REVIEW OF THE STATISTICAL DATA AVAILABLE FOR MAKO SHARK SPECIES

Prepared by IOTC Secretariat[1]

Purpose

To provide participants to the 20th Session of the IOTC Working Party on Ecosystems and Bycatch (WPEB20) Data preparatory meeting (DP) with a review of the status of the information available on mako shark species.

The document summarises the current information received for these species, in accordance with relevant Resolutions adopted by the Commission. It provides an overview of the data available in the IOTC Secretariat databases as of April 2024.

Materials

Several fisheries datasets must 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) and following the standards and formats defined in the IOTC Reporting guidelines.

Retained catch data

These correspond to the total retained catches (in live weight) per year, Indian Ocean major area, fleet, fishing gear, and species (IOTC Res. 15/02) and shall be reported through IOTC form 1RC.

Two datasets of retained catches are made available by the Secretariat: (1) the raw estimates which include both the 16 IOTC species (prior to the breakdown of species and gear aggregates) and all other species considered as bycatch and (2) the best scientific estimates only available for the 16 IOTC species (e.g., IOTC 2022).

Changes in the IOTC consolidated datasets 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.

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 IOTC forms designed for reporting geo-referenced catch and effort data vary according to the nature of the fishing gear (e.g., surface, longline, and coastal gears). In addition, information on the use of fish aggregating devices (FADs) and activity of the support vessels that assist industrial purse seiners also has to be collected and reported to the Secretariat through IOTC forms 3DA.

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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. 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, discard data reported to the Secretariat with IOTC Form 1DI 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. 22/04) 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).

Size-frequency data

The size composition of catches may be derived from the data set of individual body lengths or weights collected at sea and during the unloading of fishing vessels. The IOTC Form 4SF provides all fields requested for a complete reporting of size-frequency data to the stratification by fleet, year, gear, type of school, month, grid and species as required by IOTC Res. 15/02. While the great majority of size data reported through IOTC Form 4SF are for retained catches, CPCs can also use the same form to report size data of discarded individuals. Furthermore, additional size data (including those for individuals discarded at sea) may be collected through onboard observer programs and reported to the Secretariat as part of the ROS (see below).

Regional Observer Scheme

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.

The document IOTC-2023-SC26-07_rev2 provides a comprehensive description of the current status, coverage and data collected as part of the ROS: 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.

To date, the ROS regional database contains information for a total of 1,764 commercial fishing trips (1,013 from purse seine vessels and 751 from longline vessels of various types) made during the period 2005-2022 from 7 fleets: Japan, EU,France and Sri Lanka for longline fisheries and EU,Spain, EU,France, Japan, Korea, Mauritius, and Seychelles for purse seine fisheries. In addition, some observer reports have been submitted to the Secretariat by some CPCs (e.g. Taiwan,China) but data sets were not provided in electronic format at the operational level following the ROS standards, *de facto* preventing the entry of the data in the ROS regional database.

Morphometric data

The current length-length and length-weight IOTC reference relationships for pelagic sharks mostly come from historical data collected in the Atlantic Ocean or Western-Central Pacific Ocean (Skomal and Natanson 2003; Francis and Duffy 2005). However, several morphometric data sets have been collected for sharks through different research and monitoring programs conducted in the Indian Ocean over the last decades, including measurements taken at sea and on land (Garcia-Cortés and Mejuto 2002; Ariz et al. 2007; Romanov and Romanova 2009; Espino et al. 2010; Filmalter et al. 2012). Hence, different statistical relationships have been established for several Indian Ocean pelagic sharks based on data that may cover different size ranges as well as different areas and time periods (**Appendix I**).

Methods

The present report is based on the compilation of information derived from the datasets of shark species that were reported to the Secretariat, i.e.:

- Retained catch data for shark and ray species, including those reported as species aggregates;
- Catch and effort data for shark and ray species, including those reported as species aggregates;
- Size-frequency data for shark and ray species;
- Information on discards for shark and ray species available from the ROS;

Retained catch data for bycatch species should be considered with caution, due to several reasons (see Section Uncertainties in shark and ray catch data) that include the historically low reporting rates and a tendency to report catches for aggregated shark and ray species. Furthermore, catches of some shark and ray species that interact with coastal fisheries targeting other species than tuna and tuna-like ones may not be reported to the IOTC. In addition, catches that have been reported are thought to represent only those species that are retained onboard, without taking into account discarded individuals. Finally, in many cases, the reported catches refer to dressed weights while no information is provided on the type of processing undertaken, creating more uncertainty in the estimates of catches in live weight equivalents.

Information available on the estimates of total discards collated through IOTC form 1DI was not used in the present report as the data are currently very limited, often provided using heterogeneous formats (not fully compliant with IOTC standards) which do not include several metadata fields (e.g., reason for discard, fate) as well as the detailed information on sampling coverage and raising procedures adopted (if any).

Data processing

The preparation of the curated public-domain data sets for bycatch species follows three main data processing steps which are briefly summarized below.

First, standard controls and checks are performed to ensure that the metadata and data submitted to the Secretariat are consistent and include all mandatory fields (e.g., dimensions of the strata, etc.). The controls depend on each data set and may require the submission of revised data from CPCs if the original ones are found to be incomplete.

Second, when retained catches are not reported by a CPC, catch data from the previous year may be repeated or derived from a range of sources, e.g., the FAO FishStat database. In addition, 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 (Moreno et al. (2012)).

Finally, filtering and conversions are applied to the size data reported for the most common shark and ray species in order to harmonize their format and structure, and remove data which are non-compliant with IOTC standards, e.g., provided with size bins exceeding the maximum width considered meaningful for the species (IOTC 2020). All samples collected using types of measurement other than fork length (FL; straight distance from the tip of the upper snout to the fork of the tail) are converted into FL by using the IOTC equations and binned by constant intervals of 5 cm in size. If no IOTC-endorsed equations exist to convert from a given length measurement for a species to the standard FL measurement, the original size-frequency data are not disseminated although they are kept within the IOTC databases for future reference.

Results

Overall bycatch levels & trends

Reported retained catches of species of interest to the WPEB are largely dominated by sharks with estimates from some artisanal fisheries dating back to the early 1950s (**Fig. 3**). Overall levels and quality of reported catches of shark and ray species have increased over time due to the development and expansion of tuna and tuna-like fisheries across the Indian Ocean, the increased reporting requirements for some sensitive species such as thresher and oceanic whitetip sharks, and the implementation of retention bans in some fisheries. In 2022, the total retained catches of sharks reported to the Secretariat amounted to 76944 t, with rays representing a very small component of the reported bycatch at 1518t, i.e., about 2% of total reported shark and ray catches for the same year (**Fig. 2**).

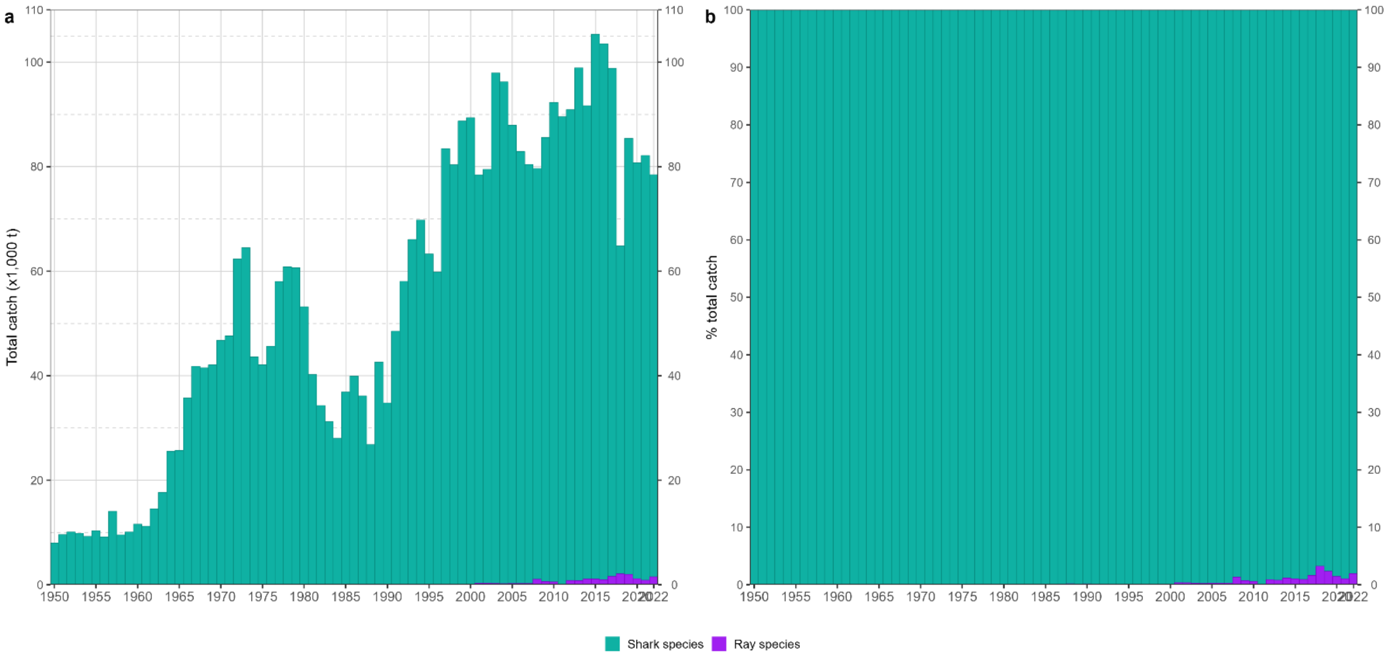


Figure 2: Annual cumulative absolute (a) and relative (b) time series of retained catches (metric tonnes; t) of shark and ray species by species category for the period 1950-2022.

Very few fleets reported catches of sharks and rays in the 1950s, but the number of reporting fleets has increased over time (**Fig. 3**). Total reported catches of sharks and rays have also increased over time, reaching a recent peak of over 100,000 t in 2015-2016. Since then, retained catches have decreased below 80,000 t in 2022.

In 2018, reported catches of sharks and rays declined significantly when compared with 2017 and 2019 levels, mostly due to a complete disappearance of catches of aggregated shark species previously reported by India (that were not replaced by detailed catches by species) as well as to marked decreases in reported shark catches from other CPCs (Mozambique and Indonesia) which in some cases are thought to indicate reporting issues rather than a true reduction in catch levels.

In the case of mako shark species, catches have been dominated by artisanal fisheries until the early 1990s (**Fig. 4**). With the expansion of industrial fisheries, there was a steady increase to a peak of around 5,000 t in 2016, after which the trend reversed, with catches falling by around 50% in the last year.

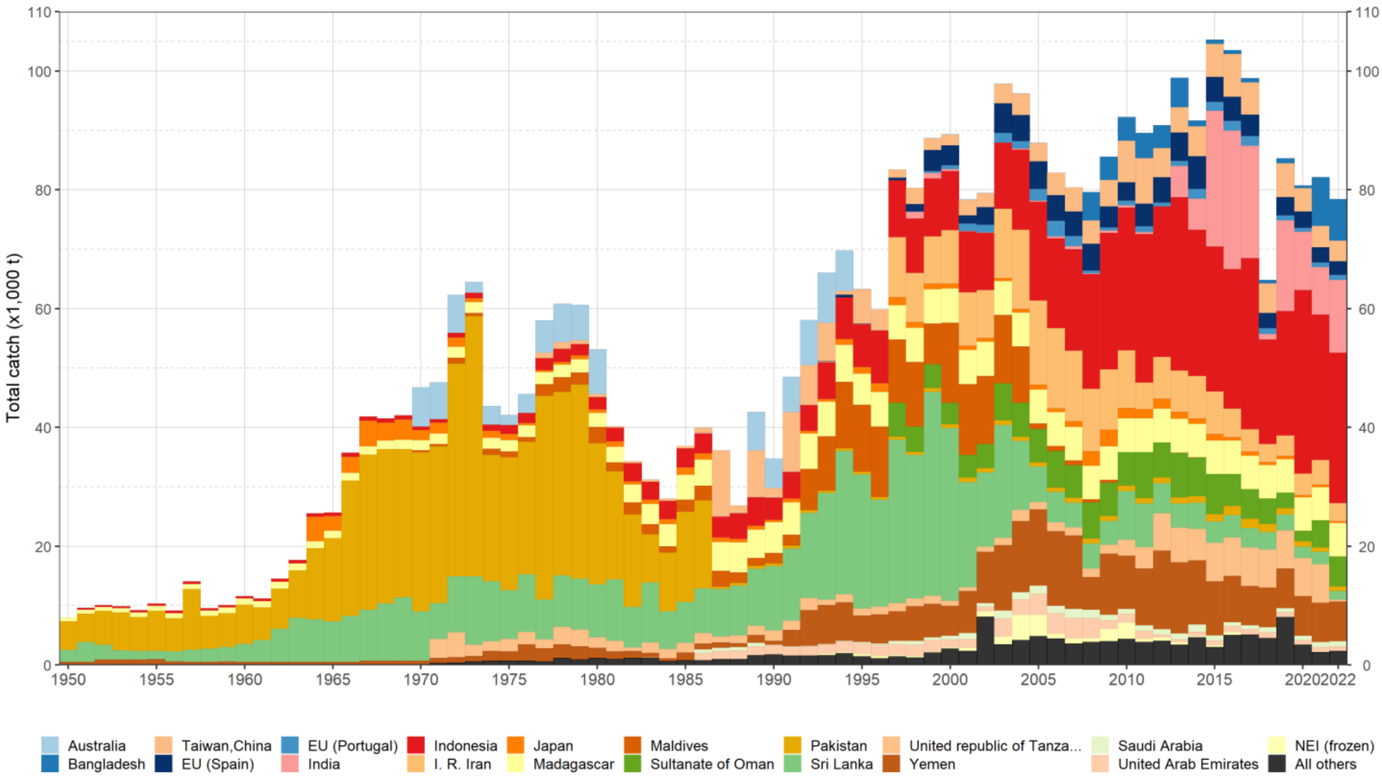


Figure 3: Annual time series of retained catches (metric tonnes; t) of sharks and rays by fleet during 1950-2022.

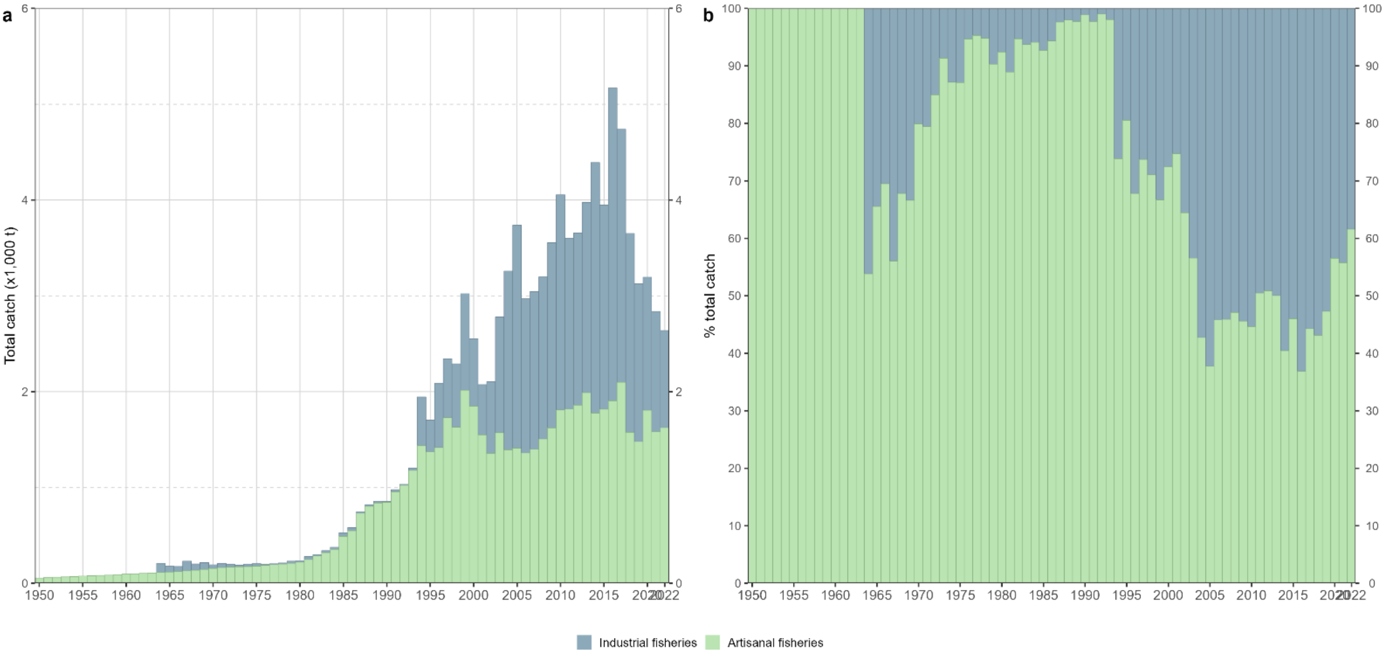


Figure 4: Annual cumulative absolute (a) and relative (b) time series of retained catches (metric tonnes; t) of mako shark species by fishery type for the period 1950-2022.

Vulnerability to fisheries

Levels of reported retained catches for sharks and rays strongly vary with fishing gear and over time but are generally increasing, contrary to the trend for mako shark species. Shortfin mako shark received the highest vulnerability ranking (No. 1) for longline gear in the ecological risk assessment (ERA) conducted for the Indian Ocean by the WPEB and SC in 2018 because it was characterized as one of the least productive shark species and with a high susceptibility to longline gear (Murua et al., 2018). Catches of mako shark species have increased sharply from early 1990s to mid-2010s, period in which longline and line fisheries accounted for more than 70% of total catches of these species (**Fig. 5**).

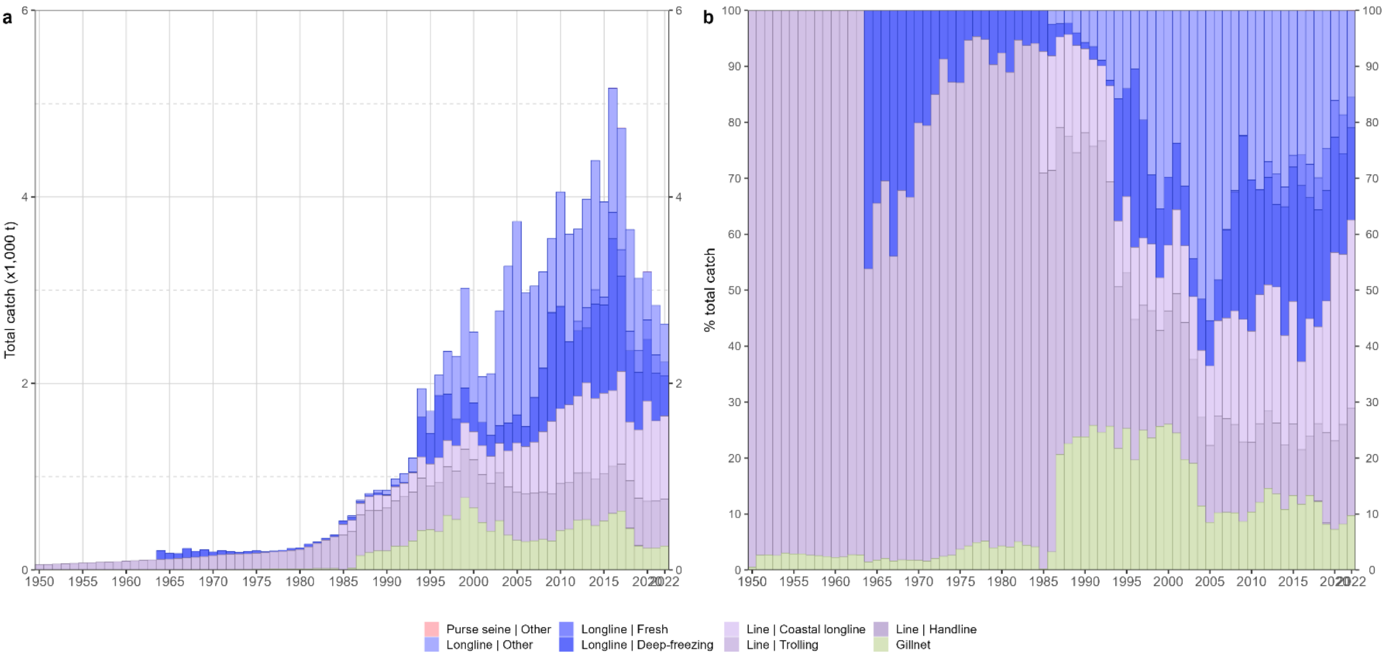


Figure 5: Annual absolute (a) and relative (b) time series of retained catches (metric tonnes; t) of mako sharks by fishery for the period 1950-2022.

Longfin makos are poorly recorded in the Indian Ocean and catches reported to the Secretariat in recent years represent less than 1% of mako species (**Fig. 6**). However, the percentage of reported catches of mako species aggregated remains considerable. Between the two species, shortfin mako dominates the catches reported by industrial fisheries, although it varies from year to year, accounting for between 50% and 70% of catches of these species. For artisanal fisheries around 80% of catches reported for mako species are aggregated.

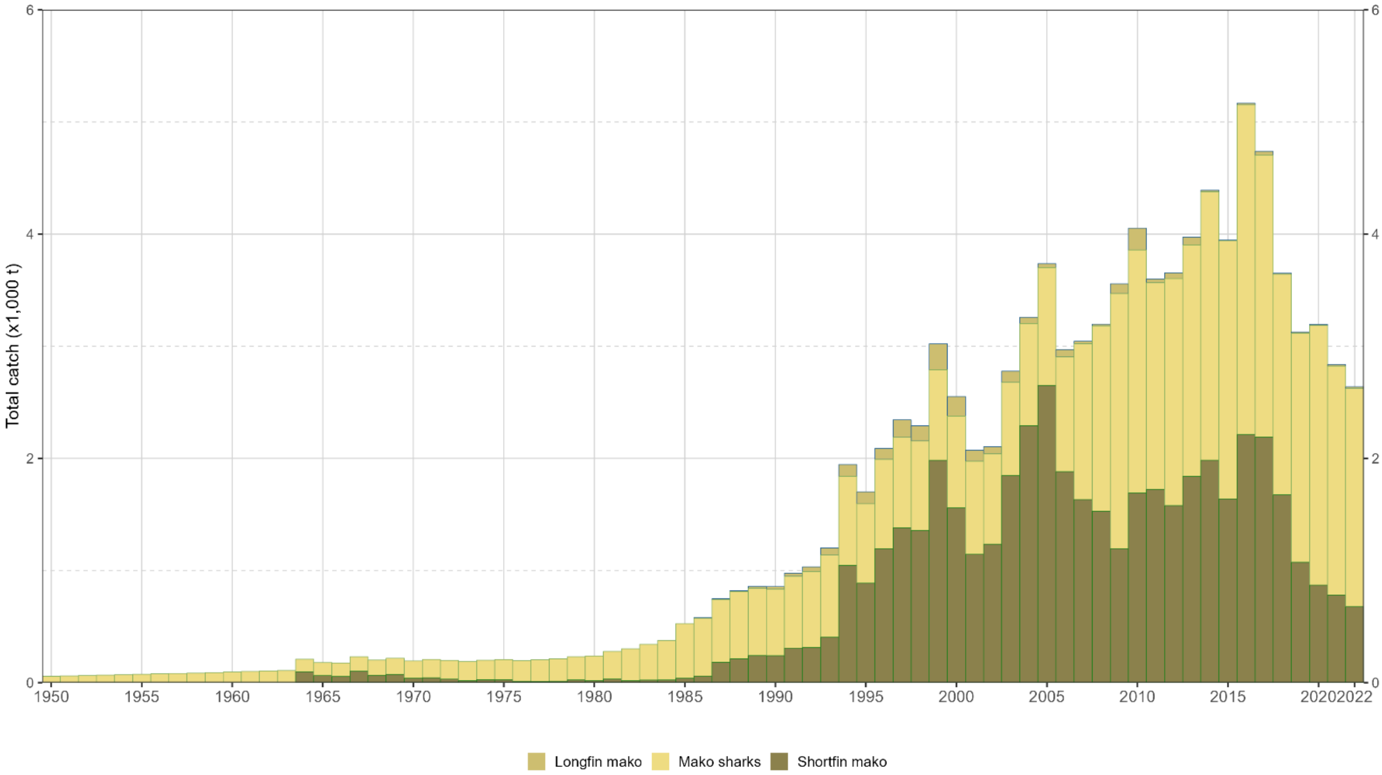


Figure 6: Annual time series of retained catches (metric tonnes; t) of mako sharks by species for the period 1950-2022.

Recent fishery features (2018-2022)

Most tuna and tuna-like fisheries of the Indian Ocean show a decline in reported catches of mako sharks in recent years (**Table 1**) except for Indonesia line fishery with a smooth increase trend (**Fig. 8**). The main fleets accounting with 74% of total catches of mako shark species are Indonesia, Taiwan, province of China, Madagascar and EU, Spain (**Fig. 9**). Nevertheless, is important to note that data for Madagascar are repeated for the coastal fisheries in recent years. Furthermore, revisions to Pakistani gillnet catches from 1987 onwards, endorsed by the SC in December 2019, introduced a mean annual decrease of around 17,000 t in total catches of shark species during the concerned period when compared to previously available official data reported by the country.

Table 1: Retained catches (metric tonnes; t) of mako sharks by year and fishery for the period 2013 -2022.

Fishery	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Purse seine | Other	0	0	0	4	1	0	0	1	0	0
Longline | Other	1,163	1,387	1,022	1,332	1,303	1,093	771	513	530	410
Longline | Fresh	217	154	84	282	283	208	237	211	196	144
Longline | Deep-freezing	585	1,010	947	1,625	1,024	763	617	659	511	434
Line | Coastal longline	965	861	866	814	992	632	735	1,075	862	889
Line | Trolling	505	505	505	505	505	505	505	505	506	505
Line | Handline	0	0	0	1	0	6	7	0	0	0
Gillnet	539	474	523	605	631	444	256	232	233	256
Total	3,974	4,391	3,947	5,168	4,739	3,651	3,127	3,195	2,837	2,638

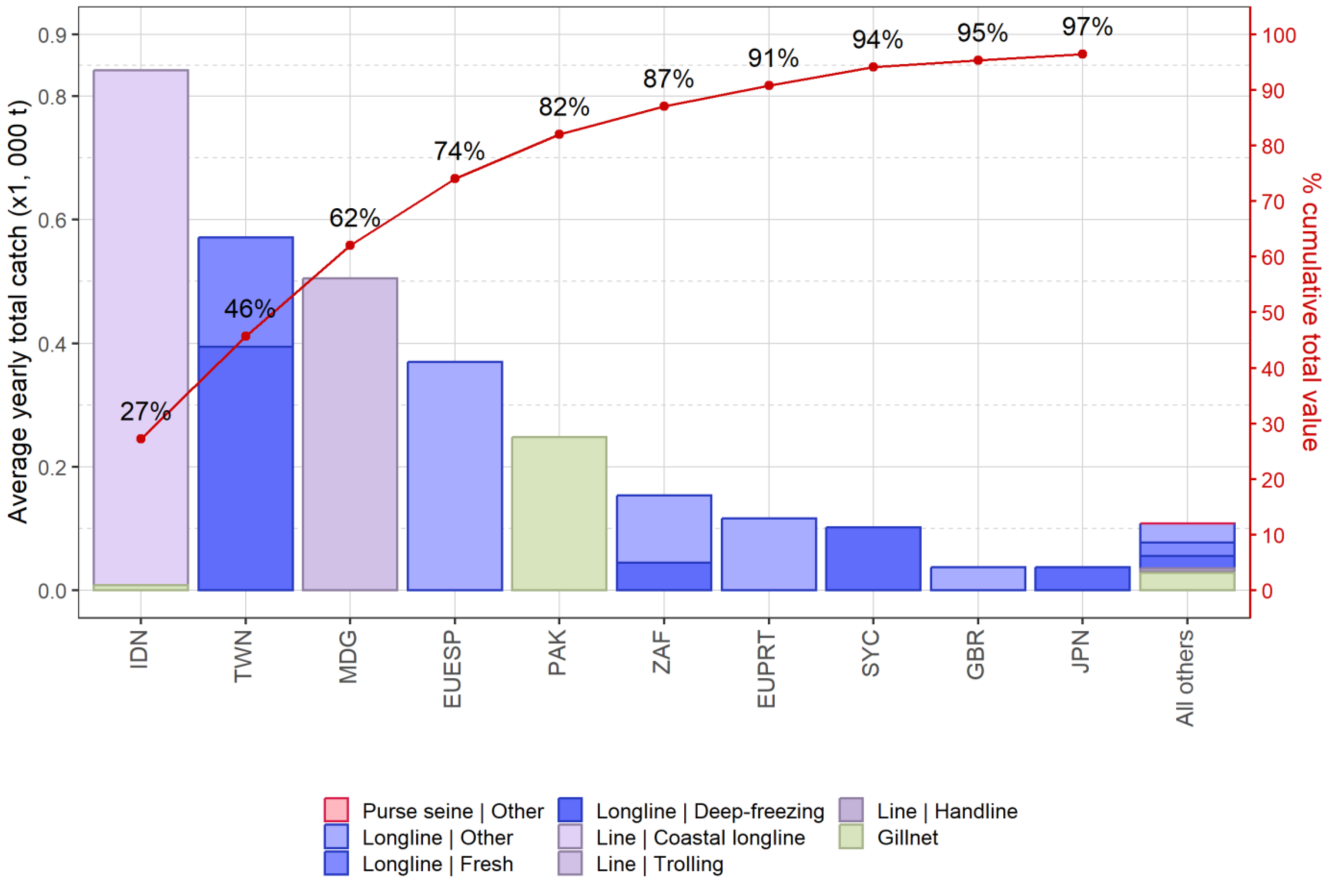


Figure 7: Mean annual retained catches (metric tonnes; t) of mako sharks 2018-2022 by fishery and fleet ordered according to the importance of catches. The solid line indicates the cumulative percentage of the total combined catches of the species for the fleets concerned.

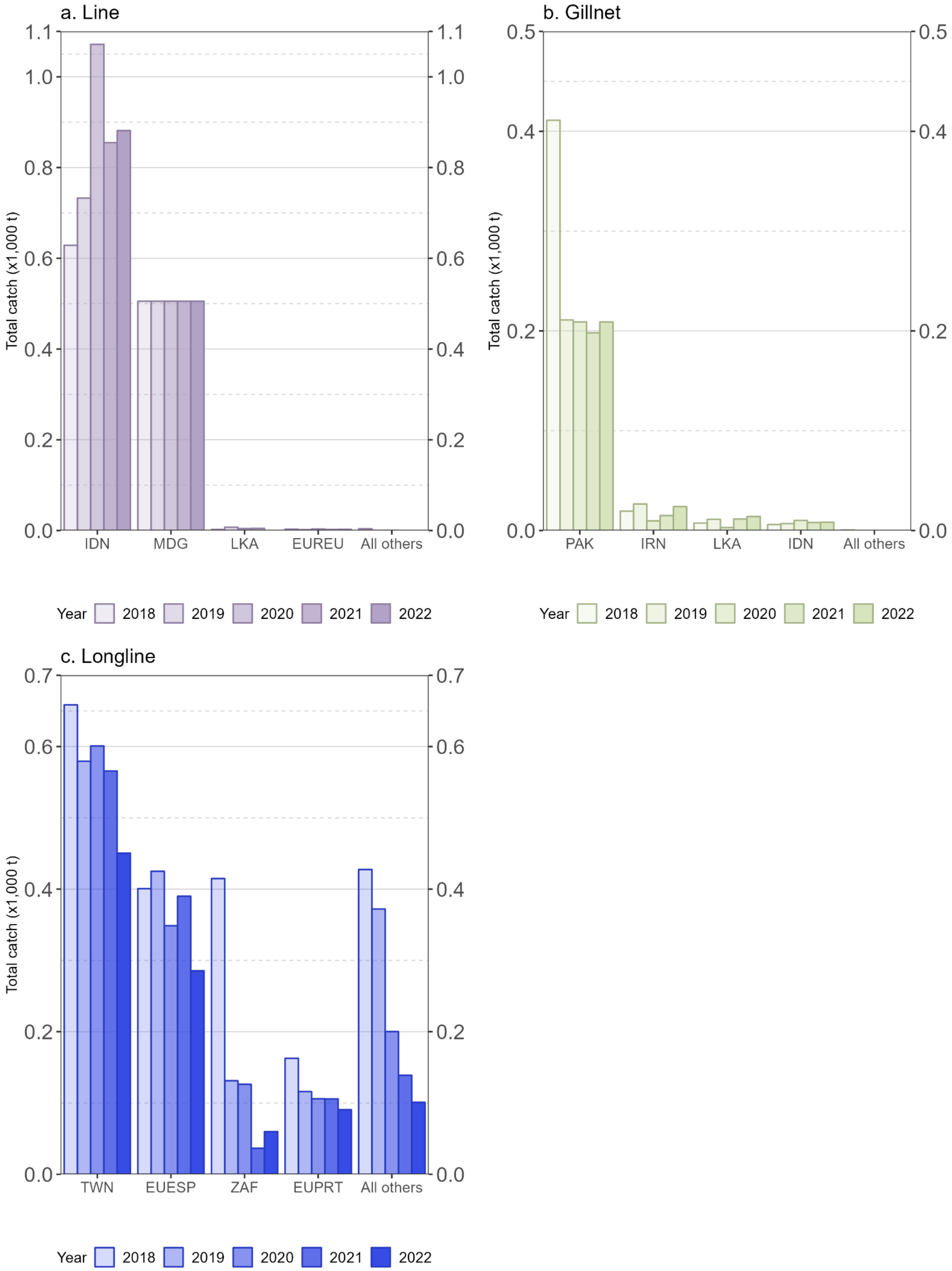


Figure 8: Annual catch trends (metric tonnes; t) of mako shark species by fishery group between for the period 2018-2022

Discarding practices

Longline fisheries

In the absence of data on total discard for most fisheries information on discarding practices can only be inferred from observer data collected through the ROS programme. However, the distribution of shark interactions with pelagic longline fisheries available through the ROS data for the period 2009-2022 only covers a small part of the longline fishing grounds. Most mako sharks are retained and interactions are mostly recorded in the Western Indian Ocean and at aggregated level (**Fig. 9**).

It is also important to highlight how restrictions following the onset of the CoViD pandemic have had a huge impact on the number of observers deployed onboard during 2020 and 2021, therefore reducing the coverage of the information available in the ROS database.

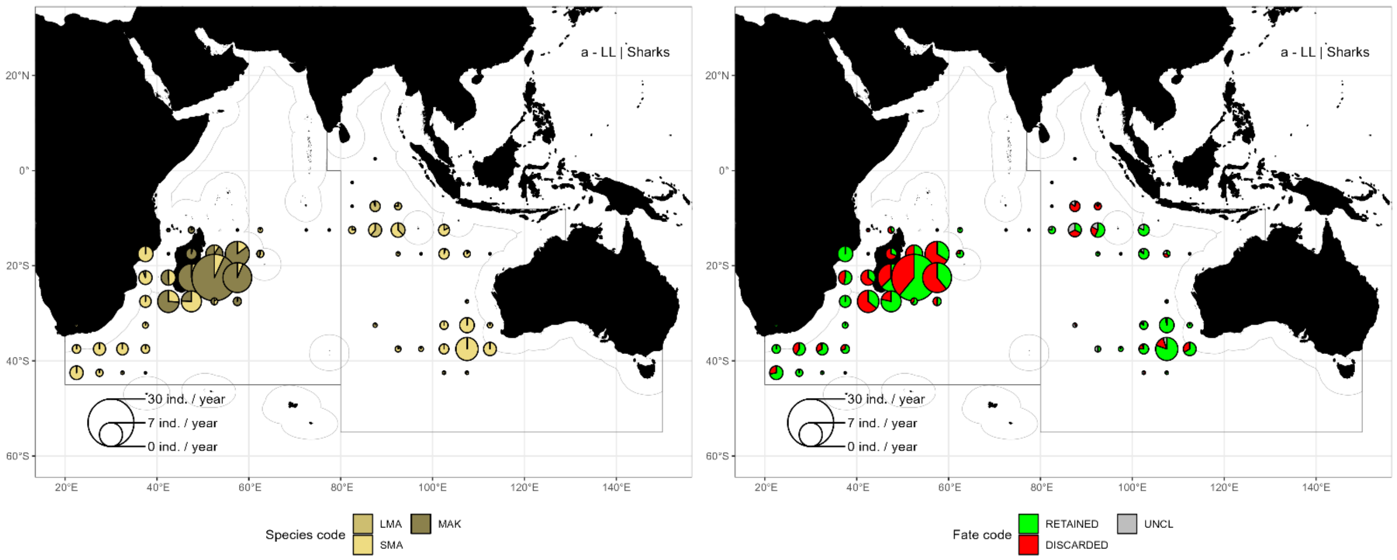


Figure 9: Mean annual number of mako shark species interactions (numbers of individuals per year) with deep-freezing longline fisheries by species (a) and fate (b) as reported to the Secretariat during the period 2009-2022.

Size composition of the catch

There are two major reporting sources of size data for sharks and rays:

1) length/weight data by species, stratified by year, fleet, type of fishery, month, and 5x5 degrees grid, as per IOTC Res. 15/02 and to be reported according to the IOTC guidelines and through the recommended form 4SF, and

2) length/weight data collected through the Regional Observer Scheme programme (Res. 11/04).

Size data can be collected at sea by fishers or observers and at landing sites by staff from research institutions or the industry, and no size data derived from the analysis of pictures or videos collected through Electronic Monitoring systems has been yet reported as such to the IOTC Secretariat.

Res. 15/02 states that *"size data for longline fleets may be provided as part of the Regional Observer Scheme where such fleets have at least 5% observer coverage of all fishing operations"*. Size data collected by observers could then have been reported twice to the Secretariat, although at different levels of spatio-temporal resolution, i.e., once per year, through regular submissions of fishery statistics stratified by fleet, gear, grid and month, and (when available) through the more detailed ROS data sets, which include information recorded by day / hour and exact location of capture.

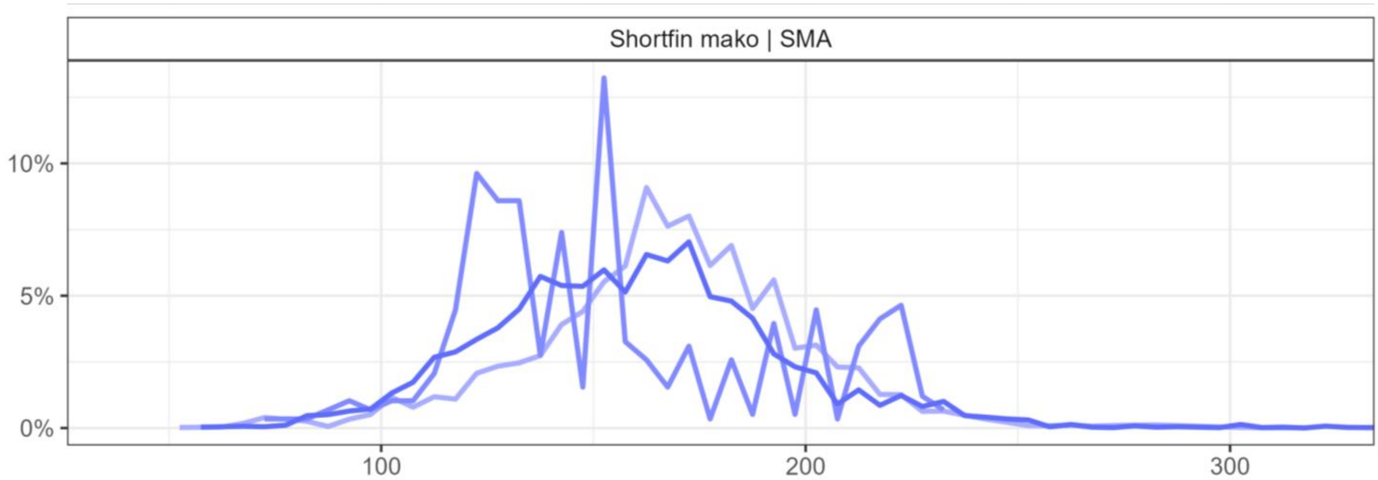
The number of size samples for sharks reported according to Res. 15/02 varies greatly between species, fisheries, and fleets, with 17% of all available samples collected by observers at sea. About 15,000 size samples are available for shortfin mako (**Table 2**).

Also, a total of 22,430 samples have been reported for species groups (SKH, MSK, MAK, THR), which is of limited use when the species composition of the aggregates is unknown.

Table 2: Total number of fish size samples collected as per Res. 15/02 and reported at species level for mako sharks species covering the period 2005-2021 through IOTC forms 4SF or equivalent.

Species		Year		Number of fish samples			
Code	**Name**	**From**	**To**	**Logbooks**	**Observers**	**Total**	**% Logbooks**
SMA	Shortfin mako	2005	2021	11,426	4,189	15,615	73.17
LMA	Longfin mako	2007	2019	2	36	38	5.26

Size data collected for shortfin mako (SMA) by observers onboard deep-freezing longliners show a distribution described by a median fork length of 177.5 cm, which is larger than the median of the sizes collected by other enumerators (162 cm) (**Fig 10)**. Spatial information shows that observer samples for this species mostly come from southern latitudes (south of 20°S) while other size data mainly come from the central and southwestern Indian Ocean, which might explain the differences in distributions beside suggesting some size-dependent variability in the spatio-temporal distribution of shortfin mako that needs further investigation.



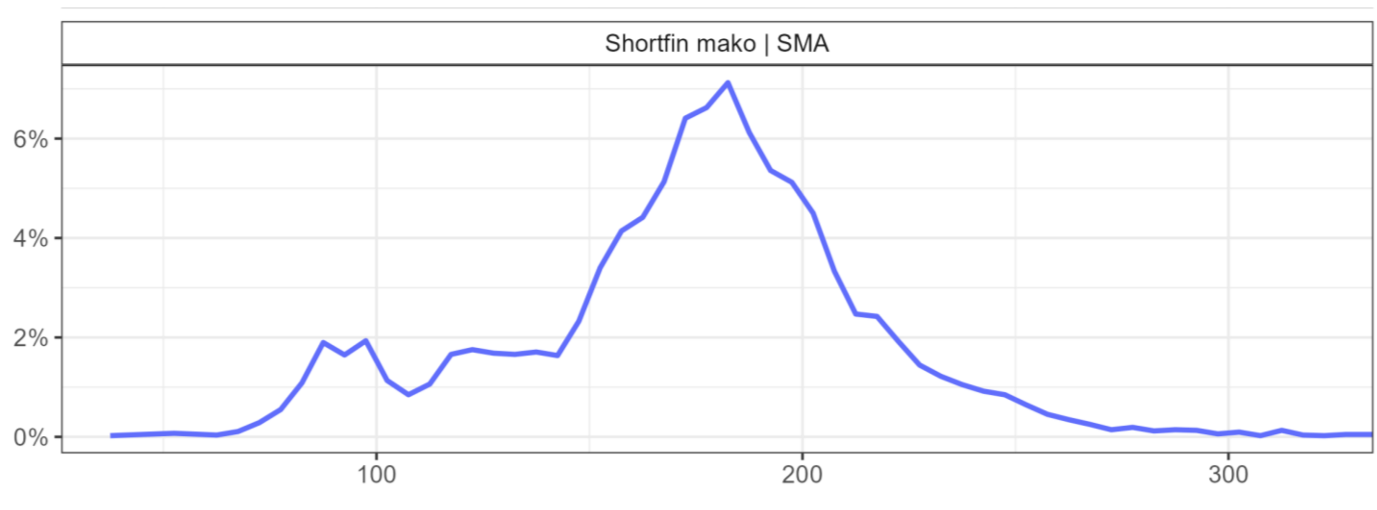


Figure 10: Relative distribution of fork lengths (cm) by 5 cm classes by fishery and source of information (top, fishers or enumerators vs. bottom, observers) for Shortfin mako shark with more than 200 fish samples by fishery available after conversion of raw size data into fork length when required.

Spatial information on mako sharks catches

Geo-referenced catches of sharks and rays are reported both in number of fish and total weight, and generally represent only a subset of the annual retained catches reported by fleet and gear for each species. Due to the general lack of information on the size composition of the catch, these cannot be converted into a common unit and therefore spatial distribution maps of catches are provided both in numbers and in weight. Overall, the distribution of the catches of sharks and rays shows the increasing improvements of data reporting over time, with data becoming available for more shark and ray species from an increasing number of CPCs and fisheries over the last four decades.

During the 1980s and 1990s, most spatial information available on retained catches of sharks and rays came from longliners of Taiwan,China and Korea, and from gillnetters of Pakistan . All nominal catches reported during the 1980s were aggregated sharks (SKH) while catches started to be reported at species and genus levels throughout the 1990s for blue shark (BSH), oceanic whitetip shark (OCS), silky shark (FAL), shortfin mako (SMA), thresher sharks (THR), and hammerhead sharks (SPN).

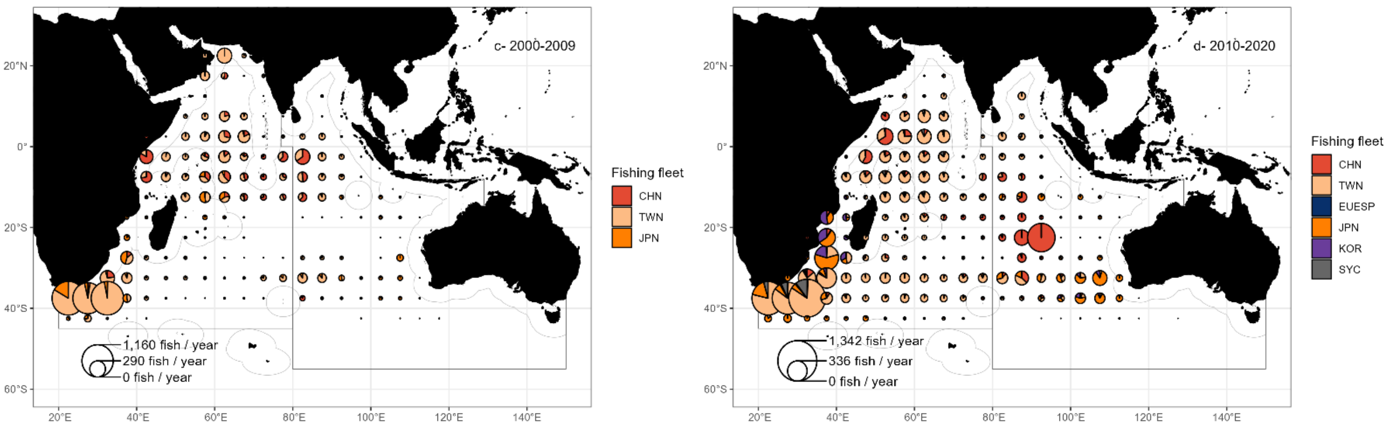


Figure 11: Mean annual retained catches by number of sharks and rays by fleet and decade reported to the Secretariat covering the period 2000-2020.

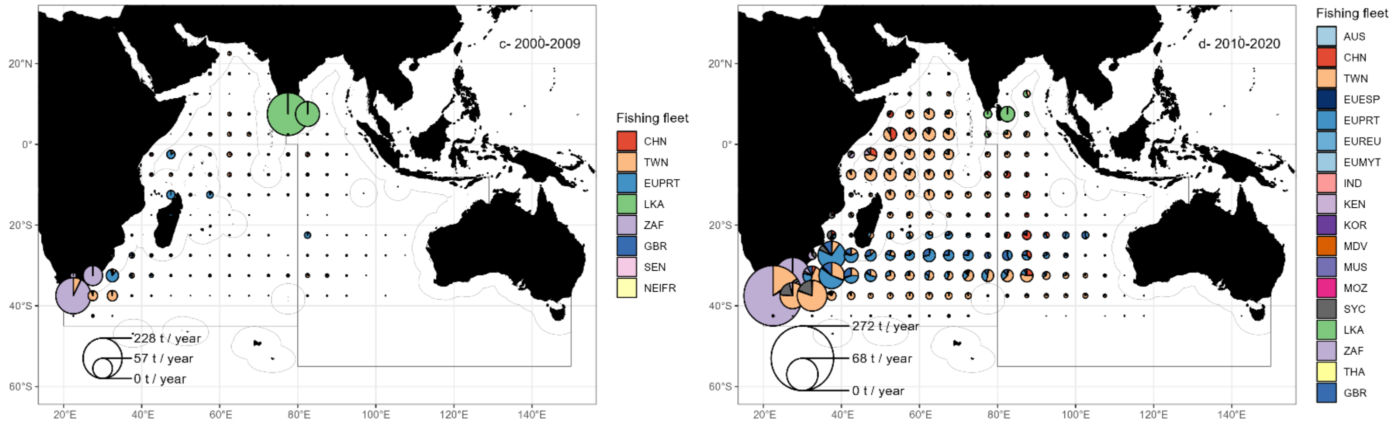


Figure 12: Mean annual retained catches by weight (metric tonnes; t) of mako sharks by fleet and decade reported to the Secretariat covering the period 2000-2020.

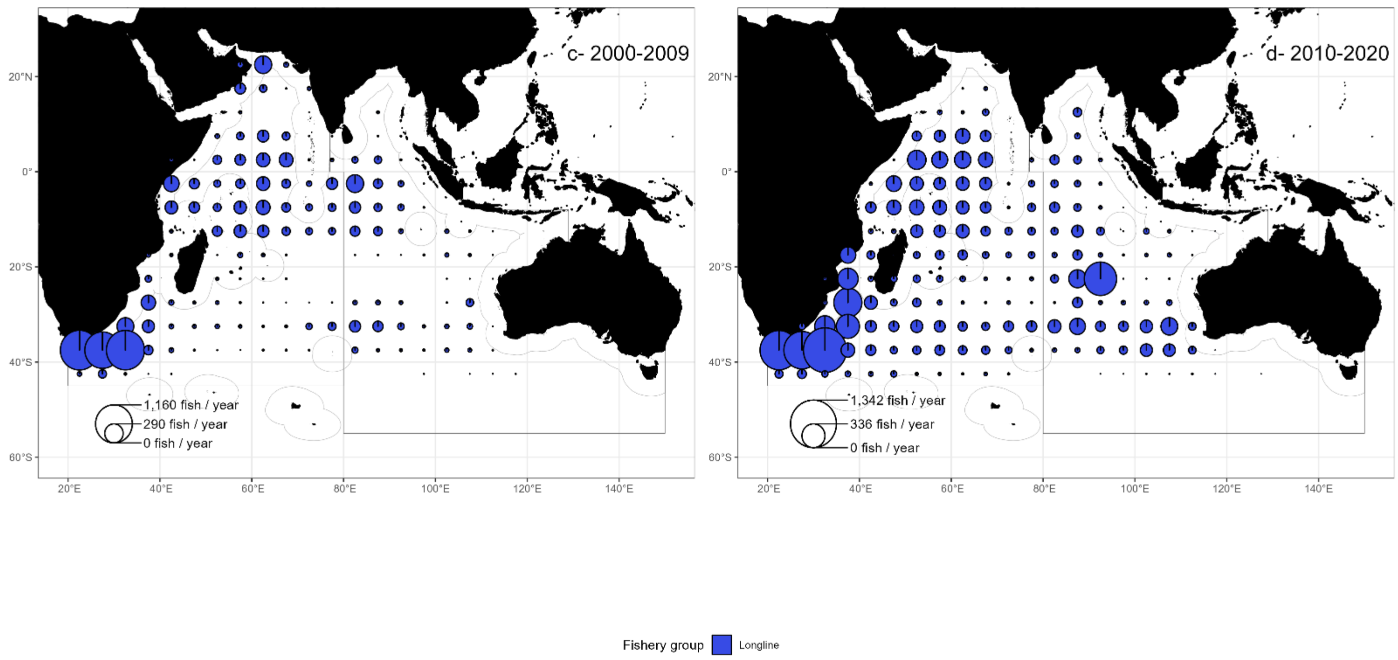


Figure 13: Mean annual retained catches by number of mako sharks by fishery and decade reported to the Secretariat covering the period 2000-2020.

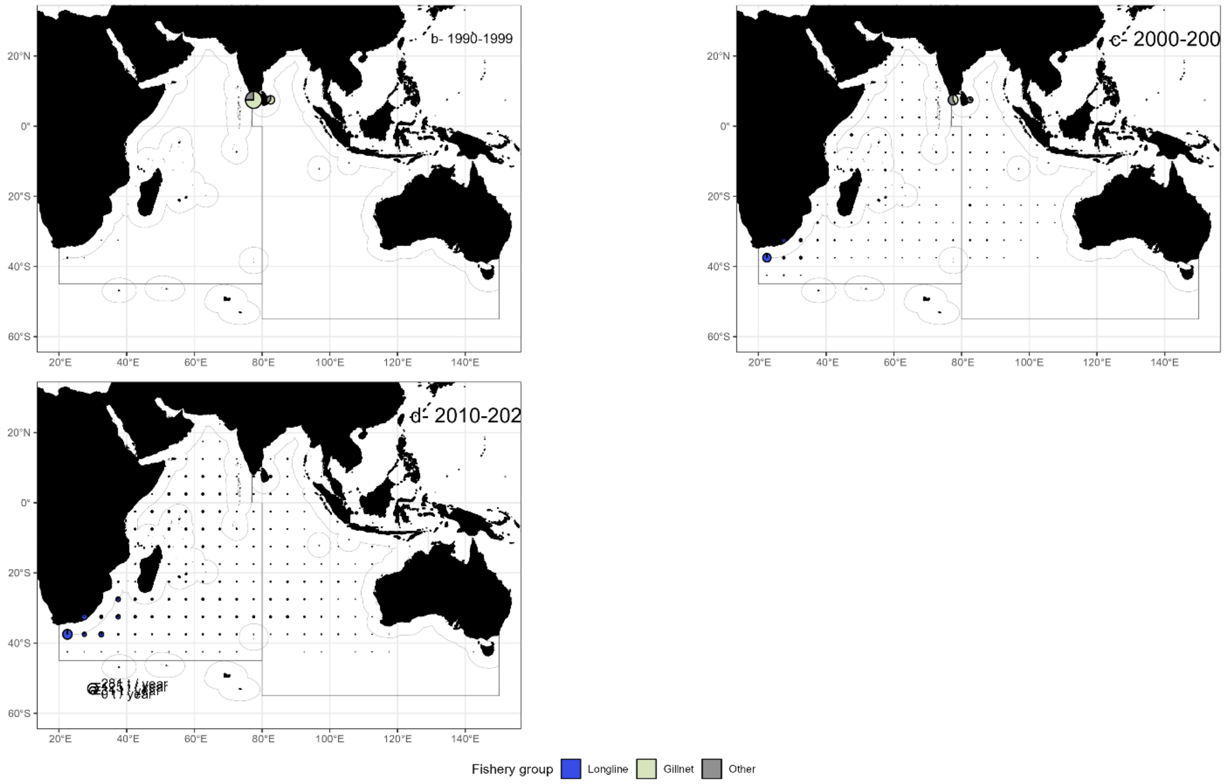


Figure 14: Mean annual retained catches by weight (metric tonnes; t) of mako sharks by fishery and decade reported to the Secretariat covering the period 2000-2020.

Uncertainties in catch and effort data

The estimation of catch and effort for sharks and rays in the Indian Ocean is compromised by the paucity and inaccuracy of the data originally reported by some CPCs.

Unreported catches

Although some fleets have been operating since the early 1950s, there are many cases where historical catches have gone unreported as many countries were not collecting fishery statistics in years prior to the 1970s. It is therefore thought that important catches of sharks and rays might have gone unrecorded in several countries. Also, there still are several fleets not reporting on their interactions with bycatch species, despite data showing that other fleets using similar gears and with comparable fishing patterns report high catch rates of bycatch species.

Some fleets have also been noted to report catches only for those species that have been specifically identified by the Commission and do not report catches of other species, not even in aggregate form: this creates problems for the estimation of total catches of all sharks and rays and hinders the possibility of further disaggregating catches originally provided as species groups.

Errors in reported catches

For the fleets that do report interactions, there still are several issues with estimates of total volumes of biomass caught. In fact, reported data tend to refer only to retained catches rather than total catches, with discard levels that are often severely under-reported or not available at all. While IOTC Res. 15/02 explicitly calls for the provision of discard data for the most commonly caught elasmobranch species, very little information has been received so far by the Secretariat. To date the EU (Spain and UK prior to BREXIT), Japan and Taiwan,China, have not provided estimates of total discards of sharks by species for their longline fisheries, although all are now reporting discards in their observer data. As for industrial purse seine fisheries, I.R. Iran, Japan, and Thailand have not provided estimates of total quantities of discards of sharks and rays by species for industrial purse seiners under their flag. EU,Spain and Seychelles are now reporting discards in their observer data and EU,Spain reported total discards for its purse seine fleet in 2018.

Errors are also introduced by the processing of retained catches undertaken at national level: these create further problems in the estimation of total weight or numbers, as sometimes dressed weight might be recorded instead of live weights. For high levels of processing such as finning, where the carcasses are not retained, the estimation of total live weight is extremely difficult and prone to errors.

Poor data resolution

Historically, shark catches have not been reported by species but simply as an aggregated total. Misidentification of shark species is also common, and additional data processing might introduce further problems related to proper species identification requiring a high level of expertise and experience to be able to accurately identify specimens. The level of reporting by gear type is much higher, and catches reported as allocated to gear aggregates are now a smaller proportion of the total.

Catch and effort data

For all aforementioned reasons, geo-referenced catch and effort data sets available at the Secretariat for shark and ray species are of poor quality overall, with very little information available to derive time series of abundance indices that are essential for conducting stock assessments.

Catch estimation process

For some fisheries characterized by outstanding issues in terms of data collection and management, the composition of the catch may be derived from a data processing procedure that relies on constant proportions of the catch assigned to shark species over time (e.g., Moreno et al. 2012). Also, revisions of historical data aimed at estimating species-specific time series of catch may rely on assumptions of constant species composition (e.g. Kai 2021), although more complex approaches exist (Martin et al. 2017). The use of constant catch proportions conceals the variability in catches inherent to changes in abundance and catchability and strongly depends on the original samples used for the processing. Recently, a revision of gillnet catches by Pakistan from 1987-2018 has impacted the mean shark catches of the CPC to the point where these are close to negligible, whereas they previously accounted for the second highest mean annual catch from all CPCs (IOTC 2019).

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Appendices

Appendix I: Morphometrics for pelagic sharks of the Indian Ocean

Table 9: Summary of length-length relationships available for some pelagic sharks of the Indian Ocean. PCL = Precaudal length (cm); FL = fork length (cm); TL = total length (cm)

Species	Equation	a	b	N	MinFL	MaxFL	Reference
Blue shark	TL=a+b*FL	-2.133820	1.2165450	10			Anderson et al. 2011
	PCL=a+b*FL	-0.831809	0.9145784				Coelho et al. 2017
	TL=a+b*FL	-4.417651	1.2172855				
	TL=a+b*FL	5.319706	1.1680878	6,485	68	352	Ariz et al. 2007
Silky shark	TL=a+b*FL	2.900000	1.2000000	265			Filmalter et al. 2012
	PCL=a+b*FL	0.400000	0.9090909	214			
	TL=a+b*FL	4.404965	1.2168411	192			Anderson et al. 2011
	TL=a+b*FL	10.136700	1.1436000	520	66	247	Ariz et al. 2007

Table 10: Summary of length-weight relationships available for some pelagic sharks of the Indian Ocean. FL = fork length (cm); RD = round weight (kg); HG = dressed weight (kg)

Species	Equation	a	b	N	MinFL	MaxFL	Reference
Blue shark	RD=a*FL^b	0.00001590000	2.84554	2,842	57	311	Romanov and Romanova 2009
	RD=a*FL^b	0.00000279680	3.16970	2,279	81	298	Ariz et al. 2007
	HG=a*FL^b	0.00000040189	3.36200	2,129	82	352	
	HG=a*FL^b	0.00000160945	3.09904	289	150	260	Garcia-Cortés and Mejuto 2002
	HG=a*FL^b	0.00000190163	3.07615	164	93	253	Espino et al. 2010
Silky shark	RD=a*FL^b	0.00001600000	2.91497	687	66	281	Romanov and Romanova 2009
	RD=a*FL^b	0.00000472550	3.17710	369	66	244	Ariz et al. 2007
	HG=a*FL^b	0.00001297700	2.83230	94	97	269	
	HG=a*FL^b	0.00001132940	2.91484	411	50	220	Garcia-Cortés and Mejuto 2002
Oceanic whitetip shark	RD=a*FL^b	0.00001842800	2.92450	93	57	219	Ariz et al. 2007
	HG=a*FL^b	0.00008043100	2.44780	131	94	243	
	HG=a*FL^b	0.00000298446	3.15417	567	65	215	Garcia-Cortés and Mejuto 2002
Shortfin mako	RD=a*FL^b	0.00003490000	2.76544	906	70	342	Romanov and Romanova 2009
Bigeye tresher	RD=a*FL^b	0.00001413000	2.99565	185	110	256	Romanov and Romanova 2012
Tiger shark	RD=a*FL^b	0.00002614000	2.82374	676	50	351	
Great hammerhead	RD=a*FL^b	0.00000293000	3.23475	143	107	335	
Scalloped hammerhead	RD=a*FL^b	0.00002101000	2.88029	197	94	257	