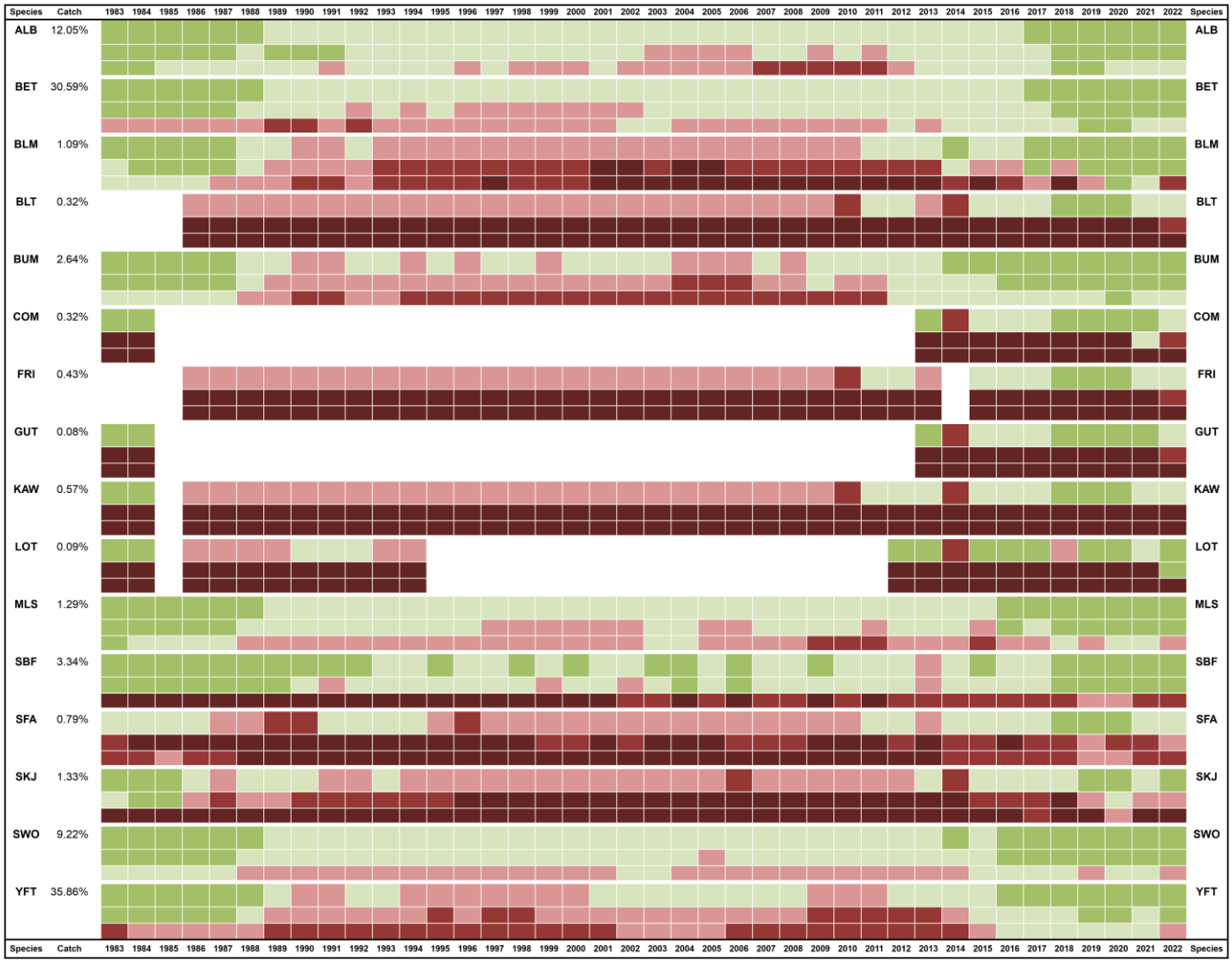

Figure 13: Reporting status of retained catch (RC), catch and effort (CE), and size-frequency (SF) data for the 16 IOTC species caught with purse seines, by year and species (1982-2022). Percentage (%) of catch indicates the contribution of the catches of each species to the total catches of all IOTC species between 1982 and 2022. For each species, the first, second, and third rows correspond to RC, CE, and SF data, respectively. Color key is given in **Table 5**

Hand line, coastal longline, troll line, and other gears

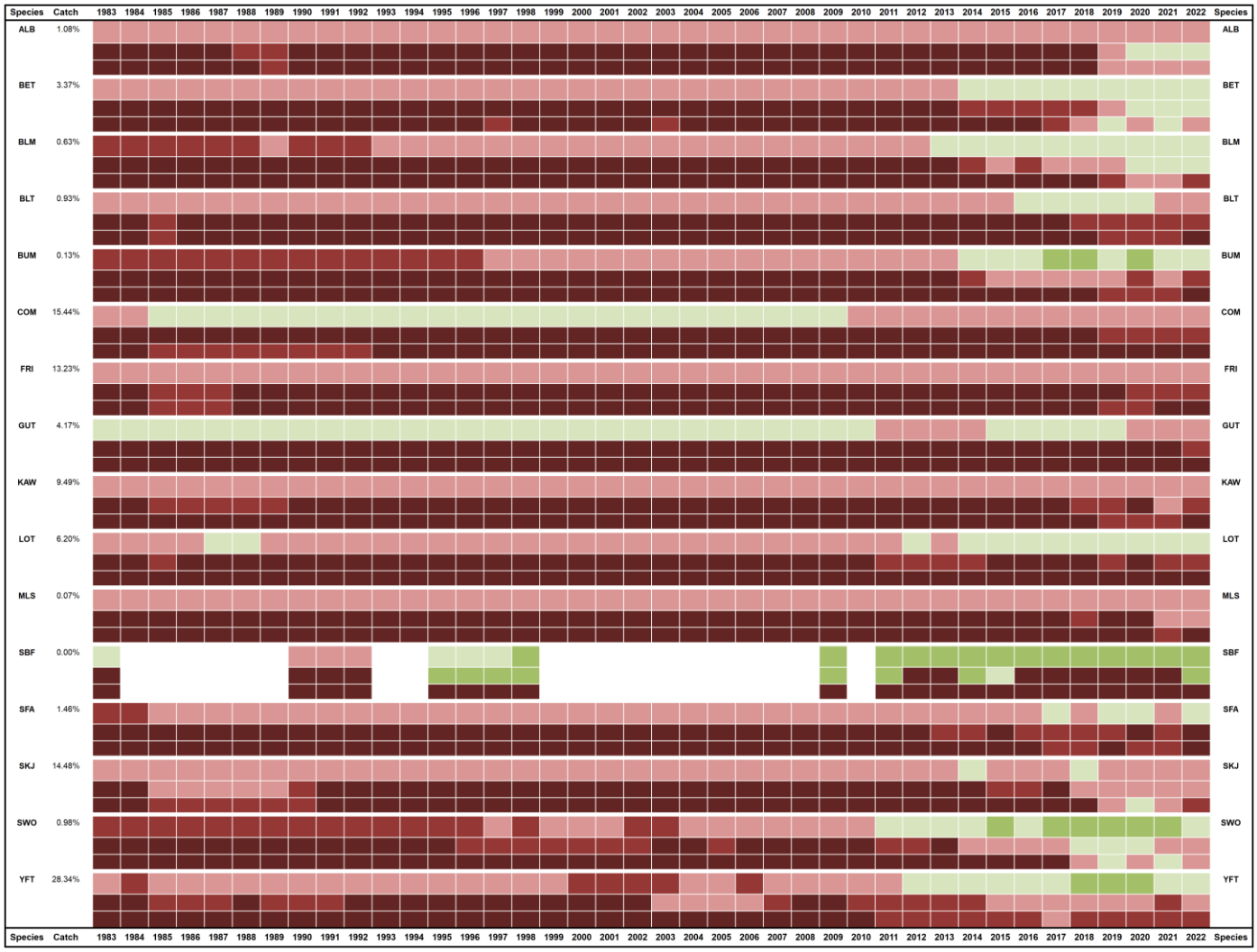

Figure 14: Reporting status of retained catch (RC), catch and effort (CE), and size-frequency (SF) data for the 16 IOTC species caught with hand lines, coastal longlines, troll lines, and other gears, by year and species (1982-2022). Percentage (%) of catch indicates the contribution of the catches of each species to the total catches of all IOTC species between 1982 and 2022. For each species, the first, second, and third rows correspond to RC, CE, and SF data, respectively. Colour key is given in **Table 5**

Appendix III: Data issues and proposed actions

Table 18: 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. No data reported for 2022	Increase engagement with national scientists and stakeholders to increase the compatibility of the national data collection and reporting systems with the IOTC reporting formats.
	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	Liaise with fisheries administrations from Pakistan and I. R. Iran to understand and address the issue
	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, with the assistance of Compliance expert 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. No data reported for 2022	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 reported for 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
	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
	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	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

Dataset	CPCs	Fisheries	Main issues	Proposed actions
	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	Follow-up to previous mission (2019-09) to support the standardization of statistical information available for handlines and gillnets, and establish proper submission of catch and effort data according to Res. 15/02 and identify the reasons for the recent remarkable increases in the catches of yellowfin tuna. Oman planned to work closely with IOTC Secretariat with the possibility of conduction a mission.
	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, Oman, Yemen**	**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
	I. R. Iran	**Drifting gillnet fishery**	Data not by IOTC standards	The IOTC Secretariat to continue providing assistance to I.R. Iran to submit size data by fishing ground and fisheries (rather than landing site) based on port sampling as logbooks are currently being fully implemented on a limited number of vessels
	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-Economic	**All**	**All**	Limited data available, and collated within the IOTC database	Liaise with FAO and other institutes (e.g., FFA) 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). Through the resolution 23/10, with the implementation of the WPSE, more emphasize on the collection of socio-economic data

Appendix IV: 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 2022

Table 19: 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	2	34	10		10
BGD							
BHR*							
CHN	CHN				81		
	TWN				255		
COM							
DJI*							
EGY*							
ERI							
EU	EUESP				8		15
	EUFRA						10
	EUITA						1
	EUMYT			90			
	EUPRT				2		
	EUREU			129	21		
GBR				10			
IDN							
IND							
IRN			3,930	1,771			
JOR*							
JPN					43		
KEN					7		
KOR					14		2
KWT*							
LKA			2,527	6,161	657	44,180	2,118
MDG							
MDV							
MMR*							
MOZ							
MUS				149	13		4
MYS			10,185	133	20	2,671	315
OMN							
PAK							
QAT*							
SAU*							
SDN							
SYC					79		13
THA							219
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 19**).

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. 15**). 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.

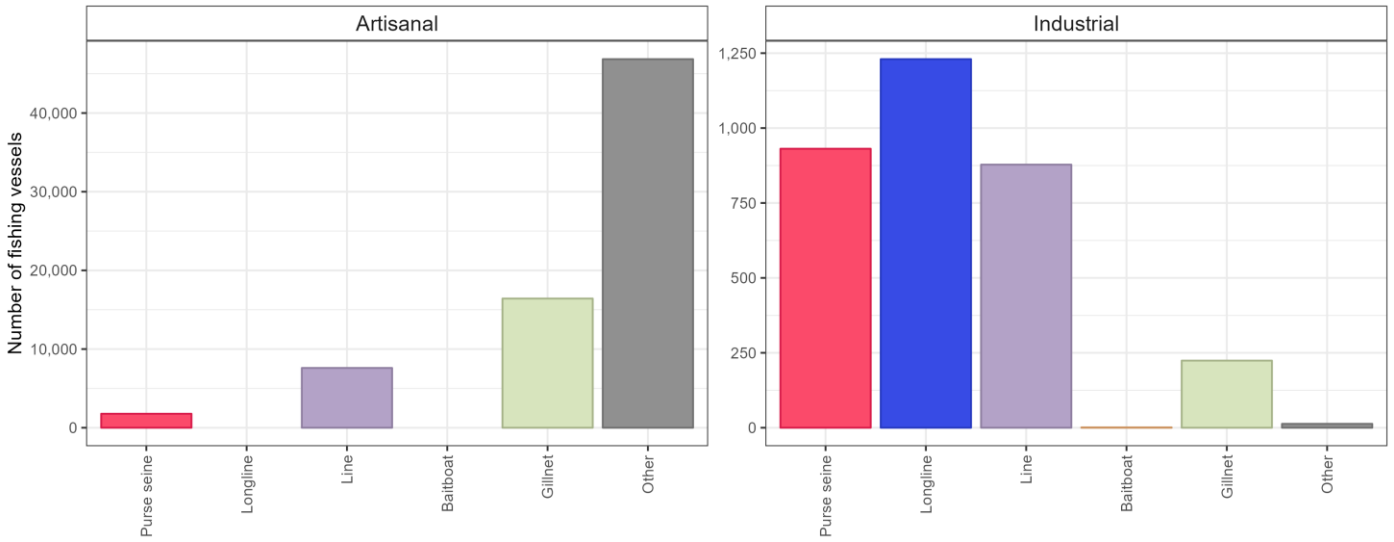

Figure 15: Number of fishing vessels by fishery group reported to the IOTC Secretariat for the year 2022 for each fishery type

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 19** for 2022), the reporting coverage may vary from year to year for others.

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