Assessing the Contribution of Purse Seine Fisheries to Overall Levels of Bycatch in the Indian Ocean

Alberto Garcia[1] & Miguel Herrera[2]

Abstract

Principle 2 of the Fishery Improvement Project run by the Producers' Organization OPAGAC contains actions intended to assess the environmental impacts of OPAGAC's purse seine fleet in the three oceans, which include the evaluation of the contribution of purse seine fisheries to overall levels of bycatch mortality in the Indian Ocean with a focus on endangered, threatened and protected species. This study represents a first attempt at evaluating impacts in the Indian Ocean in recent years. A broad and diverse range of fisheries operate in the Indian Ocean for which, in addition, data on bycatch are very poor quality or completely lacking. This study used a wide range of data sources to produce estimates for the major bycatch stocks identified by the IOTC, including sharks, marine turtles and marine mammals. According to the estimates from this study the purse seine fishery in the Indian Ocean is responsible for just 0.15% of the fishing mortality of sharks, 0.16% of whale sharks, nil of marine mammals, and 0.3% of marine turtles. By species, the silky shark is the most important bycatch species for purse seiners, although levels of fishing mortality are still very low, at 1.3% of the total. On the contrary, gillnet, driftnet, fresh-tuna and deep-freezing longline fisheries are responsible for most of the bycatch mortality of the three groups. However, the uncertainty of estimates for longline and gillnet fisheries, mainly for whale, sharks, marine mammals and marine turtles, is high due to nil or very poor levels of observer coverage in many fleets, insufficient reporting requirements, poor data quality, and little information available from other sources. The IOTC needs to urgently address those issues to be able to ensure bycatch stocks are assessed within reasonable levels of uncertainty and management advice leads to informed management decisions in the future.

Introduction

In September 2016 the purse seine fleets under the Producers' Organisation OPAGAC and the Association AGAC signed a Memorandum Of Understanding[3] with the World Wide Fund for Nature (WWF) for the implementation of a Fishery Improvement Programme (FIP), intended to facilitate Certification of the OPAGAC-AGAC (hereafter OPAGAC) Fishery with the Marine Stewardship Council (MSC), by or before the year 2021. The OPAGAC FIP (hereafter FIP) covers the three oceans and areas of competence of four RFMOs including the Indian Ocean Tuna Commission[4].

Principle 2 of the FIP is intended for the OPAGAC fleet to reduce or eliminate the environmental impacts its activities cause on non-target species and the habitat, to be achieved through the implementation of concrete actions, as identified by an independent MSC accredited consultant, with the assistance of a FIP Advisory Body.

The purpose of this document it to address some of the actions identified in the FIP Action Plan, mainly those intended to evaluate the impact of the OPAGAC Fishery over stocks of non-target species, with a focus on bycatch, and endangered, threatened and protected species (ETP as per MSC's definition) in the Indian Ocean. However, it is not possible to evaluate the contribution that the OPAGAC Fishery in the Indian Ocean makes over the total harvest of bycatch and ETP stocks unless the impact of other fisheries over those same stocks is

[1] Independent Consultant
[2] Deputy Manager (Sustainability) OPAGAC; corresponding author miguel.herrera@opagac.org
[3] https://fisheryprogress.org/system/files/documents_mou/MOU%20FIP%20OPAGAC-WWF%202016_0.pdf
[4] https://fisheryprogress.org/fip-profile/indian-ocean-tropical-tuna-purse-seine-opagac

assessed. Unfortunately, the IOTC databases contain very poor data on interactions of IOTC fisheries with sharks, marine mammals, marine turtles, and seabirds, and the same applies to data on catches, effort, length or any other biological data for such stocks. The first two sections of this paper present IOTC's management framework for bycatch species and main data gaps identified concerning such standards and the way IOTC Contracting and Cooperating Non-contracting Parties are fulfilling data requirements.

The focus of the present study is assessing recent levels of bycatch and discards for IOTC fisheries, for the main stocks of sharks, marine turtles and marine mammals, in particular for those stocks for which the IOTC has adopted specific measures. Details about the fisheries and stocks covered in this document are provided in the next section of the paper.

The following section summarises the main data gaps that exist in the IOTC databases concerning stocks that are not the target of IOTC Fisheries, sharks, marine mammals and marine turtles, mainly as a consequence of poor observer coverage or data management on the side of many IOTC CPC. This is the reason why the data in the IOTC databases is incomplete and compromises any attempt at estimating overall levels of bycatch for many IOTC fisheries.

The next section introduces the procedures used to estimate levels of bycatch for each fleet, including the type of data sources and information that was used to produce the estimates and the type of calculations that were required. This involved, in most cases, using various approaches to raise estimates, especially for those fisheries for which data were lacking, incomplete, highly aggregated, poor quality, or a combination of two or more of the previous.

The results are presented in the following section both by main stock or species group and by main fishery. This section presents the results in aggregated form rather than estimates for each individual fleet or how those estimates were put together, which is detailed in **Annex I**. Where possible, alternative estimates are also presented in **Annex I** as an attempt to assess likely levels of uncertainty.

Finally, the discussion and conclusion sections summarize the main findings of this work, including the relative importance of the different fleets in terms of contribution to levels of bycatch, with a view to assist in the prioritization of further research; the main problem areas identified; and actions that could be undertaken to address the issues identified.

This work updates previous work on sharks carried out by Hilario et al. (2013) and Clarke (2014), and is a preliminary attempt to assess the likely levels of bycatch and discards of marine mammals and turtles for the main IOTC fisheries in recent years.

Review of IOTC standards related to bycatch

Although the IOTC Agreement does not contemplate explicitly the Precautionary Approach to Fisheries Management or requires that the Commission take into consideration the impact of fishing on the broader ecosystem, or the ecosystem itself, the Commission has in reality accounted for those principles through the adoption of Resolutions and Management actions[5]; and the inception of an IOTC Working Party on Ecosystems and Bycatch (WPEB), which reports its advice to the Commission through the IOTC Scientific Committee (IOTC-2017-SC20-INF2[6]).

The main purpose of the WPEB is *"To review and analyse matters relevant to bycatch, byproduct and non-target species which are affected by IOTC fisheries for tuna and tuna-like species (i.e.* ***sharks, marine turtles,***

[5] http://www.iotc.org/sites/default/files/documents/compliance/IOTC%20-%20Compendium%20of%20ACTIVE%20CMMs%2001%20December%202017.pdf
[6] http://www.iotc.org/sites/default/files/documents/2017/11/IOTC-2017-SC20-INF02.pdf

seabirds, marine mammals and other fishes*), as well as the ecosystems in which they operate; and to develop mechanisms which can be used to better integrate ecosystem considerations into the scientific advice provided by the Scientific Committee to the Commission."*[7] For this, the IOTC has adopted measures related to: data collection and monitoring (R15-01[8]; R15-02[9]; R11-04[10]; R16-04[11]; R05-03[12]; R16-11[13]; R17-06[14]); mitigation of impacts on the ecosystem, through bans on discards of certain species (R17-04[15]) or wasteful practices (R17-05[16]); or mitigation, through the implementation of effort limits (R03-01[17]; R15-11[18]; R17-08[19]); bans or changes to certain gear configurations (R16-07[20]; R16-08[21]; R12-12[22]; R17-07[23]; R12-06[24]); bans on fishing operations (R13-04[25]; R13-05[26]); bans on the retention of some stocks and guidelines for the safe release of incidental catches (R13-06[27]; R12-04[28]; R12-09[29]).

Table 1 shows the species of bycatch covered in the above measures. As indicated in the previous paragraph (bold font) the IOTC WPEB covers stocks of sharks, marine mammals, marine turtles, seabirds, and stocks of marine fishes other than those listed in the IOTC Agreement. IOTC Resolution 15-01 *On the recording of catch and effort data by fishing vessels in the IOTC area of competence* is the only measure that contains the names of bycatch species, genus, or groups for which data must be reported to the IOTC Secretariat. However, this refers to logbooks and does not preclude IOTC CPC from collecting other information, i.e. through the implementation of the IOTC Regional Observer Scheme (R11-04). Bycatch data are also collected in port (R16-11) and at-sea (R17-06), although those records relate only to that part of the bycatch retained on board, not including discards.

However, as shown in **Table 1** in the fishery statistics section, there is not a single bycatch species or species group for which all fisheries are obliged to report catches and discards. This hampers the work of the IOTC as,

[7] http://www.iotc.org/science/wp/working-party-ecosystems-and-bycatch-wpeb
[8] Resolution 15/01 On the recording of catch and effort data by fishing vessels in the IOTC area of competence
[9] Resolution 15/02 Mandatory statistical reporting requirements for IOTC Contracting Parties and Cooperating Non-Contracting Parties (CPCs)
[10] Resolution 11/04 On a regional observer scheme
[11] Resolution 16/04 On the implementation of a pilot project in view of promoting the regional observer scheme of IOTC
[12] Resolution 05/03 Relating to the establishment of an IOTC programme of inspection in port
[13] Resolution 16/11 On port state measures to prevent, deter and eliminate illegal, unreported and unregulated fishing
[14] Resolution 17/06 On establishing a programme for transhipment by large-scale fishing vessels
[15] Resolution 17/04 On a ban on discards of bigeye tuna, skipjack tuna, yellowfin tuna, and non-targeted species caught by purse seine vessels in the IOTC area of competence
[16] Resolution 17/05 On the conservation of sharks caught in association with fisheries managed by IOTC
[17] Resolution 03/01 On the limitation of fishing capacity of Contracting Parties and Cooperating Non-Contracting Parties
[18] Resolution 15/11 On the implementation of a limitation of fishing capacity of Contracting Parties and Cooperating Non-Contracting Parties
[19] Resolution 17/08 Procedures on a fish aggregating devices (FADs) management plan, including a limitation on the number of FADs, more detailed specifications of catch reporting from FAD sets, and the development of improved FAD designs to reduce the incidence of entanglement of non-target species
[20] Resolution 16/07 On the use of artificial lights to attract fish
[21] Resolution 16/08 On the prohibition of the use of aircrafts and unmanned aerial vehicles as fishing aids
[22] Resolution 12/12 To prohibit the use of large-scale driftnets on the high seas in the IOTC area
[23] Resolution 17/07 On the prohibition to use large-scale driftnets in the IOTC area
[24] Resolution 12/06 On reducing the incidental bycatch of seabirds in longline fisheries
[25] Resolution 13/04 On the conservation of cetaceans
[26] Resolution 13/05 On the conservation of whale sharks (*Rhincodon typus*)
[27] Resolution 13/06 On a scientific and management framework on the conservation of shark species caught in association with IOTC managed fisheries
[28] Resolution 12/04 On the conservation of marine turtles
[29] Resolution 12/09 On the conservation of thresher sharks (family Alopiidae) caught in association with fisheries in the IOTC area of competence

in lack of observer data, overall retained and discarded levels of bycatch cannot be estimated for any species using the data available. Therefore, reporting standards are poor because the IOTC has not selected a core group of bycatch species for which all fisheries should report retained catch and discards, as part of their routine reports (R15-02).

In addition, the reporting standards for the Regional Observer Scheme (ROS) are poor because bycatch levels per unit of observed effort cannot be estimated from the data in the IOTC database, at least for purse seine and longline fisheries, regardless of detailed information being routinely collected by observers. As for the adopted 5% level of coverage, it is well below the minimum level recommended by the scientific community, which are at 20% (SCRS/2015/115[30]; SCRS/2012/092[31]; COMM-04-INF-04[32]).

Main data gaps

Despite all the requirements adopted and the fact that the Regional Observer Scheme (ROS) has been in place since 2011, most IOTC CPCs have systematically failed to provide the IOTC Secretariat with estimates of total bycatch; or observer reports from which bycatch levels can be assessed (IOTC–2017–WPEB13–07[33]). This is a consequence of insufficient reporting standards, poor reporting levels, and very low levels of observer coverage, with most fleets not even complying with the minima levels adopted by the Commission (R11-04, observers/port samplers shall cover a minimum of 5% of the fishing operations/trips of each CPC and fishery).

Only some fisheries report bycatch at levels at or above those adopted by IOTC, including France and Portugal (longline) and France, Spain and Mauritius (purse seine). In 2016, average levels of coverage were at 11% for purse seiners and 1% for longliners, the latter well below levels adopted by the Commission. Observer coverage for other fisheries is even lower, or nil (IOTC-2017-SC20-07 Rev_1[34]).

Document IOTC–2017–WPEB13–07 presents the main data gaps existing in the IOTC database concerning data on sharks, marine mammals, marine turtles, and seabirds, in particular:

- For Sharks, data not reported by many IOTC CPC or reports are highly incomplete (e.g. no discards reported, catches aggregated, distribution of catches unknown, effort levels unknown, lack of biological data) or inaccurate (e.g. problems with species identification, species distribution not representative of the fishery, etc.);
- For Marine Mammals, Marine Turtles and Seabirds the data reports are extremely poor, or information is too patchy and not submitted according to IOTC data reporting procedures.

On the other hand, the completeness and quality of data issuing from the IOTC ROS is very poor, as expressed through the levels of observer coverage indicated before. In addition, where available, observer data cannot be readily used, for the reasons indicated in document IOTC-2017-SC20-07 Rev_1: *Where observer programmes have been established, these are wide ranging and highly variable in the type and quality of information collected and the reporting of data to IOTC standards remains poor and so the data that are submitted and stored regionally are currently of little value*. The main issues can be summarised as follows:

[30] https://www.iccat.int/Documents/CVSP/CV072_2016/n_8/CV072081975.pdf
[31] https://www.iccat.int/Documents/CVSP/CV069_2013/n_5/CV069052220.pdf
[32] https://www.sprfmo.int/assets/Meetings/Meetings-2013-plus/Commission-Meetings/4th-Commission-Meeting-2016-Valdivia-Chile/COMM-04-INF-04-Observer-Programmes-of-RFMOs.pdf
[33] http://www.iotc.org/sites/default/files/documents/2017/08/IOTC-2017-WPEB13-07.pdf
[34] http://www.iotc.org/sites/default/files/documents/2017/12/IOTC-2017-SC20-07E_Rev_1-_ROS_update.pdf

Table 1. Bycatch species, genus or species groups for which the IOTC has set data collection or reporting requirements, through the adoption of Resolutions, in particular Resolution 15-01 On the recording of catch and effort data by fishing vessels in the IOTC area of competence. All those stocks or groups of stocks that have been identified in the OPAGAC FIP as secondary species or Endangered, Threatened and Protected species are recorded **in bold** with those specific to the IOTC Area of competence having **IOTC** as superscript to the species name. Bycatch data have to be recorded in **Weight** or **Number** and IOTC CPC are **O**bliged to report data on some bycatch while reporting for other bycatch is **V**oluntary, depending on the fishery (**L**ong**L**ine, **P**urse **S**eine, **GI**llnet, **B**ait**B**oat and **OT**her, which refers to handline and trolling). The column **In Doc.** refers to the way in which catch estimates for each bycatch species/genus/group are recorded in this document, expressed through the IOTC Code (**NO** means that catches have not been considered). The column **IOTC Management** includes the measures currently in place (other than data collection), with details provided below the table.

IOTC Code	Species (*latin name*) / [Group]	Fishery Statistics						In Doc.	IOTC Management
		Record in	LL	PS	GI	BB	OT		
SSP	Shortbill spearfish (*Tetrapturus angustirostris*)	Weight	O		O			NO	
BSH	Blue shark (*Prionace glauca*)	Weight	O		O			BSH	R17-05
MAK	Mako sharks (*Isurus spp.*)	Weight	O		O			MAK	R17-05
POR	Porbeagle shark (*Lamna nasus*)	Weight	O		O			POR	R17-05
SPN	Hammerhead sharks (*Sphyrna spp.*)	Weight	O		O			SPN	R17-05
THR	**Thresher sharks (*Alopias spp.*)** [IOTC]	Weight	O	O	O			THR	R17-05; R13-09
FAL	**Silky shark (*Carcharhinus falciformis*)**	Weight	O	O				FAL	R17-05
OCS	**Oceanic whitetip shark (*Carcharhinus longimanus*)** [IOTC]	Weight	O	O	O			OCS	R17-05; R13-06
TIG	Tiger shark (*Galeocerdo cuvier*)	Weight	V		V			SKH	R17-05
PSK	Crocodile shark (*Pseudocarcharias kamoharai*)	Weight	V		V			PSK	R17-05
WSH	**Great white shark (*Carcharodon carcharias*)**	Weight	V					SKH	R17-05
RHN	**Whale sharks (*Rhincodon typus*)** [IOTC]	Number		O	O			RHN	R17-05; R13-05
MAN	**Mantas and devil rays (Mobulidae)**	Weight	V	V	V			MAN	R17-05
PLS	Pelagic stingray (*Pteroplatytrygon violacea*)	Weight	V		V			PLS	R17-05
SRX	Other rays	Weight	V	V	V	O	O	NO	R17-05
SKH	Other sharks	Weight	O	V	O	O	O	SKH	R17-05
MZZ	Other bony fishes	Weight	O	V	O	O	O	NO	R17-04
MAM	**Marine Mammals**[IOTC]	Number	O	O	O			MAM	R13-04
TTX	**Marine turtles**[IOTC]	Number	O	O	O	O	O	TTX	R12-04
	Seabirds*	Number	O		O			NO	R12-06

***** When a CPC is fully implementing the observer program the provision of seabird data is optional (V)

R17-05 Calls for landing of shark carcasses and fins to avoid waste

R17-04 Prohibits discards of some species by PS

R13-06 Prohibits retention onboard, transhipping and unloading of oceanic whitetip shark and calls for all parties to report interactions from all gear types to the IOTC (not binding to India following an objection)

R13-05 Prohibits intentional encircling of whale sharks using purse seines and calls for all parties to report interactions from all gear types to the IOTC and implement mitigation techniques

R13-04 Prohibits intentional encircling of marine mammals using purse seines and calls for all parties to report interactions from all gear types to the IOTC and implement mitigation techniques

R12-09 Prohibits retention onboard, transhipping and unloading of thresher sharks and calls for all parties to report interactions from all gear types to the IOTC

R12-06 Calls for all parties to report interactions from all gear types to the IOTC and implement measures to reduce mortality, through changes in gear configuration

R12-04 Calls for all parties to report interactions from all gear types to the IOTC and implement measures to reduce mortality, through changes in gear configuration and safe release

- Most of the observer data reported to the IOTC Secretariat is not in a user-friendly format requiring substantial data handling and verification prior to it being input in the IOTC databases. As of May 2018, the only observer data that the IOTC Secretariat was able to provide for analysis in highly aggregated electronic format referred to datasets for EU purse seiners and Japan longliners, covering a limited number of years. Little data are available for artisanal fisheries and, where available, it is inaccurate and not in a user-friendly format (e.g. not in electronic format).
- Although the observer data provided by the IOTC Secretariat in May 2018 contained both catch and effort in aggregated form for Japan longliners and EU purse seiners, the effort data provided referred to total effort for the trip rather than the actual effort monitored by observers. Therefore, it could not be used to derive bycatch rates for these fleets.

The IOTC collects also information from Inspection in Port and Transhipments (IOTC-2017-CoC14-04a & b[35]), through the IOTC Port Inspection (R05-03) and Transhipment Programs (R17-06). However, the information collected refers only to industrial fisheries, especially longline, and covers just retained bycatch. These data are not in the public domain. However, data are incomplete as it can only be used to assess the bycatch of sharks that is retained onboard.

Therefore, although the IOTC has adopted several measures that call for IOTC CPC to report data on bycatch for their own and/or foreign fleets, the data available are largely incomplete and, where available, of very poor quality. Therefore, the levels of bycatch recorded in the IOTC databases cannot be relied upon and the estimation of total levels of bycatch requires the use of alternative sources, as explained in the following section.

Fisheries, species time-period, area, and fleets covered by the study

Bycatch species covered

Table 1 (column *In Doc.*) contains the species or species groups covered in this paper and when data are presented by species, genus or group. However, where possible catch estimates are presented by species, for individual countries (**Annex I**), or fisheries (**Results** section).

Some bycatch groups are not covered in this document including marine fishes (other than IOTC species, sharks or rays), and seabirds. The main reasons for this are: (i) there is very little information available on the levels of bycatch of marine fishes from IOTC fisheries; (ii) although the catch rates of some bycatch species of marine fish may be important for a fishery (e.g. oilfish in some longline fisheries; triggerfish in purse seine fisheries), that fishery tends to account for the majority of the impact on those species and therefore the contribution of other fisheries to the fishing mortality becomes irrelevant; (iii) the impact of fisheries over some of the stocks of marine fish bycatch of IOTC fisheries is not limited to such fisheries, which compromises any attempt at estimating the contribution of IOTC fisheries to the total catches of those species (e.g. coastal purse seiners may target small pelagics but catch also some of the bycatch species IOTC fisheries take and data for non-IOTC fisheries is generally poor or unavailable); (iv) the majority of the bycatch of seabirds occurs in southern waters, beyond the area of operation of purse seiners, and seabird bycatch in purse seine fisheries is extremely rare or nil.

The species marked in bold in **Table 1** are those that have been identified by the OPAGAC global FIP as important bycatch species. Those include secondary and Endangered, Threatened or Protected species, as per the criteria established by the Marine Stewardship Council (MSC). Rather than limiting to those bycatch

[35] http://www.iotc.org/sites/default/files/documents/2017/04/IOTC-2017-CoC14-04a_E_-_Report_on_Transhipments.pdf; http://www.iotc.org/documents/summary-iotc-regional-observer-programme-during-2016-%E2%80%93-contractor%E2%80%99s-report

species for this review, or just to those bycatch stocks identified for the OPAGAC purse seine fishery in the IOTC Area (species having IOTC as superscript in **Table 1**), this work covers most of the bycatch species in **Table 1**, as previously indicated.

Area covered

This study covers the whole of the IOTC Area, even though purse seine fisheries in the Indian Ocean tend to limit their activity to the Western tropical and subtropical waters. The reason for having selected the whole IOTC Area is that the stock structure of most stocks of bycatch in the Indian Ocean is unknown, in which cases the usual approach is to consider that each species represents a single stock in the whole management area. However, the impact of the purse seine fishery will need to be revised in the future should new research identify more than one stock in the Indian Ocean for one or more of the bycatch species covered here.

Time-period covered

The main goal of this review is to assess the contribution of purse seine fisheries to overall levels of fishing mortality in recent years, in order to be able to determine the importance of the impact of purse seiners on those species that have been identified by the OPAGAC FIP. Therefore, rather than presenting estimates over a time-series, this work presents a snapshot of bycatch levels for each fishery in recent years, i.e. the bycatch levels presented refer to average values estimated for the period 2014-16.

Table 2. Fisheries Covered (X) and not covered in this study, by range of operation

NOTE: For country codes refer to the IOTC Nominal Catch Database. Numbers in brackets in Other refer to the number of fleets involved

Fishery	Range	Fleet	Covered
Purse Seine	Coastal	EGY, IDN, IND, JOR, MMR, MOZ, MYS, SAU, SDN, THA, TZA	
	High-seas	EU.ESP, EU.FRA, EU.ITA, IRN, JAP, KOR, MUS, SYC	X
	High-seas	AUS	
Longline	Coastal	EU.REU, IDN, MDV, LKA, IND	X
	Coastal	IRN, SAU	
	Fresh-tuna	CHN, IND, IDN, MYS, NEI, LKA, TWN	X
	Swordfish	AUS, EU.FRA, EU.REU, EU.POR, EU.ESP, UK, MDG, MUS, MOZ, SYC, ZAF	X
	Deep-freezing	CHN, IND, IDN, JAP, KOR, MDV, NEI, OMN, SYC, TWN, TZA, THA	X
Gillnet	Coastal	ARE, AUS, BGD, ERI, SAU, COM, KEN, MOZ, PAK, IRN, YMN, TZA, OMN, IND, IDN, LKA, MYS, THA	X
	Coastal	BHR, DJI, KWT, QAT, MMR, TMP, EGY, JOR, SDN	
	High-seas	IRN, LKA, PAK(?)	X
Pole-and-line	Coastal	AUS, MDV, IND, IDN, LKA	
Other Coastal	Handline	AUS, BHR, COM, EGY, EU.FRA, EU.REU, GBRT, IDN, IND, JOR, KEN, LKA, MDV, MOZ, MUS, OMN, SAU, SDN, SYC, TMP, TZA, YEM	
	Trolling	ARE, AUS, BHR, COM, EGY, EU.FRA, EU.REU, IDN, IND, IRN, JOR, KEN, MDG, LKA, MDV, MMR, MOZ, MYS, MUS, OMN, SAU, SDN, TMP, TZA, YEM	
	Sport & Recreational	MOZ, ZAF, AUS	
	Other	BHR, IDN (7), IND (3), LKA (4), MMR (2), MOZ, MYS, OMN (3), SAU (2), THA	

Fisheries and fleets covered

The fisheries covered in this study and the fleets for which recent bycatch levels were estimated are presented in **Table 2**. Fleets under each fishery are classified according to their area of operation, limited to *Coastal* waters (EEZ) or operating also, or exclusively, beyond coastal waters (*High-seas*).

This document covers the entirety of the fleets using purse seine, longline, gillnet and pole-and-line fisheries, whenever those fisheries have reported catches of one or more of the core group of IOTC market species selected, including yellowfin tuna, bigeye tuna, skipjack tuna, albacore, and swordfish. The impact of some minor coastal fisheries over the bycatch species covered in this study is not accounted for. This is because those fisheries do not catch any of the five stocks referred to above (e.g. only catch neritic tunas and/or seerfish), and the bycatch that those fisheries take is likely to include species of coastal sharks or rays not covered in this study, as they are no reported interactions with industrial tuna purse seine fisheries; in addition, coastal sharks may be also caught by fleets that are not directed at IOTC species (e.g. trawl fisheries). However, it should be noted that India and Indonesia report the highest catches of sharks in the world and coastal sharks, rays and skates represent most of those catches. Catches of pelagic sharks may also occur in some sport and recreational fisheries (e.g. Australia) but they are equally not included in this study.

While not all the coastal fisheries of India and Indonesia have been excluded from the study and those remaining are not likely to catch significant amounts of the pelagic shark species recorded in **Table 1**, the catches of marine turtles in coastal waters may be very significant. Thus, the catches of marine turtles presented in this paper do not account for the catches of some coastal fisheries or for other important sources of anthropogenic mortality, like poaching at beaching sites, etc.

Data sources and procedures used for the estimation of levels of by-catch

The present work was carried out as a desk study. The authors attempted to consult as many sources as possible to produce the estimates of levels of bycatch of sharks, marine mammals and marine turtles that are presented in this paper for the IOTC fisheries, in particular:

Data from IOTC databases

Data on **incidental catches of sharks, marine mammals and marine turtles** covered in the study: Several IOTC databases contain information on retained catches and discards of the bycatch stocks covered in this paper:

- **Nominal Catches**[36]: These only include some catches of sharks that IOTC CPCs report to the IOTC or, in some cases, catches estimated by the IOTC Secretariat. Data refers only to retained catches, are very incomplete and highly aggregated, with the majority of catches recorded under the Shark NEI category (SKH) or other aggregates. Some data from this database was used for this study.
- **Discards**: Although the IOTC adopted a requirement long ago for the reporting of data on discards, the majority of IOTC CPC do not report this information and the scarce data available is not in the public domain[37]. Therefore, this study did not use data from this record.

[36] http://www.iotc.org/documents/nominal-catch-species-and-gear-vessel-flag-reporting-country, downloaded 15 March 2018

[37] According to the IOTC Secretariat *Estimates of levels of discards are not available for all fleets and species groups (IOTC species, sharks, seabirds, marine turtles, marine mammals, and other marine species) and the datasets available do not contain the information required to derive estimates of discard levels for the Indian Ocean as a whole* (http://www.iotc.org/data/datasets Discard Levels (DS))

- **IOTC Regional Observer Scheme**[38]: The IOTC adopted standards for the collection and reporting of observer data in 2010[39], including the levels of observer coverage required, at-sea and in land, and reporting deadlines. However, the majority of IOTC CPC have not complied with this requirement. For this study the only data available were in the form of highly aggregated retained and discarded catch records, originating from the available EU purse seine and Japan longline observer data. The dataset, which was in line with IOTC Confidentiality Policy and Procedures[40], was provided by the IOTC Secretariat following a request from the authors[41]. Unfortunately, the observer data available for longline fleets, as of May 2018, did not record the actual number of observed hooks hampering any attempts to derive bycatch rates from this dataset. Therefore, the data available for Japan were only used to obtain the species composition of sharks, and other bycatch. For purse seiners the observer data provided by the Secretariat were not used because it was possible to obtain scientific estimates of total bycatch levels for the Spanish fleet (see ***Data from other sources***).
- **IOTC Port inspection Scheme**: In 2010[42], the IOTC adopted standards for the collection of data on inspection of foreign vessels in port, which include data on the amount of sharks and other bycatch unloaded by foreign vessels that go through inspection in the ports of coastal states of the Indian Ocean, or other ports.
- **IOTC Transhipment Programme**: The IOTC adopted standards for the collection of data from longline vessels under the IOTC Transhipment Programme in 2014[43], which include data on the amounts of sharks and other bycatch transhipped at-sea by longliners.
  However, Port inspection and Transhipment data are not in the public domain and although the authors formally requested the data to the IOTC Secretariat, the CPCs involved did not agree that the available data be made available for the study[44].

  In general bycatch data are very poor and, where available, data are very incomplete, and the catches are recorded in aggregated format rather than by species.

Data on **catches and effort of IOTC species**: The authors selected a core group of market species that are the target of IOTC fisheries in order to be able to use this information and the available bycatch data to complete the estimates of bycatch for fisheries for which data was incomplete or lacking (through the use of one or more proxy fleets). The following species were selected: **Yellowfin tuna** (YFT), **bigeye tuna** (BET), **skipjack tuna** (SKJ), **albacore** (ALB), **longtail tuna** (LOT), and **swordfish** (SWO).

- Nominal Catches[45]: Data on total retained catches for the core species group, by fleet and species. In specific cases the catches of species other than the core group (e.g. Southern bluefin tuna, longtail tuna) were also used in the estimation of bycatch levels for some fleets. This dataset was also used to

[38] http://www.iotc.org/science/regional-observer-scheme-science
[39] http://www.iotc.org/sites/default/files/documents/compliance/cmm/iotc_cmm_11-04_en.pdf, that superseded IOTC Resolution 10-04 On a regional observer scheme
[40] http://www.iotc.org/sites/default/files/documents/compliance/cmm/iotc_cmm_12-02_en.pdf
[41] Data provided by Fabio Fiorellato, Data Coordinator IOTC Secretariat, on 9 May 2018 (ROS_data_summary_v2.xlsx)
[42] http://www.iotc.org/sites/default/files/documents/compliance/cmm/iotc_cmm_16-11_en.pdf, that superseded IOTC Resolution 10-11 On port state measures to prevent, deter and eliminate illegal, unreported and unregulated fishing
[43] http://www.iotc.org/sites/default/files/documents/compliance/cmm/iotc_cmm_1706.pdf, that superseded IOTC Resolution 14-06 On establishing a programme for transhipment by large-scale fishing vessels
[44] Data formally requested by José Carlos Báez (IEO Spain) on 2 July 2018 (IOTC Request Form). Negative response from CPC forwarded by the Executive Secretary of IOTC (Christopher O'Brien), received on 24 August 2018 (IOTC Ref: 7001)
[45] http://www.iotc.org/sites/default/files/documents/2017/09/IOTC-2017-WPTT19-DATA03_-_NC.zip, downloaded on 15 March 2018

identify all fisheries for which bycatch levels had to be estimated because it contains the best scientific estimates of catch according to the IOTC Scientific Committee.

- Catch-and-Effort[46]: The available catch and effort data for IOTC fleets was used to estimate total levels of effort and catch rates for the fleets for which these data were available, as recorded in the IOTC catch-and-effort table.
- IOTC Fishing Craft Statistics[47] and Records of Active[48] and Authorized[49] Vessels: The number of active fishing units and overall tonnage for each fleet was built using information from the IOTC Fishing Craft Statistics and Records of Fishing Vessels, as reported by flag states to the IOTC. This information was used as a proxy to effort data for fleets for which catch and effort data as per IOTC standards were not available or of poor quality.

Table 3. Average weights at capture for the main shark species captured by longline fisheries, obtained from available literature and the available observer data for Japan longliners.

Group Code	Species (*latin name*) / [Group]	Mean Weight (kg)	NºREF
BSH	Blue shark (*Prionace glauca*)	35.69	4
MAK	Mako sharks (*Isurus* spp.)	40.16	4
POR	Porbeagle shark (*Lamna nasus*)	30.63	1
SPN	Hammerhead sharks (*Sphyrna* spp.)	56.90	2
THR	Thresher sharks (*Alopias* spp.)	40.45	3
FAL	Silky shark (*Carcharhinus falciformis*)	25.46	2
OCS	Oceanic whitetip shark (*Carcharhinus longimanus*)	31.48	4
PSK	Crocodile shark (*Pseudocarcharias kamoharai*)	6.08	2
SKH	Other sharks	28.22	1
PLS	Pelagic stingray (*Pteroplatytrygon violacea*)	1.15	2

References:

1. Kim, D., Lee, S., Kwon, Y., Ku, J., Lee, M. and An, D. (2017). Korea National Report to the Scientific Committee of the Indian Ocean Tuna Commission, 2017. IOTC-2017-SC20-NR13.
2. IOTC Regional Observer Scheme
3. Varghese, S., Vijayakumaran, K., Tiburtius, A. and Mhatre, V. (2015). Diversity, abundance and size structure of pelagic sharks caught in tuna longline survey in the Indian seas. Indian Journal of Geo-Marine Science, 44: 26-36.
4. Xu, L., Wang, X., Chen, Y., Wu, F., Zhu, J. and Yang, X. (2017). China National Report to the Scientific Committee of the Indian Ocean Tuna Commission, 2017. IOTC-2017-SC20-NR02.

Biological data on the stocks of **sharks, marine mammals and marine turtles**: The IOTC Secretariat provided equations for the conversion of length into weight for IOTC bycatch species, mainly sharks[50]. In addition, the authors compiled information on the average weight of shark species from several publications, as recorded in **Table 3**. This information was used to convert numbers of sharks into weight in cases in which only numbers of bycatch by species were available.

[46] http://www.iotc.org/sites/default/files/documents/2017/09/IOTC-2017-WPTT19-DATA07_-_CELL_ALL.zip, downloaded on 15 March 2018

[47] http://iotc.org/oqs, online query facility accessed March 2018 (several dates)

[48] http://www.iotc.org/sites/default/files/documents/compliance/vessel_lists/GetActiveVesselListE.zip, downloaded on 15 March 2018

[49] http://www.iotc.org/vessels/current, accessed March 2018 (several dates)

[50] Data provided by Fabio Fiorellato, Data Coordinator IOTC Secretariat, on 6 June 2018 (IOTC_CONVERSION_EQUATIONS.xlsx)

Data from other sources

The IEO (Oceanographic Institute of Spain) provided estimates of discards and retained catches of main bycatch stocks for the Spanish purse seine fishery in the Indian Ocean[51]. This information was used to estimate bycatch rates for industrial purse seiners, and estimate total bycatch for the purse seine fishery as a whole.

Publications

The authors did a thorough search for all data available in scientific papers (peer reviewed or not), reports and other publications, including online material. Most of the information on bycatch came from National Reports presented by CPC to meetings of the IOTC Scientific Committee, papers presented to IOTC Working Parties, reports from research programmes in land and at-sea, reports from sampling programmes, and other sources. The information in scientific papers was used in several ways to assist in the estimation of catches of sharks, marine mammals and marine turtles. Most of the estimates for marine mammals and marine turtles were raised using data from publications as such bycatch groups are poorly represented in the IOTC databases. While the authors attempted to use publications from recent years to raise estimates, in some cases in which information on recent bycatch levels was lacking it was necessary to also use sources from earlier years.

Annex I contains details about the way the catches of sharks, marine mammals and marine turtles were estimated for each individual fleet, including the list of publications and background material used in each case.

In most cases bycatch levels were estimated using data from various sources and various estimation procedures, depending on the species or group for which catches had to be estimated. The three methods below, while representing a simplification of the procedures used are useful to understand the main approaches that were used to estimate bycatch:

1. Bycatch species for which estimates of total bycatch are available for a fleet:
    a. When estimates were available by species they were directly used;
    b. When estimates were available in aggregated format (e.g. genus, family, whole group) they were broken by species using estimates by species derived from data available for the same fleet or a proxy fleet.
2. Bycatch species for which estimates are available but they do not represent total catch: In many cases the information available for a fleet represented just a sample corresponding to part of such fleet overall fishing activity. Where possible, the estimates available were raised to total catch using the level of coverage provided in the paper:
    a. Using the effort measure recorded (e.g. number of hooks, fishing days, number of sets, number of boats, number of trips, etc.), and the totals estimated from the catch and effort or vessel records databases;
    b. Using the ratio between bycatch and the catches of one or more species in the core group, as available, and the total catches for the fleet concerned obtained from the nominal catch table.
3. Bycatch species for which estimates of bycatch are not available for the fleet concerned:
    a. Where possible, bycatch levels were estimated using information for the same fleet for previous years. The ratio bycatch: catch of core group of species was used to estimate bycatch levels in recent years.
    b. Where bycatch levels were not available at all for the fleet concerned, or were not from recent years, data from a proxy fleet was used. In most cases, the ratio bycatch: catch of core group

[51] Data provided by Francisco Abascal, Head Tropical Tuna Group IEO of Spain, on 29 June 2018 (IOTC Forms 1D1 and 1RC)

of species from the proxy fleet and the catch of the core group of species for the target fleet were used to estimate bycatch levels for such fleet.

As indicated before, for some fleets the estimation of bycatch levels involved also the conversion from numbers into weight or other additional procedures prior to those indicated above.

While bycatch levels were estimated in weight for most sharks the bycatch of whale sharks, for marine turtles and marine mammals bycatch levels were estimated in number (**Table 1**).

Results

This section presents a summary of the results obtained, by main bycatch stock and fishery. Further details on the estimates of bycatch levels for each individual fleet and how those were obtained for each stock can be found in **Annex 1**.

Table 4 shows the catches of sharks, marine mammals and marine turtles estimated. Overall, this study has estimated that the fisheries covered have caught around 210,000 metric tons of sharks (excluding the whale shark) per year in recent years (2014-16), which is equivalent to around 1 metric ton of sharks for each 5 tons of the core species identified for the study. This represents around twice as much the catches of sharks as those recorded in the IOTC nominal catch database. The highest catches of sharks were estimated for the following species/genus: Blue shark (around 26% of the total weight of sharks), mako sharks (19%), thresher sharks (18%), silky shark (11%), and mantas and devil rays (5%).

In terms of numbers, the study estimated incidental catches for whale sharks, marine mammals, and marine turtles, amounting to over 1,200 whale sharks (1.1 whale sharks per 1,000 tons of core species), 170,000 marine mammals (151 marine mammals per 1,000 tons of core species), and 31,000 marine turtles (28 marine turtles per 1,000 tons of core species). Olive Ridley turtles account for the highest incidental catch of marine turtles, representing around 78% of the total number of turtles caught dead. However, these estimates are subject to high uncertainty due to the paucity of the information available and the lack of some key elements (e.g. estimates of post-release survival following entanglement) to estimate the real contribution of fishing gears to the mortality of the marine mammals and marine turtles. In addition, as previously indicated, the catches of marine turtles might be underrepresented because they could be high on some of the coastal fisheries not covered by the study. The estimation of the number of marine mammals by species, other than whales as a group, was not possible, due to the paucity of the information available and, therefore, only estimates of total mortality in number are presented for each group.

Figure 1 presents the contribution of purse seine and other fisheries to the total estimates of bycatch for marine turtles (in number, left), marine mammals and whale sharks (in number, middle), and sharks (in weight, right). In recent years, purse seiners have caught 0.15% of the catches of sharks (316 tons, excluding the whale shark), 0.16% of the whale sharks (2 specimens), nil marine mammals, and 0.3% of the marine turtles (90 specimens).

Gillnets and driftnets are the highest contributor to bycatch mortality in the Indian Ocean, accounting for over 50% of the catches of sharks, almost all marine mammals and whale sharks, and over 40% of the marine turtles. However, the contribution to marine turtle and marine mammal bycatch of some of the coastal gillnets not covered by this study may be also significant (e.g. some coastal gillnets in Arabian and African countries and coastal gears of Indonesia and other countries) and therefore these estimates, bearing in mind the high uncertainty they might be subject to, may underrepresent to some extent the impact of this gear.

Fresh and deep-freezing longliners account for over 50% of the catches of turtles (over 4/5 of which come from fresh-tuna longliners which operate more in coastal waters) and around 50% of the catches of sharks

(around 3/5 of which come from fresh-tuna longliners). However, bycatch levels may be underrepresented, as many sharks and all turtles are discarded, and discards are not always reported or covered in publications.

Table 4. Catches of sharks, marine mammals and marine turtles estimated for IOTC fisheries in recent years (2014-16), by year and species/group. Catches of whale sharks and marine mammals and turtles are shown in number while the catches of other species are in weight. The catches of fresh-tuna and deep-freezing longliners, as per the IOTC definition, are presented separately.

Group Code	Name	Record in	Total	Fishery			
				Gillnet	Fresh Longline	Frozen Longline	Purse seine
Sharks	**Total Sharks** *Elasmobranchia*	**Weight**	**209,742**	**104,325**	**66,737**	**38,364**	**316**
BSH	Blue shark *Prionace glauca*	Weight	**55,353**	2,588	29,408	23,357	0
MAK	Mako sharks *Isurus spp.*	Weight	**39,102**	31,055	3,831	4,216	0
POR	Porbeagle shark *Lamna nasus*	Weight	**96**	0	0	96	0
SPN	Hammerhead sharks *Sphyrna spp.*	Weight	**5,936**	4,153	1,534	249	0
THR	Thresher sharks *Alopias spp.*	Weight	**37,285**	24,950	10,160	2,175	0
FAL	Silky shark *Carcharhinus falciformis*	Weight	**23,295**	13,205	6,768	3,026	296
OCS	Oceanic whitetip shark *Carcharhinus longimanus*	Weight	**2,880**	1,116	1,323	431	10
PSK	Crocodile shark *Pseudocarcharias kamoharai*	Weight	**2,605**	0	2,270	335	0
SKH	Other sharks NEI	Weight	**28,804**	16,818	8,061	3,925	0
MAN	Mantas and devil rays *Mobulidae*	Weight	**10,480**	10,441	28	1	10
PLS	Pelagic stingray *Pteroplatytrygon violacea*	Weight	**3,908**	0	3,355	553	0.05
RHN	Whale sharks *Rhincodon typus*	Number	**1,239**	1,237	0	0	2
MAM	**Total Marine Mammals** Cetaceans	**Number**	**172,529**	**172,232**	**239**	**58**	**0**
ODN	Total Toothed Whales *Odontoceti*	Number	**172,422**	172,223	151	48	0
MYS	Total Baleen Whales Mysticeti	Number	107	9	88	10	0
TTX	**Total Marine turtles** Testudines	**Number**	**31,602**	**15,278**	**14,895**	**1,339**	**90**
LKV	Olive ridley turtle *Lepidochelys olivacea*	Number	**24,620**	10,385	13,452	739	44
TUG	Green turtle *Chelonia mydas*	Number	**3,061**	2,139	840	68	14
TTL	Loggerhead turtle *Caretta caretta*	Number	**1,412**	1,200	45	156	11
DKK	Leatherback turtle *Dermochelys coriacea*	Number	**1,051**	463	424	159	5
TTH	Hawksbill turtle *Eretmochelys imbricata*	Number	**986**	955	4	11	16

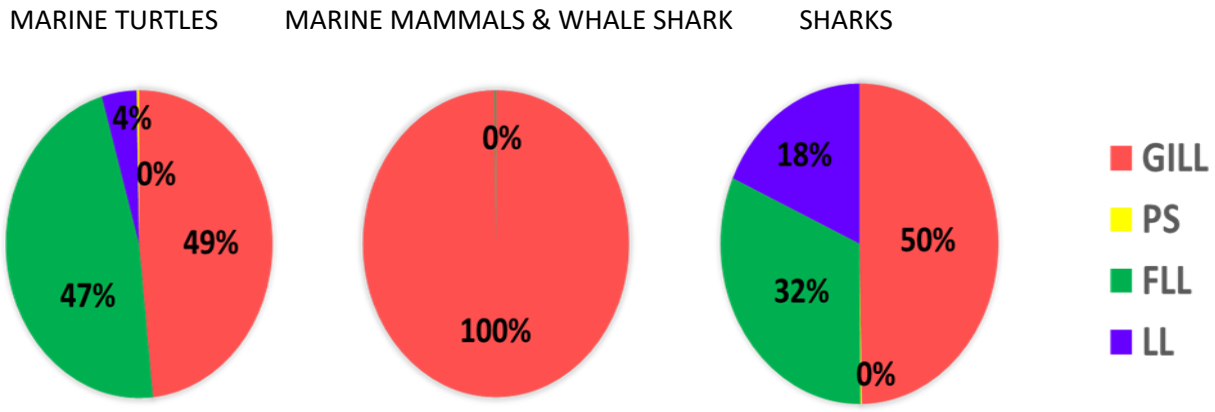

Figure 1: Contribution of fresh-tuna longline (green), deep-freezing longline (blue), gillnet and driftnet (red), and purse seine (yellow) to the total bycatch estimated for marine turtles (in number, left), marine mammals (in number, middle), and sharks (in weight, right), for the period 2014-16.

Levels of mortality by main IOTC bycatch stock

Blue shark (*Prionace glauca*)

The Blue shark (**Figure 2**) is the most important bycatch of sharks in the Indian Ocean, with over 55,000 tonnes per year, representing more than a quarter of the total shark mortality (excluding the whale shark, Fig. 2: *% over SKH*). This means that almost 7 tonnes of blue shark are caught per 100 tonnes of target species (Fig.2: *% over target*). However, such estimates are subject to high uncertainty as over 40% of the total blue shark mortality was estimated from alternative sources because many fleets do not report catches of this species (Fig. 2: *Source*).

Almost all the blue shark fishing mortality comes from longline fisheries (95%) the remaining coming from gillnets (5%) (Fig.2: *% by fishery*). Indonesian coastal and fresh tuna longline fleets (35%) and Taiwanese deep-freezing longliners (15%) account for most of the mortality of blue shark estimated (Fig.2: *Main Fleets*). On the contrary, there have not been any events of incidental catch of blue shark reported for purse seine fisheries, for which nil levels of fishing mortality have been estimated (**Table 4**).

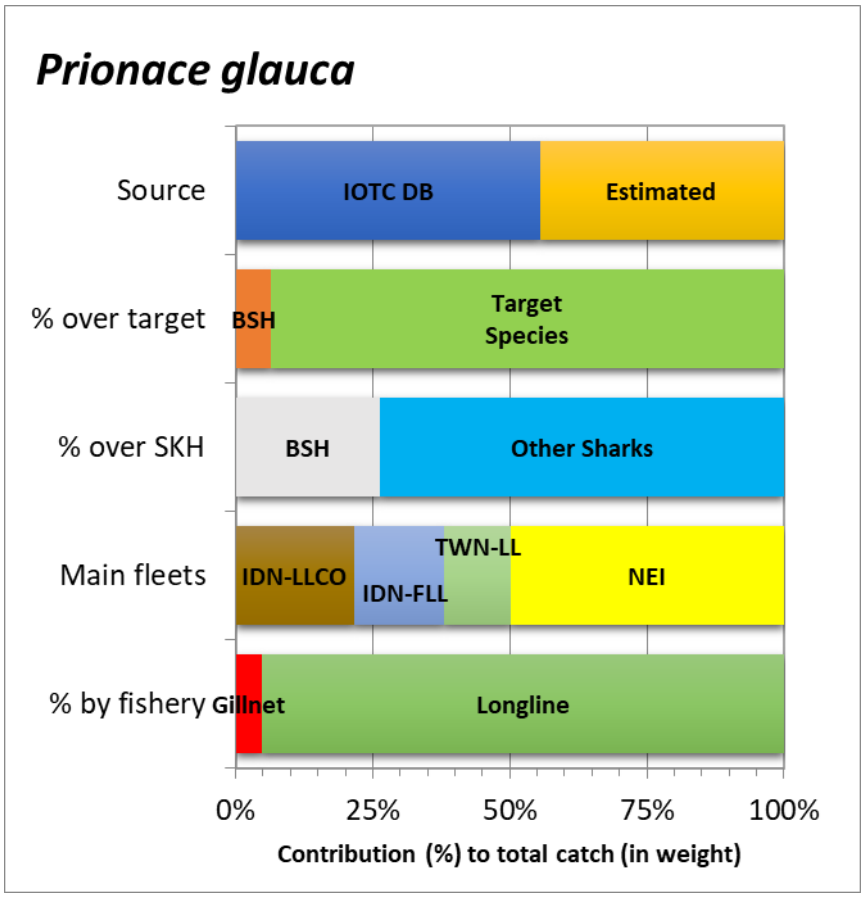

Figure 2: Fishing mortality of **Blue Shark** (*Prionace glauca*) in the Indian Ocean (average 2014-16)

Source: % of the catches of blue shark (*BSH*) recorded in the *IOTC* Nominal Catch *Database* versus those *Estimated*;

% over Target: ratio (%) that the catches of blue shark (*BSH*) make over the catches of the core group of *Target Species* selected for this study;

% over SKH: contribution (%) that the mortality of blue shark (*BSH*) make over the total levels of shark mortality estimated;

Main Fleets: Main fleets for which blue shark (*BSH*) mortality have been estimated (Coastal longlines of Indonesia [*IDN-LLCO*], Fresh-tuna longlines of Indonesia [*IDN-FLL*], Deep-freezing longlines of Taiwan [*TWN-LL*], other fleets [*NEI*]);

% by Fishery: Contribution (%) of each fishery to the total mortality of blue shark (*BSH*) in the Indian Ocean.

Mako sharks (*Isurus* spp.)

Mako sharks (**Figure 3**) are the second most important bycatch of sharks in the Indian Ocean, with over 39,000 tonnes per year, representing 19% of the total shark mortality (excluding the whale shark, Fig. 3: *% over SKH*). This means that near 5 tonnes of mako sharks are caught per 100 tonnes of target species (Fig.3: *% over target*). However, such estimates are subject to high uncertainty as over 90% of the mortality of mako sharks had to be estimated for this study because most fleets do not report catches of the species under this group (Fig. 3: *Source*).

The majority of the mako sharks mortality come from gillnet fisheries (79%) the remaining being from longlines (21%) (Fig.3: *% by fishery*). Iranian, Yemeni and Pakistani gillnet fleets account for more than half (61%) the mortality of mako sharks estimated (Fig.3: *Main Fleets*). On the contrary, there have not been any events of incidental catch of mako sharks reported for purse seine fisheries, for which nil levels of fishing mortality have been estimated (**Table 4**).

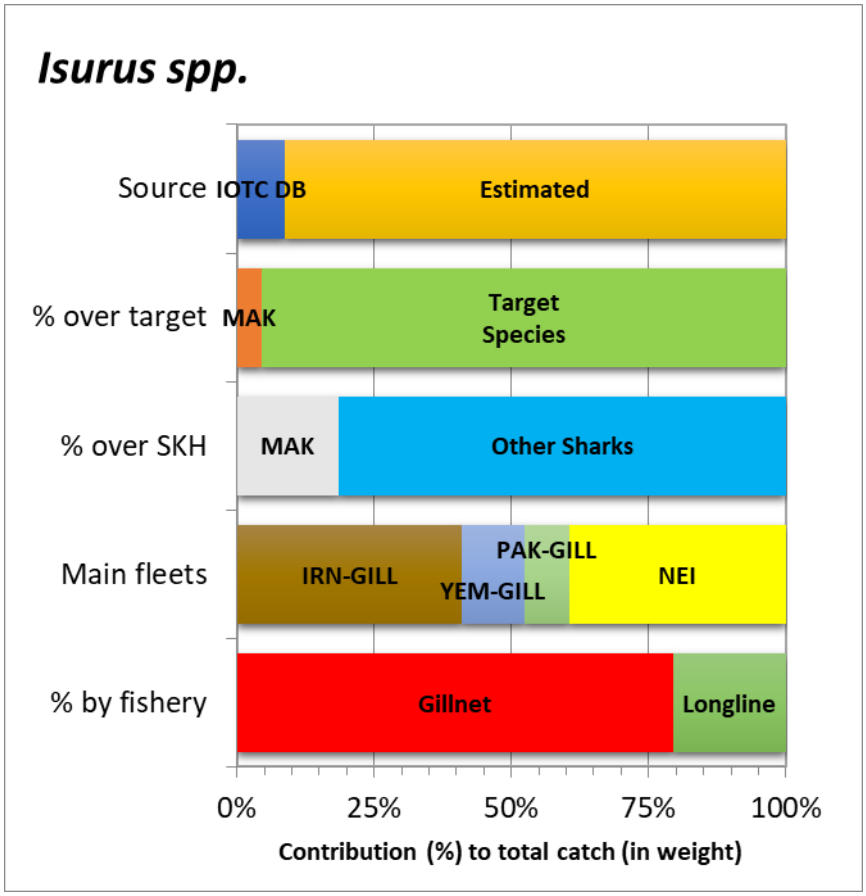

Figure 3: Fishing mortality of **Mako Sharks** (*Isurus* spp.) in the Indian Ocean (average 2014-16)

Source: % of the catches of mako sharks (*MAK*) recorded in the *IOTC* Nominal Catch *Database* versus those *Estimated*;

% over Target: ratio (%) that the catches of mako sharks (*MAK*) make over the catches of the core group of *Target Species* selected for this study;

% over SKH: contribution (%) that the mortality of mako sharks (*MAK*) make over the total levels of shark mortality estimated;

Main Fleets: Main fleets for which mako sharks (*MAK*) mortality have been estimated (Gillnets of Irán [*IRN-GILL*], Gillnets of Yemen [*YEM-GILL*], Gillnets of Pakistan [*PAK-GILL*], other fleets [*NEI*]);

% by Fishery: Contribution (%) of each fishery to the total mortality of mako sharks (*MAK*) in the Indian Ocean.

Porbeagle (*Lamna nasus*)

Porbeagle (**Figure 4**) seems to be a rare event in the catches of some Indian Ocean fisheries, and therefore only 96 tonnes per year have been estimated for this species. This represents less than 0.05 of the total shark mortality (excluding the whale shark, Fig. 4: *% over SKH*), and 0.012 tonnes of porbeagle for each 100 tonnes of target species (Fig.4: *% over target*). However, such estimates are subject to high uncertainty as over 44% of the porbeagle mortality had to be estimated for this study because many fleets do not report catches of this species (Fig.4: *Source*). In addition, the fact that Porbeagle is a rare event increases even more the uncertainty of the estimates because this added to the extremely low levels of observer coverage recorded for many fleets hampered any attempt to reliably estimate levels of motality for this species.

The totality of the porbeagle mortality is thought to originate from longline fisheries (100%) (Fig.4: *% by fishery*). Japanese deep-freezing longliners have the greatest impact on the mortality of porgeagle (86%) while the combined swordfish longline fleets from South Africa and Portugal account for around 10% (Fig.4: *Main Fleets*). On the contrary, there have not been any events of incidental catch of porbeagle reported for purse seine fisheries, for which nil levels of fishing mortality have been estimated (**Table 4**).

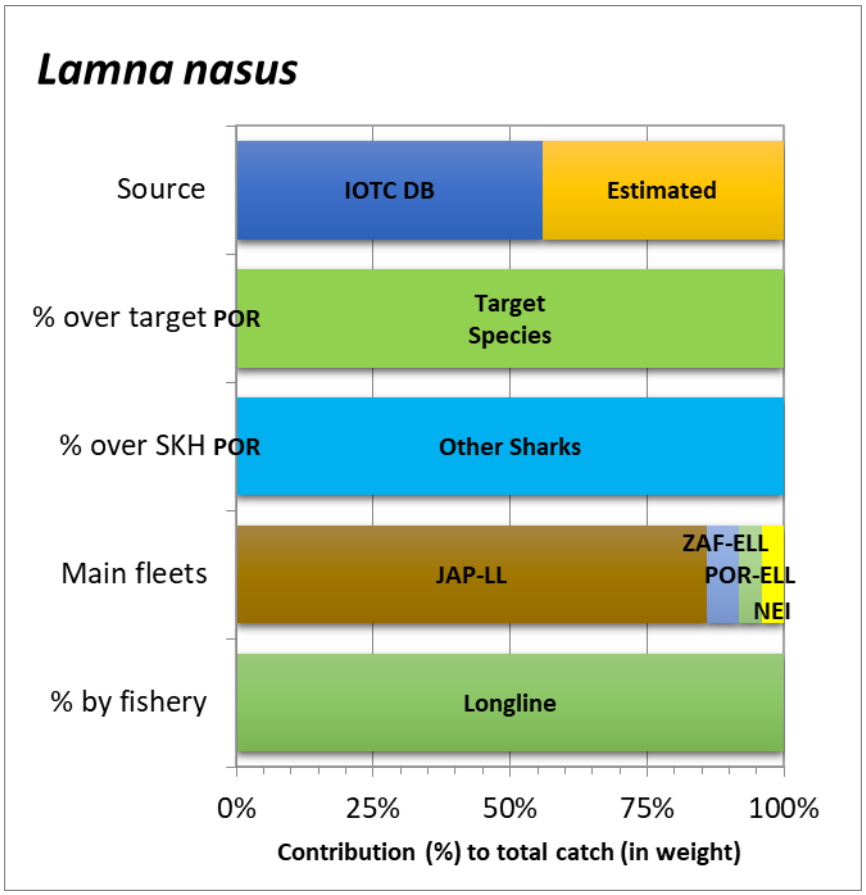

Figure 4: Fishing mortality of **Porbeagle** (*Lamna nasus*) in the Indian Ocean (average 2014-16)

Source: % of the catches of porbeagle (*POR*) recorded in the *IOTC* Nominal Catch *Database* versus those *Estimated*;

% over Target: ratio (%) that the catches of porbeagle (*POR*) make over the catches of the core group of *Target Species* selected for this study;

% over SKH: contribution (%) that the mortality of porbeagle (*POR*) make over the total levels of shark mortality estimated;

Main Fleets: Main fleets for which porbeagle (*POR*) mortality have been estimated (Deep-freezing longlines of Japan [*JPN-LL*], Swordfish longlines of South Africa [*ZAF-ELL*], Swordfish longlines of Portugal [*POR-ELL*], other fleets [*NEI*]);

% by Fishery: Contribution (%) of each fishery to the total mortality of porbeagle (*POR*) in the Indian Ocean.

Silky shark (*Carcharhinus falciformis*)

Silky shark (**Figure 5**) is the fourth most important shark bycatch in the Indian Ocean, with over 23,000 tonnes per year, which represents over 10% of the total shark mortality (excluding the whale shark, Fig. 5: *% over SKH*). This means that near 3 tonnes of silky shark are caught per 100 tonnes of target species (Fig.5: *% over target*). However, such estimates are subject to high uncertainty as near 90% of the silky shark mortality had to be estimated for this study because most fleets do not report catches of this species (Fig. 5: *Source*).

Most of the silky shark mortality come from gillnet (57%) and longline fisheries (42%), the remaining being from purse seiners (1.3%) (Fig.5: *% by fishery*). Sri Lankan gillnet and coastal tuna longline fleets (30%) and Indian gillnet (18%) account for most of the catches of silky shark estimated (Fig.5: *Main Fleets*). Silky shark is the most important shark bycatch for purse seiners, with Spanish purse seiners accounting for near 0.5% of the overall silky shark mortality (123 tonnes, **Table 4**).

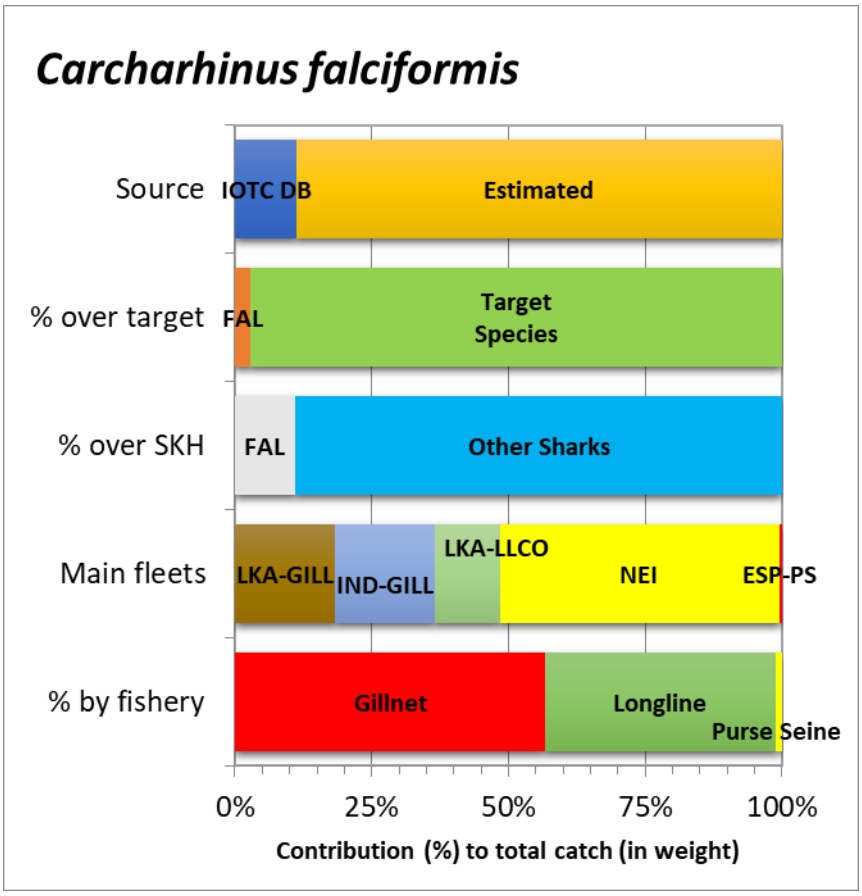

Figure 5: Fishing mortality of **Silky Shark** (*Carcharhinus falciformis*) in the Indian Ocean (average 2014-16)

Source: % of the catches of silky shark (*FAL*) recorded in the *IOTC* Nominal Catch *Database* versus those *Estimated*;

% over Target: ratio (%) that the catches of silky shark (*FAL*) make over the catches of the core group of *Target Species* selected for this study;

% over SKH: contribution (%) that the mortality of silky shark (*FAL*) make over the total levels of shark mortality estimated;

Main Fleets: Main fleets for which silky shark (*FAL*) mortality have been estimated (Gillnets of Sri Lanka [*LKA-GILL*], Gillnets of India [*IND-GILL*], Coastal longlines of Sri Lanka [*LKA-LLCO*], other fleets [*NEI*]);

% by Fishery: Contribution (%) of each fishery to the total mortality of silky shark (*FAL*) in the Indian Ocean.

Oceanic whitetip shark (*Carcharhinus longimanus*)

Around 2,900 tonnes of oceanic whitetip shark (**Figure 6**) have been estimated per year, which represents near 1.5% of the total shark mortality (excluding the whale shark, Fig. 6: % *over SKH*). Thus, 0.36 tonnes of oceanic whitetip shark are caught per 100 tonnes of target species (Fig.6: % *over target*). However, such estimates are subject to high uncertainty as over 80% of the oceanic whitetip shark mortality had to be estimated for this study because most fleets do not report catches of this species (Fig. 6: *Source)*.

Most of the oceanic whitetip shark mortality come from longline (61%) and gillnet (39%) fisheries with purse seine fisheries accounting for just 0.35% (10 tonnes, **Table 4**) of the mortality (Fig.6: % *by fishery*). Sri Lankan gillnet and coastal tuna longline fleets (33%) and Indian gillnet (19%) account for most of the oceanic whitetip shark mortality estimated (Fig.6: *Main Fleets*).

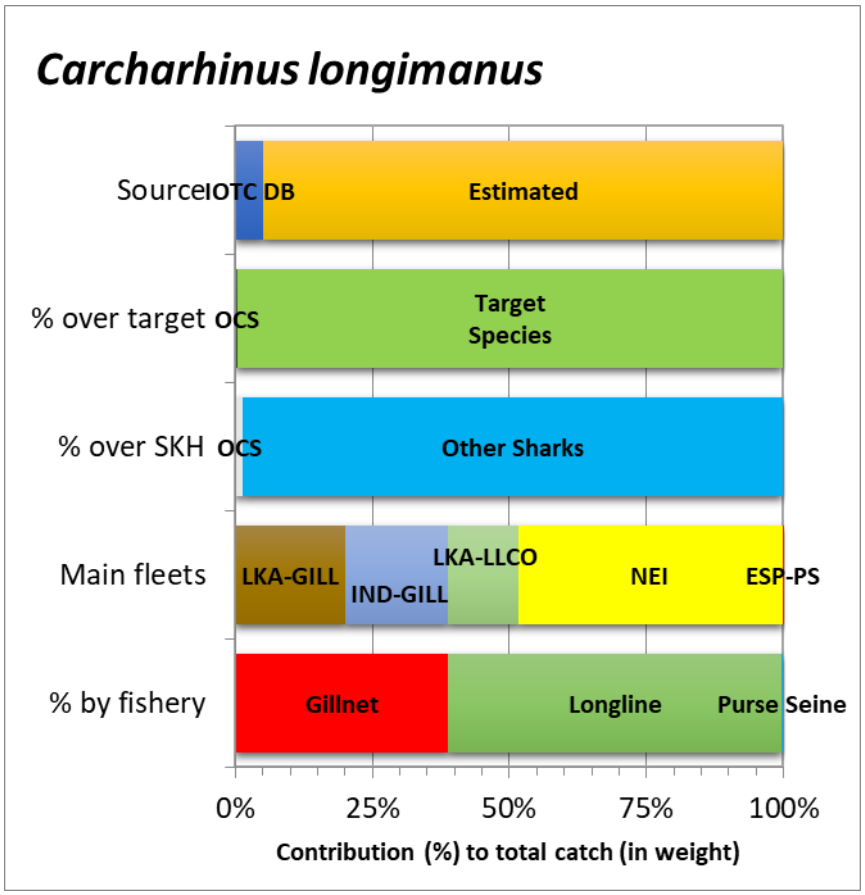

Figure 6: Fishing mortality of **Oceanic WhiteTip Shark** (*Carcharhinus longimanus*) in the Indian Ocean (average 2014-16)

Source: % of the catches of oceanic whitetip shark (*OCS*) recorded in the *IOTC* Nominal Catch *Database* versus those *Estimated*;

% over Target: ratio (%) that the catches of oceanic whitetip shark (*OCS*) make over the catches of the core group of *Target Species* selected for this study;

% over SKH: contribution (%) that the mortality of oceanic whitetip shark (*OCS*) make over the total levels of shark mortality estimated;

Main Fleets: Main fleets for which oceanic whitetip shark (*OCS*) mortality have been estimated (Gillnets of Sri Lanka [*LKA-GILL*], Gillnets of India [*IND-GILL*], Coastal longlines of Sri Lanka [*LKA-LLCO*], other fleets [*NEI*]);

% by Fishery: Contribution (%) of each fishery to the total mortality of oceanic whitetip shark (*OCS*) in the Indian Ocean.

Thresher sharks (*Alopias* spp.).

Thresher sharks (**Figure 7**) are the third most important bycatch of sharks in the Indian Ocean, with over 37,000 tonnes per year, which represents more the 18% of the total shark mortality (excluding the whale shark, Fig. 7: *% over SKH*). Thus, close to 5 tonnes of thresher sharks are caught per 100 tonnes of target species (Fig.7: *% over target*). However, such estimates are subject to high uncertainty as near 90% of the thresher sharks mortality had to be estimated for this study because most fleets do not report catches of the species under this group (Fig. 7: *Source*).

Most of the thresher sharks mortality comes from gillnet fisheries (67%) the remaining originating from longliners (33%) (Fig.7: *% by fishery*). Iranian gillnets (22%), Indian longline/trolling combination (12%) and Indonesian gillnets (10%) account for most of the mortality of thresher sharks estimated (Fig.7: *Main Fleets*). On the contrary, there have not been any events of incidental catch of thresher sharks reported for purse seine fisheries, for which nil levels of fishing mortality have been estimated (**Table 4**).

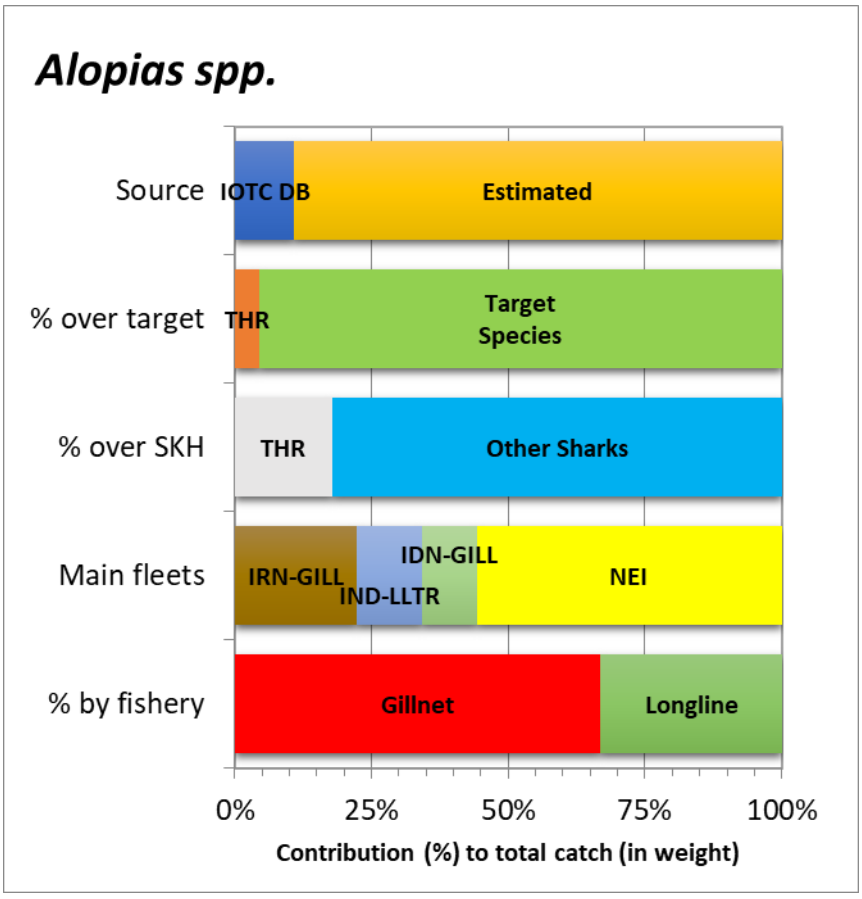

Figure 7: Fishing mortality of **Thresher Sharks** (*Alopias* spp.) in the Indian Ocean (average 2014-16)

Source: % of the catches of thresher sharks (*THR*) recorded in the *IOTC* Nominal Catch *Database* versus those *Estimated*;

% over Target: ratio (%) that the catches of thresher sharks (*THR*) make over the catches of the core group of *Target Species* selected for this study;

% over SKH: contribution (%) that the mortality of thresher sharks (*THR*) make over the total levels of shark mortality estimated;

Main Fleets: Main fleets for which thresher sharks (*THR*) mortality have been estimated (Gillnets of Iran [*IRN-GILL*], Gillnets of India [*IND-GILL*], Gillnets of Indonesia [*IDN-GILL*], other fleets [*NEI*]);

% by Fishery: Contribution (%) of each fishery to the total mortality of thresher sharks (*THR*) in the Indian Ocean.

Hammerhead sharks (*Sphyrna* spp.)

Hammerhead sharks (**Figure 8**) are an important shark bycatch in the Indian Ocean, with over 5,900 tonnes per year, which represents the 3% of the total shark mortality (excluding the whale shark, Fig. 8: *% over SKH*). This means that over 0.7 tonnes of hammerhead sharks are caught per 100 tonnes of target species (Fig.8: *% over target*). However, such estimates are subject to high uncertainty as over 60% of the hammerhead sharks mortality had to be estimated for this study because many fleets do not report catches of the species under this group (Fig. 8: *Source*).

Most of the hammerhead sharks mortality comes from gillnet fisheries (70%) the remaining being from longlines (30%) (Fig.8: *% by fishery*). Iranian (29%), Indian (11%) and Yemeni (8%) gillnet fleets account for most of the hammerhead sharks mortality estimated (Fig.8: *Main Fleets*). On the contrary, there have not been any events of incidental catch of hammerhead sharks reported for purse seine fisheries, for which nil levels of fishing mortality have been estimated (**Table 4**).

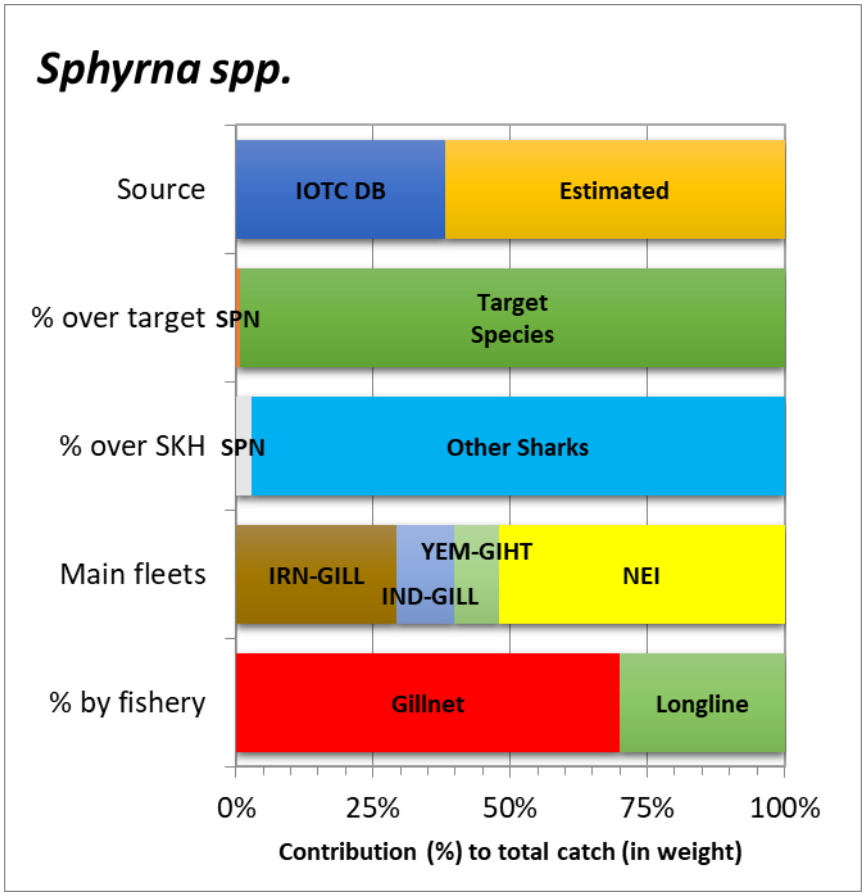

Figure 8: Fishing mortality of **Hammerhead Sharks** (*Sphyrna* spp.) in the Indian Ocean (average 2014-16)

Source: % of the catches of hammerhead sharks (*SPN*) recorded in the *IOTC* Nominal Catch *Database* versus those *Estimated*;

% over Target: ratio (%) that the catches of hammerhead sharks (*SPN*) make over the catches of the core group of *Target Species* selected for this study;

% over SKH: contribution (%) that the mortality of hammerhead sharks (*SPN*) make over the total levels of shark mortality estimated;

Main Fleets: Main fleets for which hammerhead sharks (*SPN*) mortality have been estimated (Gillnets of Iran [*IRN-GILL*], Gillnets of India [*IND-GILL*], Gillnets of Yemen [*YEM-GILL*], other fleets [*NEI*]);

% by Fishery: Contribution (%) of each fishery to the total mortality of hammerhead sharks (*SPN*) in the Indian Ocean.

Crocodile shark (*Pseudocarcharias kamoharai*)

Crocodile shark (**Figure 9**) is a rare bycatch in the Indian Ocean tuna fisheries, with just over 2,600 tonnes per year, which represents 1% of the total shark mortality (excluding the whale shark, Fig. 9: *% over SKH*). This means that over 0.3 tonnes of crocodile shark are caught per 100 tonnes of target species (Fig.9: *% over target*). However, such estimates are subject to high uncertainty as near the totality of the crocodile shark mortality had to be estimated for this study because most fleets do not report catches of this species (Fig. 9: *Source*).

All the estimated crocodile shark mortality comes from longline fisheries (Fig.9: *% by fishery*). Indonesian coastal, fresh-tuna and deep-freezing longline fleets account for most (94%) of the crocodile shark mortality estimated (Fig.9: *Main Fleets*). On the other hand, there have not been any events of incidental catch of crocodile shark reported for purse seine fisheries, for which nil levels of fishing mortality have been estimated (**Table 4**).

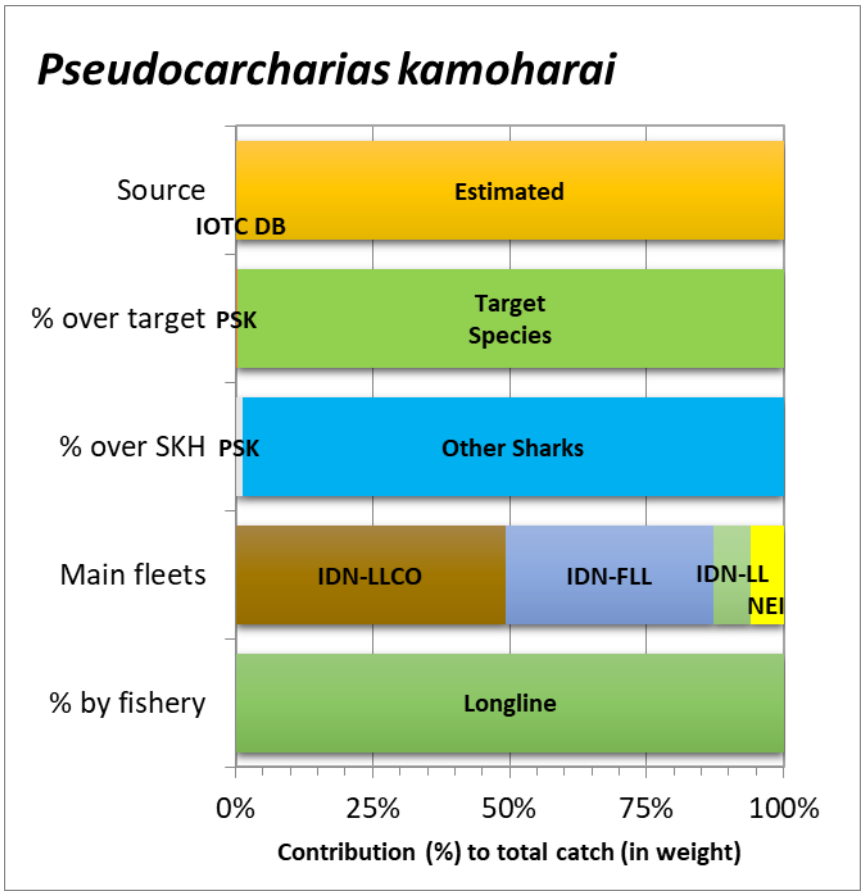

Figure 9: Fishing mortality of **Crocodile Shark** (*Pseudocarcharias kamoharai*) in the Indian Ocean (average 2014-16)

Source: % of the catches of crocodile shark (*PSK*) recorded in the *IOTC* Nominal Catch *Database* versus those *Estimated*;

% over Target: ratio (%) that the catches of crocodile shark (*PSK*) make over the catches of the core group of *Target Species* selected for this study;

% over SKH: contribution (%) that the mortality of crocodile shark (*PSK*) make over the total levels of shark mortality estimated;

Main Fleets: Main fleets for which crocodile shark (*PSK*) mortality have been estimated (Coastal longlines of Indonesia [*IDN-LLCO*], Fresh-tuna longlines of Indonesia [*IDN-FLL*], Deep-freezing longlines of Indonesia [*IDN-LL*], other fleets [*NEI*]);

% by Fishery: Contribution (%) of each fishery to the total mortality of crocodile shark (*PSK*) in the Indian Ocean.

Mantas and Stingrays (Mobulidae)

Mantas and stingrays (**Figure 10**) are an important bycatch in the Indian Ocean with around 10,500 tonnes per year, which represents the 5% of the total shark mortality (excluding the whale shark, Fig. 10: *% over SKH*). Thus, near 1.3 tonnes of mantas and stingrays are caught per 100 tonnes of target species (Fig.10: *% over target*). However, such estimates are subject to high uncertainty as near the totality of the manta and stingray mortality had to be estimated for this study because most fleets do not report catches of the species under this group (Fig. 10: *Source*).

Near the totality of the mantas and stingrays mortality comes from gillnet fisheries (over 99%), the remaining coming from longlines (0.3%) and purse seines (0.1%, 10 tonnes, **Table 4**) (Fig.10: *% by fishery*). Iranian (50%), Sri Lankan (16%) and Pakistani (10%) gillnet fleets account for most of the mortality of mantas and stingrays estimated (Fig.10: *Main Fleets*).

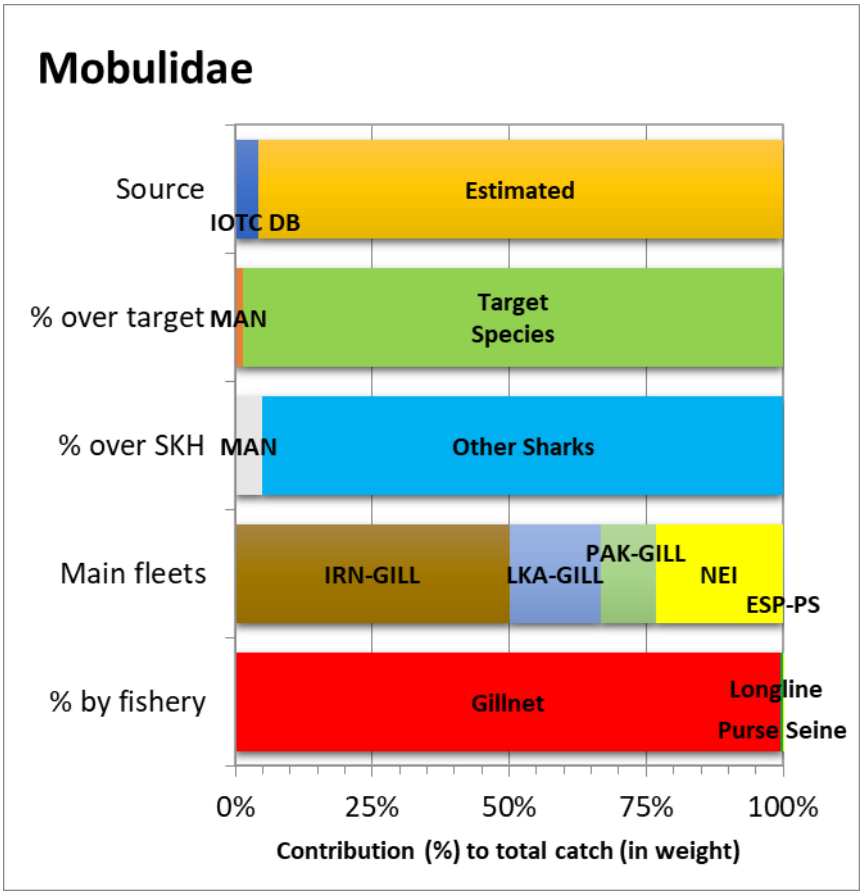

Figure 10: Fishing mortality of **Mantas and Stingrays** (Mobulidae) in the Indian Ocean (average 2014-16)

Source: % of the catches of mantas and stingrays (*MAN*) recorded in the *IOTC* Nominal Catch *Database* versus those *Estimated*;

% over Target: ratio (%) that the catches of mantas and stingrays (*MAN)* make over the catches of the core group of *Target Species* selected for this study;

% over SKH: contribution (%) that the mortality of mantas and stingrays (*MAN*) make over the total levels of shark mortality estimated;

Main Fleets: Main fleets for which mantas and stingrays (*MAN*) mortality have been estimated (Gillnets of Iran [*IRN-GILL*], Gillnets of Sri Lanka [*LKA-GILL*], Gillnets of Pakistan [*PAK-GILL*], other fleets [*NEI*]);

% by Fishery: Contribution (%) of each fishery to the total mortality of mantas and stingrays (*MAN*) in the Indian Ocean.

Pelagic stingray (*Pteroplatytrigon violacea*)

Near 3,900 tonnes of pelagic stingray (**Figure 11**) are estimated per year, which represents the 2% of the total shark mortality (excluding the whale shark, Fig. 11: *% over SKH*). This means that near 0.5 tonnes of pelagic stingray are caught per 100 tonnes of target species (Fig.11: *% over target*). However, such estimates are subject to high uncertainty as the totality of the pelagic stingray mortality had to be estimated for this study because not a single fleet has ever reported catches of this species (Fig. 11: *Source*).

Near the totality of the pelagic stingray mortality comes from longlines (near 100%), the remaining originating from purse seines (0.001%, 0.05 tonnes, **Table 4**) (Fig.11: *% by fishery*). Indonesian coastal and fresh-tuna longline fleets (78%) and the Chinese deep-freezing longline fleet (7%) account for most of the mortality of mantas and stingrays estimated (Fig.11: *Main Fleets*).

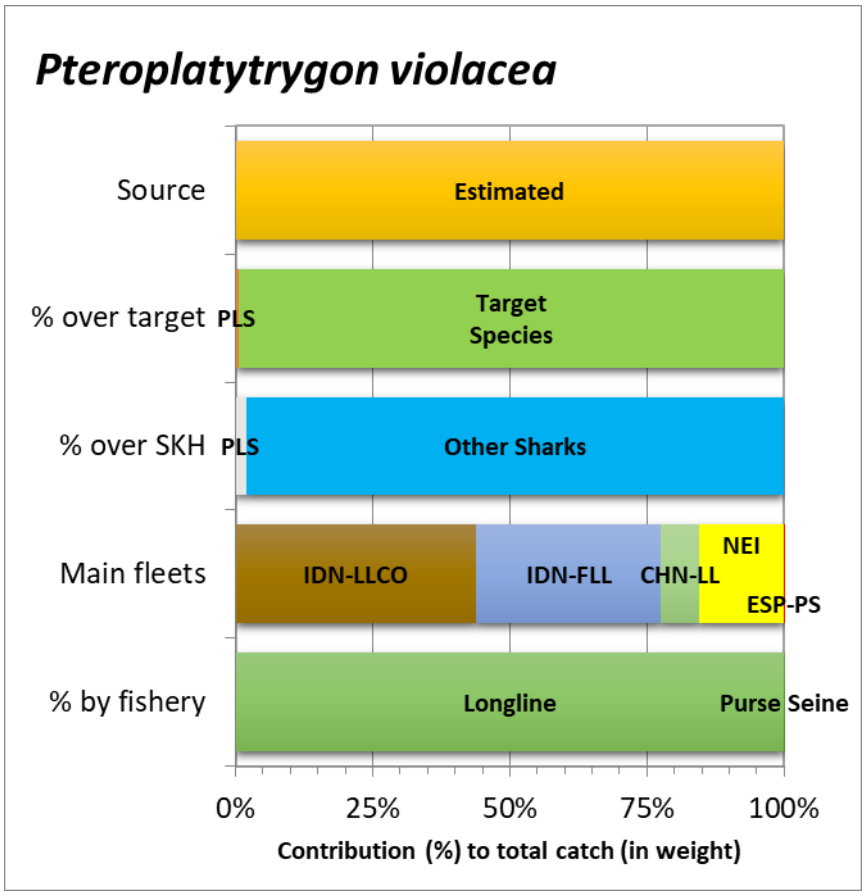

Figure 11: Fishing mortality of **Pelagic Stingray** (*Pteroplatytrygon violacea*) in the Indian Ocean (average 2014-16)

Source: % of the catches of pelagic stingray (*PLS*) recorded in the *IOTC* Nominal Catch *Database* versus those *Estimated*;

% over Target: ratio (%) that the catches of pelagic stingray (*PLS)* make over the catches of the core group of *Target Species* selected for this study;

% over SKH: contribution (%) that the mortality of pelagic stingray (*PLS*) make over the total levels of shark mortality estimated;

Main Fleets: Main fleets for which pelagic stingray (*PLS*) mortality have been estimated (Coastal longlines of Indonesia [*IDN-LLCO*], Fresh-tuna longlines of Indonesia [*IDN-FLL*], Deep-freezing longlines of China [*CHN-LL*], other fleets [*NEI*]);

% by Fishery: Contribution (%) of each fishery to the total mortality of pelagic stingray (*PLS*) in the Indian Ocean.

Other shark species

This group (**Figure 12**) includes both catches of sharks aggregated that could not be assigned to one of the categories used for this study and catches of species of sharks other than those covered. Overall, they represent near 29,000 tonnes per year, 14% of the total shark catch (excluding the whale shark, Fig. 12: *% over SKH*). This means that near 4 tonnes of aggregated and other shark species are caught per 100 tonnes of target species (Fig.12: *% over target*). The total mortality estimated for this group cannot be properly compared with the catches in the IOTC Database because most of the catches of sharks in the IOTC database are not by species while this group represents only the part of those catches that could not be disaggregated for this study (Fig. 12: *Source*).

Most of the mortality for this group was estimated for gillnets (58%) and longlines (42%) (Fig.12: *% by fishery*). Iranian and Indian (31%) gillnet fleets and the Taiwanese (8%) deep-freezing longline fleet account for most of the mortality estimated for this group (Fig.12: *Main Fleets*). On the other hand, there have not been any events of incidental catch of sharks under this group reported for purse seine fisheries, for which nil levels of fishing mortality have been estimated (**Table 4**).

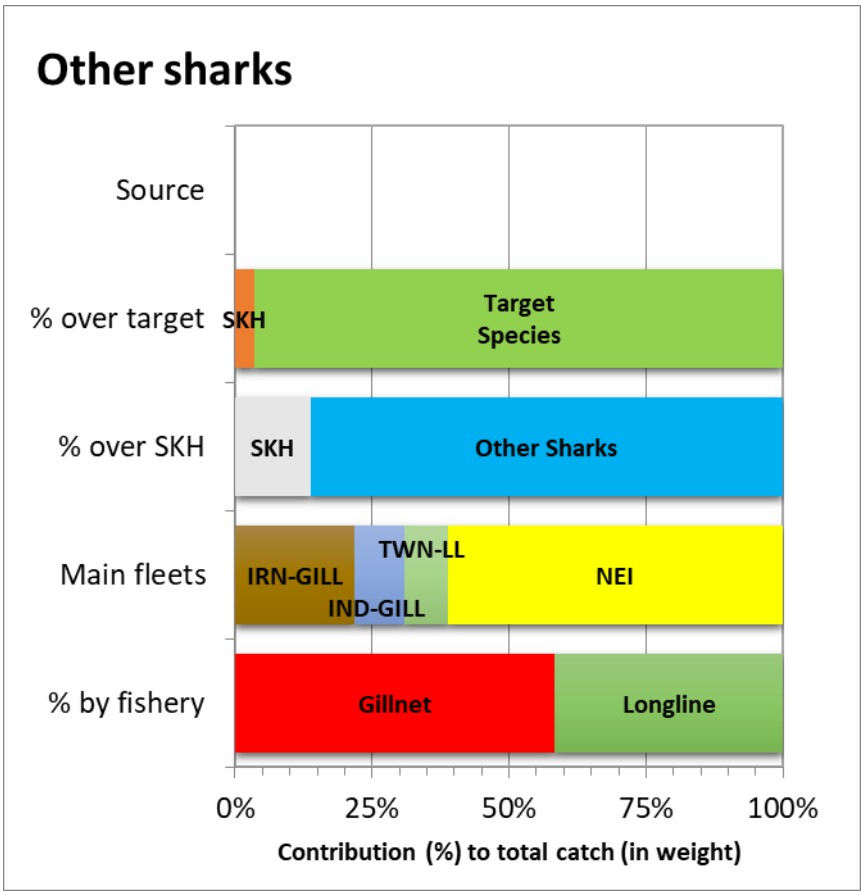

Figure 12: Fishing mortality of **Other Sharks** in the Indian Ocean (average 2014-16)

Source: not applicable for the aggregated category;

% over Target: ratio (%) that the catches of other sharks (*SKH)* make over the catches of the core group of *Target Species* selected for this study;

% over SKH: contribution (%) that the mortality of other sharks (*SKH*) make over the total levels of shark mortality estimated;

Main Fleets: Main fleets for which mortality of other sharks (*SKH*) have been estimated (Gillnets of Iran [*IRN-GILL*], Gillnets of India [*IND-GILL*], Deep-freezing longlines of Taiwan [*TWN-LL*], other fleets [*NEI*]);

% by Fishery: Contribution (%) of each fishery to the total mortality of other sharks (*SKH*) in the Indian Ocean.

Marine turtles, mammals and whale shark

Figure 13 shows preliminary estimates of total incicental catch for marine turtles (left), marine mammals (right) and whale sharks (middle), all in number of individuals, for the IOTC fisheries covered in this study. In average, over 31,000 marine turtles, 1,200 whale sharks and 172,000 marine mammals have been caught each year by fisheries directed at the IOTC target stocks selected for this study. However, it is worth to note that such estimates have been raised using the little information available at the time of the review and therefore are subject to high uncertainty and will need to ve reviewed as more information become available.

Bearing in mind the above, the following figures are presented for illustrative purposes and should be considered as preliminary estimates.

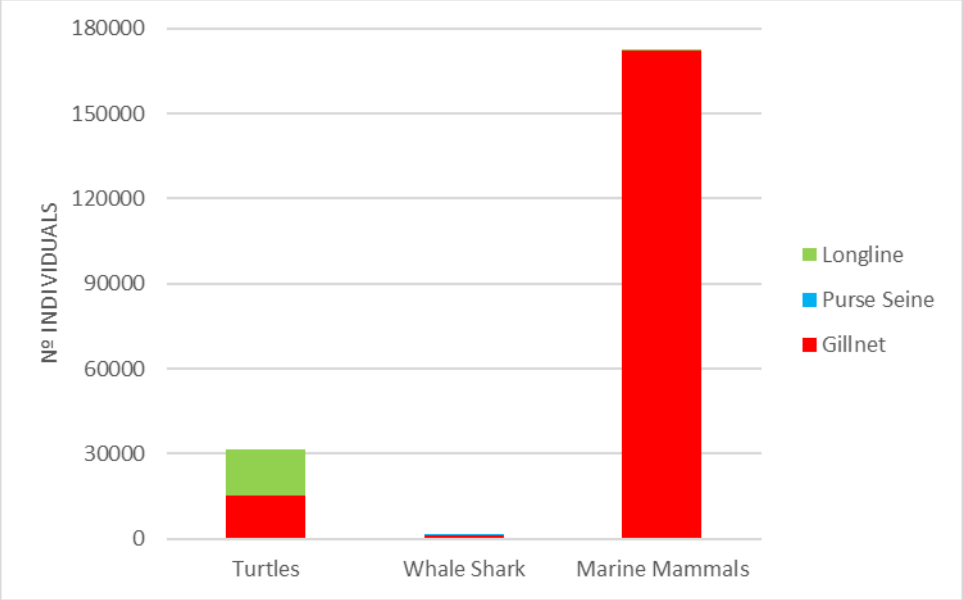

Figure 13: Numbers of marine *Turtles*, *Whale Shark*s and *Marine Mammals* estimated as incidental mortality to IOTC purse seine (blue), longline (green), and gillnet (red) fisheries (average for the period 2014-16)

Most of the marine turtle mortality comes from gillnets and longlines, with only around 0.3% of the mortality related to industrial purse seiners (**Table 4**, 90 individuals). The main five species of turtles in the Indian Ocean are present in the bycatch: Olive Ridley (78%), Green turtle (10%), Loggerhead turtle (5%), Leatherback turtle (3%) and Hawksbill turtle (3%). The contribution of purse seine fisheries to overall levels of marine turtle bycatch mortality vary depending on the species with Olive Ridley's accounting for 0.18% of the total mortality estimated (**Table 4**, 44 specimens), Green turtle for 0.45% (14 specimens), Loggerhead turtle for 0.78% (11 specimens), Leatherback turtle for 0.48% (5 specimens) and Hawksbill turtle for 1.6% (16 specimens). However, as indicated, these figures may overrepresent the contribution of purse seiners to marine turtle mortality because many fisheries and other sources of marine turtle mortality have not been covered.

As for marine mammals, it has been estimated that over 172,000 specimens are killed annually by tuna fishing gears in the IOTC area. The mortality of marine mammals is caused almost exclusively by gillnets and driftnets, which account for over 99.8% of the catches estimated. Longline mortality accounts for less than 0.2% of the total catch. The paucity of the data available did not make it possible to break the catches of marine mammals by species. However, it is thought that the majority of the catches of marine mammals refer to toothed whales (mainly dolphins and related species; *Odontoceti* in **Table 4**). Although whales may be incidentally caught on purse seine nets they always escape before the net is fully pursed, either breaking the net or swimming under it or the boat, and no whale casualties have been reported by observers in recent years (**Table 4**).

Whale shark is a common bycatch of some tuna fisheries as well. It is estimated that over 1230 individuals are killed each year, with gillnet fisheries making for near 100% of the total numbers taken. Purse seine mortality accounts for less than 0.2% of the total numbers, or 2 individuals per year (**Table 4**). It is important to note that it is likely that whale shark mortality comes from non-EU and Seychelles purse seine fleets because those fleets, unlike EU and Seychelles fisheries, have not adopted protocols for the safe release of whale sharks and have reported very low observer coverage.

In addition, it is likely that purse seiners have reduced their levels of fishing mortality on whale and whale sharks since 2014, following the adoption of IOTC resolutions 13-04 and 13-05 (**Table 1**), which prohibit surrounding whales and whale sharks with purse seine nets when their presence has been detected prior to pursing of the net.

Levels of shark mortality by main IOTC fishery

Gillnet and driftnet fisheries

Figure 14 shows the catches of sharks estimated for gillnet and driftnet fisheries. Catches were estimated for fleets in eleven countries, with over 104,000 tonnes of Elasmobranchs estimated per year (**Table 4**), around half of the total catches of sharks (Fig. 14: *% over Fisheries*). The gillnet and driftnet fisheries of Iran catch over 38% of the total catches estimated for this gear. India (15%) and Sri Lanka (13%) have also very important fisheries for sharks (Fig. 14: *Main Fleets*).

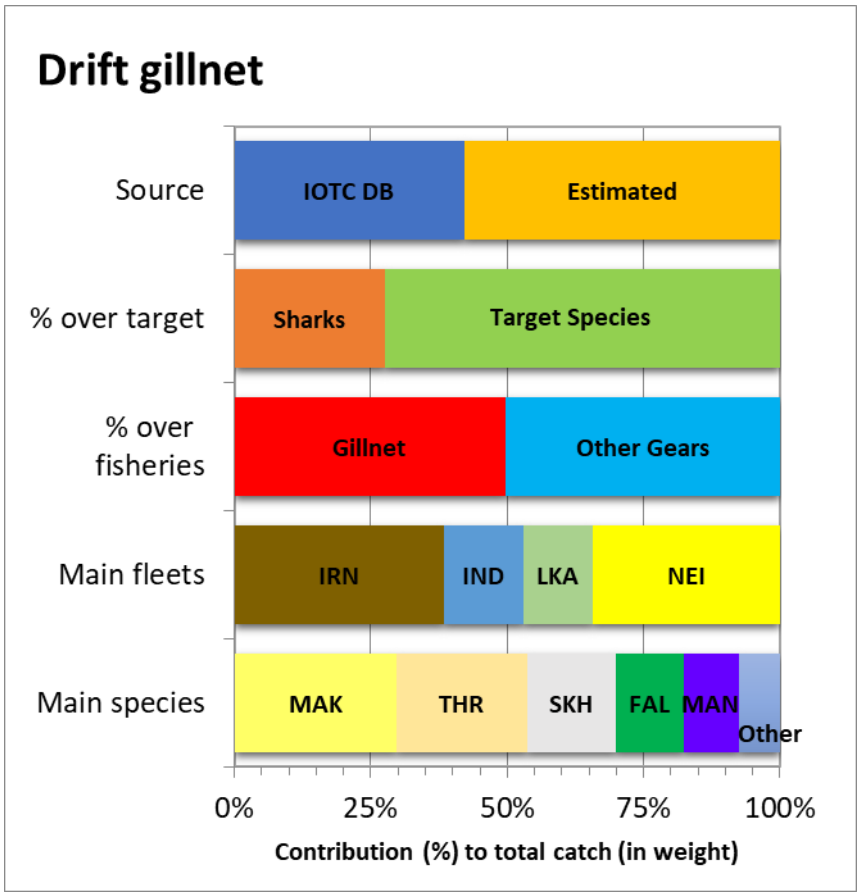

Figure 14: Fishing mortality of **shark species** in the Indian Ocean to **Gillnet** and **Driftnet** fisheries (average 2014-16)

Source: % of the catches of sharks of *Gillnets* and *Driftnet* recorded in the *IOTC* Nominal Catch *Database* versus those *Estimated*;

% over Target: ratio (%) that the catches of sharks of *Drift*nets and *Gillnet*s make over the total catches of those gears for the core group of *Target Species* selected for this study;

% over Fisheries: contribution (%) that the drift and *Gillnets* shark mortality make over the total mortality estimated;

Main Fleets: Main gillnet and driftnet fleets for which shark mortality have been estimated (Islamic Republic of Iran [*IRN*], India [*IND*], Sri Lanka [*LKA*], other fleets [*NEI*]);

Main Species: Main species of sharks caught by *Gillnet* fisheries (Mako sharks [*MAK*], Thresher sharks [*THR*], Sharks unidentified [*SKH*], Silky shark [*FAL*], Mantas and Devil rays [*MAN*], and *Other* shark *Species* NEI).

As much as 60% of the shark mortality for this component had to be estimated (Fig. 14: *Source*). In addition, for many of the fleets it was not possible to fully break the catches of sharks by species, meaning that more than 15% of the total catches estimated remain unidentified by species. Therefore, the catches of individual shark species or genus used for the study could be underrepresented considering that some of the aggregated catches may correspond to those species or genus.

Gillnets and Driftnets in the Indian Ocean catch as much as 38 tonnes of sharks per 100 tons of total catch of target species plus sharks (Fig. 14: *% over Target*). The main species (Fig. 14: *Main Species*) are, in descending order of importance, Mako sharks (30%), Thresher sharks (24%), the group of unidentified shark species (16%), Silky shark (13%) and Mantas and Stingrays (10%).

Longline fisheries

Figure 15 shows the catches of sharks estimated for longline fisheries. Catches were estimated for fleets in 36 fisheries with over 105,000 tonnes of Elasmobranchs estimated per year (**Table 4**), around half of the total catches of sharks (Fig. 15: *% over Fisheries*). The coastal and fresh-tuna longline fisheries of Indonesia catch over 32% of the total longline catches of sharks estimated, with Taiwanese deep-freezing longliners accounting for 13% of the catches (Fig. 15: *Main Fleets*). Within the category longline, fresh-tuna longliners (12 fleets) account for over 60% of the total shark catches while deep-freezing longliners (24 fleets) make for the remaining (near 40%) (Fig. 15: *Longline Type*).

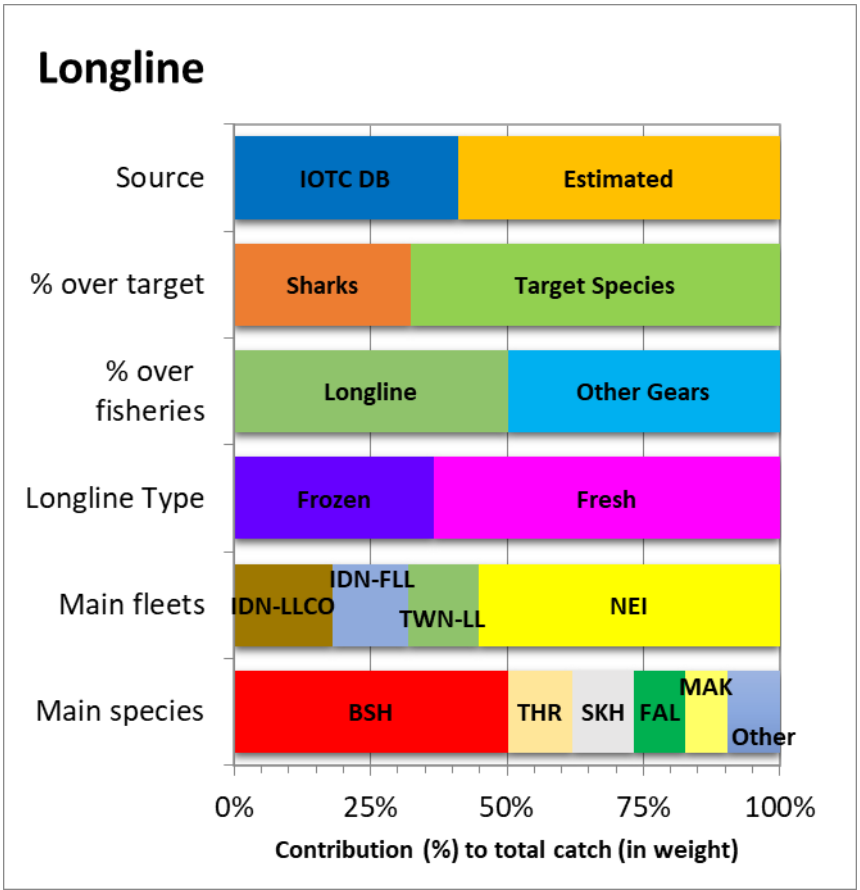

Figure 15: Fishing mortality of **shark species** in the Indian Ocean to **Longline** fisheries (average 2014-16)

Source: % of the catches of sharks of *Longlines* recorded in the *IOTC* Nominal Catch *Database* versus those *Estimated*;

% over Target: ratio (%) that the catches of sharks of *Longlines* make over the total catches of those gears for the core group of *Target Species* and sharks selected for this study;

% over Fisheries: contribution (%) that the *Longline* shark mortality make over the total shark mortality estimated;

Longline Type: Contribution (%) of fresh-tuna and deep-freezing longliners to overall levels of shark mortality;

Main Fleets: Main *Longline* fleets for which shark mortality have been estimated (Indonesian Coastal longline [*IDN-LLCO*], Indonesian fresh-tuna longline [*IDN-FLL*], Taiwanese depp-freezing longline [*TWN-LL*], other fleets [*NEI*]);

Main Species: Main species of sharks caught by *Longline* fisheries (Blue shark [*BSH*], Thresher sharks [*THR*], Sharks unidentified [*SKH*], Silky shark [*FAL*], Mako sharks [*MAK*], and *Other* shark *Species* NEI).

Longlines in the Indian Ocean catch as much as 48 tonnes of sharks for each 100 tons of the core target species selected for the study, which means that around 30% of the total catch are sharks (Fig. 15: *% over Target*). The main species (Fig. 15: *Main Species*) are, in descending order of importance, blue shark (50%), Thresher sharks (12%), the group of unidentified shark species (11%), Silky shark (9%) and Mako shark (8%).

As much as 58% of the catches of sharks for this component had to be estimated (Fig. 15: *Source*). In addition, for many of the fleets it was not possible to fully break the catches of sharks by species, meaning that more than 11% of the total catches estimated remain unidentified by species. This means that the catches of individual shark species for this component could be underrepresented as some of the catches in aggregated form could correspond to one or more of the species covered.

Purse seine fisheries

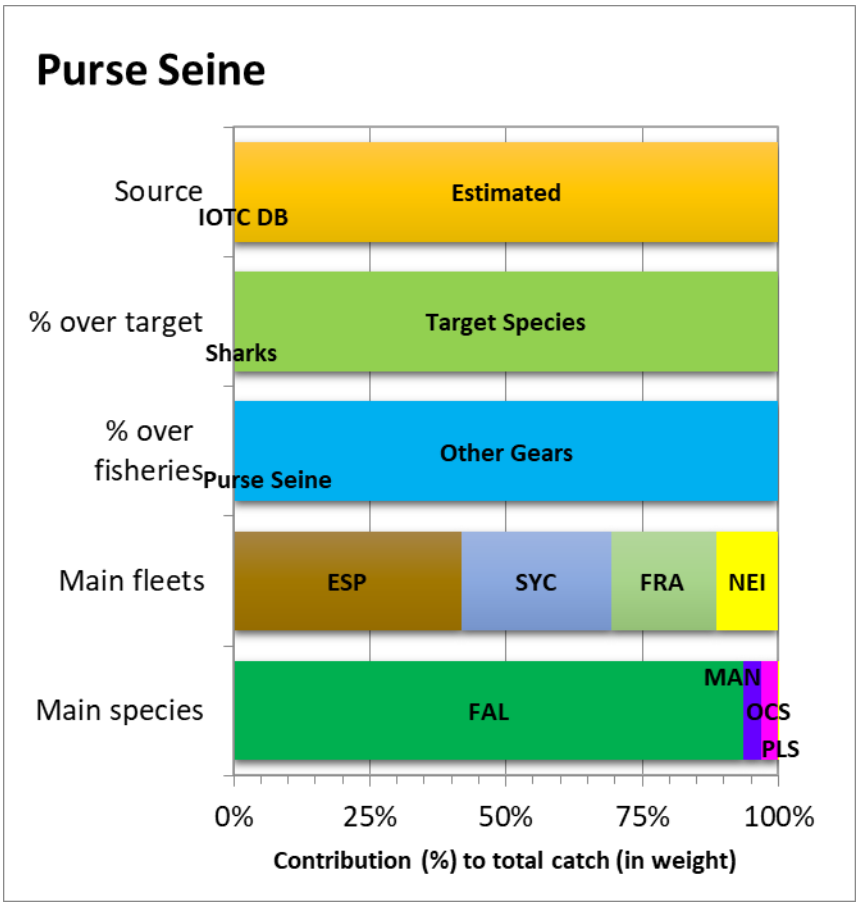

Figure 16: Fishing mortality of **shark species** in the Indian Ocean to **Purse seine** fisheries (average 2014-16)

Source: % of the catches of sharks of *Purse seines* recorded in the *IOTC* Nominal Catch *Database* versus those *Estimated*;

% over Target: ratio (%) that the catches of sharks of *Purse seines* make over the total catches of those gears for the core group of *Target Species* selected for this study;

% over Fisheries: contribution (%) that the *Purse seine* shark mortality make the total shark mortality estimated;

Main Fleets: Main *Purse seine* fleets for which shark mortality have been estimated (Spain [*ESP*], Seychelles [*SYC*], France [*FRA*], other fleets [*NEI*]);

Main Species: Main species of sharks caught by *Purse seine* fisheries (Silky shark [*FAL*], Manta and stingrays [*MAN*], Oceanic whitetip shark [*OCS*], Pelagic stingray [*PLS*].

Figure 16 shows the catches of sharks estimated for purse seine fisheries. Purse seine fisheries in the IOTC area catch over 310 tonnes of elasmobranch per year (**Table 4**), representing 0.15% of the total estimated shark catch in the Indian Ocean (Fig. 16: *% over Fisheries*). The bulk of the catches of sharks is taken by purse seiners flagged in Spain (42%), Seychelles (28%), and France (20%) (Fig. 16: *Main Fleets*).

Purse seines in the Indian Ocean catch 0.10 tonnes of sharks for each 100 tons of the core target species selected for the study (Fig. 16: *% over Target*). Silky sharks are the main species caught by purse seiners, representing over 90% of the total catches of sharks for this gear. Other minor species are mantas and stingrays (3.23%), and oceanic white tip shark (3.19%) (Fig. 16: *Main Species*).

At the time of preparation of this report the IOTC nominal catch database did not contain any catches of sharks under the purse seine component (Fig. 16: *Source*). However, the catches estimated for the Spanish fleet, which were used for this study, will be reported to the IOTC in the near future.

Discussion

This study represents a new attempt at estimating catches of pelagic sharks, and a first attempt at estimating the numbers of marine mammals and marine turtles taken by fisheries directed at one or more of the main market tuna and tuna-like species in the Indian Ocean. Its main purpose is to assess the contribution of industrial purse seine fisheries in the Indian Ocean to overall levels of fishing mortality of the main pelagic bycatch stocks in recent years, which is one of the objectives identified under OPAGAC's Fishery Improvement Project[52].

The Indian Ocean is, by far, the most complex in terms of the number of fleets and countries involved in tuna fisheries, and one where artisanal and semi-industrial fisheries are as important as industrial fisheries, or even more important[53]. For this reason, the authors identified a selected group of fisheries, as those targeting a core group of market tuna and tuna-like species (tropical tunas, albacore and swordfish), and a group of pelagic sharks, marine mammals and marine turtles, for which to estimate catches (**Table 1**), in line with both IOTC data requirements and the bycatch species identified by the OPAGAC FIP (**Table 1**, bold font). Pole-and-line, sport, recreational, and other small hook-and-line fisheries (handline and trolling) were not covered because the levels of bycatch reported for those fisheries are generally very low and, although they may take some bycatch, the catches refer normally to species of coastal sharks, unlike those covered here, and include nil or very little catches of marine mammals[54].

Regardless of the fleets and fisheries not accounted for in the study, it is very likely that the fleets covered contributed to most of the fishing mortality of the sharks taken by IOTC fleets and, to a lesser extent, also the mortality of marine mammals and marine turtles. However, while the authors considered rates of post-release bycatch mortality for the fleets for which they were available, there are many fleets and fishing modes for which no information is available at all, or for which only information on the status of bycatch at-release, and its likely fate, is available. The implementation of programmes to tag bycatch at-release across the main fleets and gear types could assist in improving future estimates, considering that rates of survival of bycatch post-release vary a lot depending on the species, gear, and protocols used for the release (e.g. Code of Good Practices used in EU and Seychelles purse seiners).

In addition, the contribution to bycatch levels of many non-tuna fisheries that operate in coastal waters is unknown and could be very significant[55], especially for some marine turtles and marine mammals (e.g. coastal gillnets, trammel nets, trawls, fixed nets, etc.). The mortality of marine turtles in nesting sites and/or the

[52] https://fisheryprogress.org/fip-profile/indian-ocean-tropical-tuna-purse-seine-opagac
[53] http://www.iotc.org/sites/default/files/documents/2017/10/IOTC-2017-WPTT19-07_-_Data_and_stats_paper.pdf
[54] http://www.fao.org/3/a-br817e.pdf
[55] https://onlinelibrary.wiley.com/doi/full/10.1111/j.1755-263X.2010.00105.x

mortality induced by other factors not related to fishing (e.g. plastic polution) is also unknown and could be significant[56]. In addition, this study did not cover bycatch mortality to ghost fishing. While it is known that ghost fishing on most purse seine fisheries has been substantially reduced following the introduction of non-entangling FADs, some residual mortality of marine turtles and sharks has been reported in some studies[57]. On the contrary, ghost fishing could pose a serious threat to some bycatch stocks following the loss of driftnet panels and, to a lesser extent, longlines[58].

As for the fleets covered in the study, the levels of bycatch estimated represent more than 1.4 times the bycatch recorded in the IOTC Database, meaning that many of the catches of those species remain unreported[59]. In addition, in many cases estimates may refer to just retained catches of sharks or not account for all the catches discarded. Where available, around 15% of the catches of sharks and the majority of catches of marine mammals remain aggregated by species, due to the paucity of the data available on the species composition of bycatch for some fleets. Despite the large amount of bycatch that could not be broken by species for this study, it is important to note that this amount is markedly lower than the 26% of the catches of sharks that remain aggregated in the IOTC Database[60]. Therefore, this study represents an improvement in terms of total catch and the resolution of that catch by species, at least for sharks and marine turtles.

Bycatch reporting rates are low because most of the IOTC CPC have failed to implement observer programs or, where an observer program is in place, observer coverage is very low, or the quality of the data collected is too poor to allow for any sensible estimation of bycatch[61]. In recent years, while purse seine observers have covered for over 20% of the purse seine effort, observer coverage on longline and gillnet fisheries have amounted to just 1.3% and less than 0.5% of the fishing activity, respectively[62]. The only known gillnet observer program for which some data have been published is run by the WWF in Pakistan[63]. This led to data from only two observer programs, EU purse seine and Japan longline, made available for the study. Unfortunately, it was not possible to derive any quantitative estimate using such data because the effort and catch data provided by the IOTC Secretariat from the Japanese and EU observer programs were highly aggregated and could not be reconciled.

In addition, although several attempts were made to obtain data from alternative IOTC Programs, such as data from the IOTC Port Inspection Schemes and Transshipment Programs, some IOTC CPCs have systematically denied access to data from such programmes and therefore it was not possible to use such data for this study.

Despite the above issues, the authors used the information available to raise preliminary estimates of recent bycatch levels (2014-16) for the stocks concerned, by fleet and, in most cases, species. Around 210,000 tons of pelagic sharks are caught each year by the main IOTC fisheries (**Table 4**), of which purse seiners barely catch 0.15% of the total (**Figure 16**). Gillnet (**Figure 14**) and longline (**Figure 15**) fisheries contribute to most of the shark bycatch mortality (**Table 4** & **Figure 1**). Although the importance of each shark species varies depending

[56] https://www.sciencedirect.com/science/article/pii/S0025326X8780019X (Laist, D. W. (1987). Overview of the biological effects of lost and discarded plastic debris in the marine environment. Marine Pollution Bulletin, 18(6), 319–326. doi:10.1016/s0025-326x(87)80019-x); http://plasticbusters.unisi.it/wp-content/uploads/sites/37/2016/04/Campani2013.pdf (Campani, T. *et al.* (2013). Presence of plastic debris in loggerhead turtle stranded along the Tuscany coasts of the Pelagos Sanctuary for Mediterranean Marine Mammals (Italy). Marine Pollution Bulletin, 74(1), 225–230. doi:10.1016/j.marpolbul.2013.06.053)

[57] http://www.iotc.org/sites/default/files/documents/2018/09/IOTC-2018-WPEB14-12.pdf

[58] http://www.iotc.org/sites/default/files/documents/2014/10/IOTC-2014-WPEB10-28_-_Olive_ridley_mortality.pdf

[59] http://www.iotc.org/sites/default/files/documents/2017/11/IOTC-2017-WPDCS13-07_-_Data.pdf

[60] http://www.iotc.org/sites/default/files/documents/2017/08/IOTC-2017-WPEB13-07.pdf

[61] http://www.iotc.org/sites/default/files/documents/2017/08/IOTC-2017-WPEB13-08_3.pdf

[62] *Ibid*. 61

[63] https://www.cms.int/iosea-turtles/sites/default/files/basic_page_documents/IOTC-2015-ROSWS02-R-FinalReport.pdf

on the fishery, the catch of silky sharks estimated for purse seiners, which represents most of the shark catch of purse seiners (**Table 4**), only represents around 1.3% of the total catches estimated for this species (**Figure 5**).

While bearing in mind the high uncertainty of the estimates, the contribution of purse seine fisheries to the mortality of marine turtles, whale sharks, and marine mammals is also extremely low or nil, as most of the catches of these groups originate from gillnet and driftnet fisheries and, to a lesser extent, longline fisheries (**Table 4**, **Figure 13**). Despite the prohibition of driftnets by the FAO in 1992[64] and the Resolutions adopted by the IOTC banning its use[65], effective since the end of 2012, the use of driftnets in the Indian Ocean seems to be still overspread[66] with that gear alone responsible for an estimated mortality of at least 15,000 marine turtles, mainly olive Ridley, and 172,000 cetaceans in the Indian Ocean. While Pakistan has communicated changes in gear configuration that may affect catch rates of species within these groups[67], the authors consider that the survival rates reported for marine turtles are not reliable because the duration between setting and hauling of a 7 km driftnet is considered too long to allow for any survival of marine turtles following entanglement.

Table 5 compares the catches of sharks estimated in this study with those of Murua *et al.* (2013)[68] and Clarke (2014)[69]. While the approaches, time-periods and fleets covered in each study differ there is merit in comparing the three approaches and attemp to explain the reasons why, for some species, the estimates differ considerably.

Table 5. Comparison between the catch estimates for the main shark species covered in this study (Garcia & Herrera) and estimates from previous studies (Murua *et al.* 2013, and Clarke 2014).

Garcia & Herrera covered over 50 fleets and estimated average catches of sharks for the period 2014-16;

Murua *et al.* covered 16 fleets plus a category "other fleets" and estimated average catches of sharks for the period 2000-2011;

Clarke raised estimates using Hong Kong shark-fin trade data and various scenarios to allocate catches of blue shark (BSH) and oceanic whitetip shark (OCS) to the Indian Ocean; Estimates are provided for the first (2000) and last (2011) year of the time series; the catches of OCS were estimated using the ratio 1 OCS : 16 BSH provided by Clarke; however, Clarke notes that the catches of OCS are in decline and therefor it is likely that estimates for 2011 are higher than the actual catches of this species;

For details on species names of sharks refer to **Table 4**.

Group Code	GARCIA & HERRERA av(2014-16)	MURUA et al. av(2000-11)	CLARKE Y2000 Y2011	Group Code	GARCIA & HERRERA av(2014-16)	MURUA et al. av(2000-11)	CLARKE Y2000 Y2011
Sharks	209,742	154,219		FAL	23,295	31,901	
BSH	55,353	49,000	53,000 73,000	OCS	2,880	16,546	3,313 4,563*
MAK	39,102	15,575		PSK	2,605	65	
POR	96	24		MAN	10,480	3,094	
SPN	5,936	9,239		PLS	3,908	232	
THR	37,285	23,908		RHN	1,239 no	13 Tons	

[64] http://www.un.org/documents/ga/res/44/a44r225.htm
[65] http://www.iotc.org/sites/default/files/documents/compliance/cmm/iotc_cmm_1707_0.pdf
[66] http://www.iotc.org/sites/default/files/documents/2017/08/IOTC-2017-WPEB13-19.pdf
[67] *Ibid.* 66
[68] http://ec.europa.eu/fisheries/documentation/studies/sharks/scientific-advice-sharks_en.pdf
[69] http://www.iotc.org/sites/default/files/documents/2015/07/IOTC-2014-WPEB10-INF26_Rev_1_-_shark_fin_trade.pdf

The results obtained in this study are within the range of estimates obtained by Clarke (2014) for the two species of sharks she covered. The higher estimates obtained by Clarke for the blue shark (BSH) may originate from the fact that Clarke treates the longline fishery as a single unit while in this study fresh-tuna longline and deep-freezing longline fisheries have been treated separately. Over the last decade, fresh-tuna longliners have gained the more and more importance in the Indian Ocean and in recent years they have reported most of the fishing effort and catch in the region[70]. These fleets, mainly from Indonesia and Taiwan, operate closer to coastal waters and may use different gear configurations and target different stocks, which may lead to catches of sharks that differ from those estimated for deep-freezing longliners. This would also be applicable to ratios that compare effort levels among the different oceans; or ratios that compare total catch or the catches of a core group of species. On the other hand, the catches of oceanic whitetip shark (OCS) estimated by Clarke agree quite well with the catches from this study. While Clarke estimates a ratio 16:1 for BSH:OCS, she indicates that the catches of oceanic whitetip shark have been declining for some years and therefore, it is likely that the ratio 16:1 cannot be applied to estimate catches of OCS in 2011. The catches of OCS estimated here tend to confirm the constant decline in catches of OCS in the Indian Ocean.

While this study and Murua *et al.* (2013) come to the same conclusion in terms of the contribution of industrial tuna purse seine fisheries to the total catches of sharks in the Indian Ocean, at or below 1%, this is not the case with the species breakdown. Therefore, the catches of shark estimated by Murua *et al.* (2013) and those estimated here differ for most species of sharks, excluding the blue shark. There may be various reasons why those estimates differ, in particular the different time-periods used for the estimate, the limited number of fleets covered by Murua *et al.*, and the weight that each estimate gave to the different data sources used. However, the differences in estimates warrant further consideration, including a detailed comparison between the catches of sharks estimated for each individual fleet, and review of the estimation procedures used in each case.

As for marine turtles and marine mammals, there is little information available from past studies from which the estimates in this study can be compared with. However, as noted, the generalized lack of estimates of post-release survival of marine turtles and mammals and contribution of ghost fishing to the mortality of those groups is likely to compromise the quality of the estimates, which are already subject to high uncertainty due to the little data available from observer programmes, or other sources.

Conclusion and Recommendations

While preliminary, this study stresses the need for IOTC CPCs to improve data collection and reporting for bycatch stocks, and for the IOTC to improve data reporting requirements and dissemination standards; and implement alternative arrangements to improve the quality of bycatch data in the future. Unless data on bycatch are substantially improved, including the estimation of the levels of bycatch for the main stocks over the time-series, the IOTC Scientific Committee will be unable to respond to requests from the Commission that the status of some bycatch stocks be assessed, and robust management advice provided on those stocks.

The following represents a non-comprehensive list of recommendations from the authors of this paper, which are made bearing in mind the issues encountered in estimating levels of bycatch for IOTC fisheries:

- It is important that the IOTC finds appropriate mechanisms to ensure that all IOTC CPC comply with the most basic data collection and reporting requirements for bycatch stocks, as identified by the Commission. Where required, the Commission should contemplate adopting a scheme of sanctions to penalize cases of reiterated non-compliance by CPCs;

[70] http://www.iotc.org/sites/default/files/documents/2014/11/IOTC-2014-WPDCS10-INF01_-_Report_on_Fishing_Capacity.pdf

- It is important that the Commission find ways to ensure that, as a minimum requirement, all IOTC CPCs comply with provisions in the IOTC Regional Observer Scheme, especially with minima observer coverage levels adopted (5% of the fishing sets/operations); additionally, the Commission should contemplate adopting minima observer coverage levels in line with recommendations from the IOTC Scientific Committee, i.e. require that at least 20% of the fishing operations are covered by observers; this could be done using a combination of both human and electronic observers;
- It is important that the Commission contemplates moving towards the consolidation of all national observer schemes under a Regional Observer Scheme, with all competences transferred to the IOTC Secretariat or an independent service provider hired to that effect;
- It is important that the IOTC Scientific Committee considers streamlining the standards for the reporting and dissemination of data from observer programs, to ensure that observer data in the public domain can be used in the estimation of catch rates for all bycatch species for which catches are reported;
- It is important that the Commission considers adopting standards for the dissemination of data from the IOTC Port Inspection Scheme, Transshipment Program and other programmes where bycatch data are collected, in order to assist in the independent estimation of alternative bycatch levels for the main stocks;
- It is important that the IOTC Scientific Committee promotes the inception of research programs to estimate bycatch post-release survival rates and levels of fishing mortality to ghost fishing, for the main target and bycatch stocks in the Indian Ocean; and assess how much of the discards of IOTC fisheries may be unaccounted for in estimates;
- It is important that the IOTC Scientific Committee promotes capacity building on safe handling and release of bycatch for all fleets in order to increase the chance of survival of sensitive bycatch stocks in the Indian Ocean; and for the Commission to adopt such standards.
- It is important for the IOTC Scientific Committee to promote capacity building and the inception of data collection and research programs in coastal countries to assess the bycatch stocks caught by their fisheries, to assist in assessing the contribution of coastal fisheries to levels of fishing mortality for bycatch stocks.
- It is important for the Commission to consider funding alternative [desk] studies to be able to quantify the importance of causes other than IOTC fisheries to bycatch mortality, especially for marine turtles and marine mammals.

The IOTC needs to urgently address the issues referred to above to be able to ensure that bycatch stocks are assessed within reasonable levels of uncertainty, and management advice leads to informed management decisions in the future.

Regardless of the uncertainty of estimates, the main conclusion that can be drawn from this study is that the contribution of industrial purse seine fisheries to the mortality of the three groups covered, sharks, marine turtles and marine mammals, is very low, as it represents much less than 1% of the total mortality for each and every group, and is never higher than 1.5% for an individual species (e.g. silky shark). Even though estimates could be subject to change in the future as more information is made available, it is very unlikely that this represent a substantial change in the contribution of purse seine to levels of bycatch of sharks, marine mammals and marine turtles, which in the Indian Ocean are very low.

Acknowledgements

We would like to extend our gratitude to all those that have collaborated and provided information for this study, in particular Christopher O'Brien and Fabio Fiorellato (IOTC); Craig Proctor and William White (CSIRO); Achmad Mustofa (WWF-Indonesia); José Carlos Báez and Francisco Abascal (IEO Tenerife); José Luis Sánchez Lisazo (Universidad de Alicante); Hilario Murua (AZTI-Tecnalia); Vanessa Rojo and Isadora Moniz (OPAGAC).

Reference

References corresponding to the main text have been included as footnote, including hyperlinks to the documents of reference. The references below refer to the documents used to raise estimates for each individual fleet, as recorded in the Tables included in **Annex I** (column *NºREF Proxy*).

References Gillnet/Driftnet Fisheries: Pakistan:

1. Moazzam, M. (2012). Status of fisheries of neritic tuna in Pakistan. IOTC-2012-WPNT02-13.
2. Moazzam, M. (2013). An assessment of cetacean mortality in the gillnet fishery of the Northern Arabian Sea. IOTC-2013-WPEB09-28.
3. Moazzam, M. and Nawaz, R. (2014). An assessment of cetacean mortality in the tuna fisheries of Pakistan. IOTC-2014-WPEB10-INF25.
4. Moazzam, M. and Nawaz, R. (2014). By-catch of tuna gillnet fisheries of Pakistan: A serious threat to non-target, endangered and threatened species. *Journal of the Marine Biological Association of India, 56* (1), 85-90.
5. Shahid, U., Moazzam, M., Nawaz, R., Razzaq, S. and Ayub, S. (2016). Bycatch analysis of tuna gillnet fisheries of Pakistan: An analysis of bycatch data from 2013-2015. IOTC-2016-WPEB12-INF11.

References Gillnet/Driftnet Fisheries: Iran: Nil.

References Gillnet/Driftnet Fisheries: Yemen: Nil.

References Gillnet/Driftnet Fisheries: Tanzania: Nil.

References Gillnet/Driftnet Fisheries: Oman: Nil.

References Gillnet/Driftnet Fisheries: Other: Nil.

References Gillnet/Driftnet Fisheries: India:

1. Heralth, H. and Maldeniya R. (2013). Status of Shark fishery in Sri Lanka. IOTC-2013-WPEB09-18.
2. Rajagolapan, M., Vijayakumaran, K. and Vivekanandan, E. (2008). Fishery-Related Mortality of Sea Turtles in India: An Overview. In Marine Turtles of the Indian Subcontinent. *Conservation and Society*, 6 (2), 208. Pp 227- 237.

References Gillnet/Driftnet Fisheries: Sri Lanka:

1. Dayaratne, P. and Joseph, L. (1993). A Study on dolphin catchs in Shri Lanka. Report prepared for the Bay of Bengal Programme, Madras, India.
2. Hasarangi, D., Maldeniya, R. and Haputhantri S. (2012). A review on Shark Fishery Resources in Sri Lanka. IOTC-2012-WPEB08-15 Rev_1.
3. Heralth, H. and Maldeniya R. (2013). Status of Shark fishery in Sri Lanka. IOTC-2013-WPEB09-18.
4. Hewapathirana, H. and Gunawardane, N. (2017). Sri Lanka National Report of the Scientific Committee of the Indian Ocean Tuna Commission, 2017. IOTC-2017-SC20-NR25.
5. Kapurusinghe, T. and Saman, M. (2001). Marine turtle By-catch in Sri Lanka. Three year study from September 1996 to September 1999. Proceedings of the twenty first annual symposium on marine turtle biology and conservation, Philadelphia, USA (In Press).
6. Moazzam, M. and Nawaz, R. (2014). By-catch of tuna gillnet fisheries of Pakistan: A serious threat to non-target, endangered and threatened species. *Journal of the Marine Biological Association of India, 56* (1), 85-90.
7. Rajagolapan, M., Vijayakumaran, K. and Vivekanandan, E. (2008). Fishery-Related Mortality of Sea Turtles in India: An Overview. In Marine Turtles of the Indian Subcontinent. Conservation and Society, 6 (2), 208. Pp 227- 237.
8. Shahid, U., Moazzam, M., Nawaz, R., Razzaq, S. and Ayub, S. (2016). Bycatch analysis of tuna gillnet fisheries of Pakistan: An analysis of bycatch data from 2013-2015. IOTC-2016-WPEB12-INF11.

References Gillnet/Driftnet Fisheries: Indonesia:

1. Kapurusinghe, T. and Saman, M. (2001). Marine turtle By-catch in Sri Lanka. Three-year study from September 1996 to September 1999. Proceedings of the twenty first annual symposium on marine turtle biology and conservation, Philadelphia, USA (In Press).
2. Novianto, D., Nugroho, A. and Zedta, R. (2016). Composition and abundance of pelagic shark caught by Drift Gillnet in Cilacap Oceanic Fishing Port, Indonesia. IOTC-2016-WPEB12-17.
3. Rajagolapan, M., Vijayakumaran, K. and Vivekanandan, E. (2008). Fishery-Related Mortality of Sea Turtles in India: An Overview. In *Marine Turtles of the Indian Subcontinent.* Conservation and Society, 6 (2), 208. Pp 227- 237.
4. White, W., Giles, J., Dharmadi, D. and Potter, I. (2006). Data on the bycatch fishery and reproductive biology of mobulidrays (Myliobatiformes) in Indonesia. *Fisheries Research*, 82, 65–73.

References Gillnet/Driftnet Fisheries: Malasya: Nil.

References Gillnet/Driftnet Fisheries: Thailand Nil.

References Purse Seine Fisheries: Spain:

1. Amande, J., Ariz, J., Chassot, E., Chavance, P., Delgado de Molina, A., Gaertner, D., Murua, H., Pianet, R. and Ruiz, J. (2008) Bycatch and discards of the European Purse Seine Tuna Fishery in the Indian Ocean estimation and characteristics for the 2003-2007 period. IOTC-2008-WPEB-12

2. Capietto, A., Escalle, L., Chavance, P., Dubroca, L., Delgado de Molina, A., Murua, H., Floch, L., Damiano, A., Rowat, A. and Merigot, B. (2014). Mortality of marine megafauna induced by fisheries: Insights from the whale shark, the world's largest fish. *Biological Conservation*, 175, 147-151.
3. IEO. (2018). IOTC Bycatch Forms for Spanish Purse Seine as submitted to IOTC.

References Purse Seine Fisheries: France: Nil.

References Purse Seine Fisheries: Iran: Nil.

References Purse Seine Fisheries: Japan: Nil.

References Purse Seine Fisheries: Republic of Korea: Nil.

References Purse Seine Fisheries: Mauritius: Nil.

References Purse Seine Fisheries: Seychelles: Nil.

References Swordfish Longline Fisheries: Australia:

1. Hobsbawn, P., Patterson, H. and Williams, A. (2017). Australian National Report to the Scientific Committee of the Indian Ocean Tuna Commisision for 2017. IOTC-2017-SC-NR01.
2. Coelho, R., Lino, P. and Santos, M. (2011). At haulback mortality of elasmobranchs caught on the Portuguese Longline Swordfish fishery in the Indian Ocean. IOTC-2011-WPEB07-31.
3. Coelho, R. (2016). Hooking mortality of oceanic whitetip sharks caught in a pelagic longline targeting swordfish in the SW Indian Ocean: Comments on the eficienctcy of no-retention measures. IOTC-2016-WPEB12-26.

References Swordfish Longline Fisheries: France (Mayotte):

1. Kiszka, J., Bein, A., Bach, P., Jamon, A., Layssac, K., Labart, S. and Wickel, J. (2010). Catch and bycatch in the pelagic longline fishery around Mayotte (NE Mozambique Channel), July 2009- September 2010. IOTC-2010-WPEB-19.
2. Sabarros, P., Romanov, E., Le Foulgoc, L., Richard, E., Lamoureux, J. and Bach, P. (2013). Commercial catch and discards of pelagic longline fishery of Reunion Island based on the self-reporting data collection program. IOTC-2013-WPEB09-37 Rev_1.

References Swordfish Longline Fisheries: Reunion (**France):**

1. Bach, P., Chassot, E., Bourjea, J., Evano, H., Huet, J., Chavance, P., Floch, L., Cauquil, P., Sabarros, P., Giannasi, P. and Marsac, F. (2015). Rapport national destine au Comité scientifique de la Commission des thons de l' ocean Indien, 2015. IOTC-2015-SC18-NR06.
2. Bach, P., Chassot, E., Bonhommeau, S., Sabarros, P., Billet, N., Floch, L., Cauquil, P., Evano, H., Huet, J., Damiano, A., Giannasi, P. and Marsac, F. (2016). Rapport national destiné au Comité scientifique de la Commission des thons de l'océan Indien, 2016. IOTC-2016-SC19-NR06_Rev_1.
3. Bach, P., Sabarros, P., Billet, N., Floch, L., Cauquil, P., Lebranchu, J., Chassot, E., Bonhommeau, S., Evano, H., Huet, J., Damiano, A., Giannasi, P, and Marsac, F. (2017). Rapport national destine au Comité scientifique de la Commission des thons de l'océan Indien, 2017. IOTC-2017-SC20-NR05_EU_Rev1.
4. Sabarros, P., Romanov, E., Le Foulgoc, L., Richard, E., Lamoureux, J. and Bach, P. (2013). Commercial catch and discards of pelagic longline fishery of Reunion Island based on the self-reporting data collection program. IOTC-2013-WPEB09-37 Rev_1.

References Swordfish Longline Fisheries: Portugal:

1. Coelho, R. (2015). EU-Portugal National Report to the Scientific Committee of the Indian Ocean Tuna Commission, 2015. IOTC-2015-SC18-NR06.
2. Coelho, R. (2016). EU-Portugal National Report to the Scientific Committee of the Indian Ocean Tuna Commission, 2016. IOTC-2016-SC19-NR06_Rev_1.
3. Coelho, R. (2017). EU-Portugal National Report to the Scientific Committee of the Indian Ocean Tuna Commission, 2017. IOTC-2017-SC20-NR05_EU_Rev1.
4. Sabarros, P., Romanov, E., Le Foulgoc, L., Richard, E., Lamoureux, J. and Bach, P. (2013). Commercial catch and discards of pelagic longline fishery of Reunion Island based on the self-reporting data collection program. IOTC-2013-WPEB09-37 Rev_1.

References Swordfish Longline Fisheries: Spain:

1. Ardill, D., Itano, D. and Gillett, R. (2012). A review of Bycatch and Discards issues in Indian Ocean Tuna Fisheries. IOTC-2012-WPEB08-INF20.
2. IEO. (2015). Spanish National Report to the Scientific Committee of the Indian Ocean Tuna Commission, 2015. IOTC-2015-SC18-NR06.
3. IEO and SGP. (2016). Spanish National Report to the Scientific Committee of the Indian Ocean Tuna Commission, 2016. IOTC-2016-SC19-NR06_Rev_1.
4. IEO and SGP. (2017). EU-SPAIN National Report to the Scientific Committee of the Indian Ocean Tuna Commission, 2017. IOTC-2017-SC20-NR05_EU_Rev1.
5. Sabarros, P., Romanov, E., Le Foulgoc, L., Richard, E., Lamoureux, J. and Bach, P. (2013). Commercial catch and discards of pelagic longline fishery of Reunion Island based on the self-reporting data collection program. IOTC-2013-WPEB09-37 Rev_1.

References Swordfish Longline Fisheries: United Kingdom: Nil.

References Swordfish Longline Fisheries: Madagascar:

1. Razafimandimby, Y. and Joachim, L. (2017). Update on shark catch characteristics by national longline fleets in Madagascar (2010-2016). IOTC-WPEB13-11.

References Swordfish Longline Fisheries: Mauritius: Nil.

References Swordfish Longline Fisheries: Mozambique:

1. Coelho, R., Lino, P. and Santos, M. (2011). At haulback mortality of elasmobranchs caught on the Portuguese Longline Swordfish fishery in the Indian Ocean. IOTC-2011-WPEB07-31.
2. Coelho, R. (2016). Hooking mortality of oceanic whitetip sharks caught in a pelagic longline targeting swordfish in the SW Indian Ocean: Comments on the eficienctcy of no-retention measures. IOTC-2016-WPEB12-26.
3. Mutombene, R. (2016). Depredation and incidental catches on Longline Fishery of Southern Mozambique. IOTC-2016-WPEB12-26.
4. Sabarros, P., Romanov, E., Le Foulgoc, L., Richard, E., Lamoureux, J. and Bach, P. (2013). Commercial catch and discards of pelagic longline fishery of Reunion Island based on the self-reporting data collection program. IOTC-2013-WPEB09-37 Rev_1.

References Swordfish Longline Fisheries: Seychelles: Nil.

References Swordfish Longline Fisheries: South Africa:

1. Coelho, R., Lino, P. and Santos, M. (2011). At haulback mortality of elasmobranchs caught on the Portuguese Longline Swordfish fishery in the Indian Ocean. IOTC-2011-WPEB07-31.
2. Coelho, R. (2016). Hooking mortality of oceanic whitetip sharks caught in a pelagic longline targeting swordfish in the SW Indian Ocean: Comments on the eficienctcy of no-retention measures. IOTC-2016-WPEB12-26.
3. Groeneveld, J., Cliff, G., Dudley, S., Foulis, A., Santos J., and Wintner, S. (2014). Population structure and biology of shortfin mako, *Isurus oxyrinchus*, in the south-west Indian Ocean. IOTC-2014-WPEB10-INF12.
4. Mejuto, J., García-Cortés, B., Ramos-Cartelle, A., and de la Serna, J.M. (2009). Scientific estimations of by-catch landed by the spanish surface longline fleet targeting swordfish (Xiphias gladius) in the Atlantic Ocean with special reference to the years 2005 and 2006. Report published in *Collective Volume of Scientific Paper* ICCAT, 64(7): 2455-2468.
5. Parker, D., Winker, H., da Silva, C., Mketsu, S. and Kerwath, S. (2017). South African National Report to the Scientific Committee of the Indian Ocean Tuna Commission, 2017. IOTC-2017-SC20-NR26.
6. Petersen, L., Honig, M., Ryan, P., Nel, R. and Underhill, G. (2009). Turtle bycatch in the pelagic longline fishery off southern Africa. *African Journal of Marine Science*, 31:1, 87-96.
7. Petersen, L., Honig, M., Ryan, P., Underhill, G., and Compagno, L. (2009). Pelagic shark bycatch in the tuna- and swordfish-directed longline fishery off southern Africa. *African Journal of Marine Science*, 31:2: 215-225.
8. Sabarros, P., Romanov, E., Le Foulgoc, L., Richard, E., Lamoureux, J. and Bach, P. (2013). Commercial catch and discards of pelagic longline fishery of Reunion Island based on the self-reporting data collection program. IOTC-2013-WPEB09-37 Rev_1.

References Deep-freezing Longline Fisheries: China:

1. Gao, C. and Dai, X. (2016). Estimating the composition and capture status of bycatch using Chinese longline observer data in the Indian Ocean. IOTC-2016-WPEB12-16 Rev_1.
2. Petersen, L., Honig, M., Ryan, P., Underhill, G., and Compagno, L. (2009). Pelagic shark bycatch in the tuna- and swordfish-directed longline fishery off southern Africa. *African Journal of Marine Science*, 31:2: 215-225.
3. Varghese, S., Vijayakumaran, K., Tiburtius, A. and Mhatre, V. (2015). Diversity, abundance and size structure of pelagic sharks caught in tuna longline survey in the Indian seas. *Indian Journal of Geo-Marine Science*, 44: 26-36.
4. Xu, L., Wang, X., Chen, Y., Wu, F., Zhu, J. and Yang, X. (2017). China National Report to the Scientific Committee of the Indian Ocean Tuna Commission, 2017. IOTC-2017-SC20-NR02.

References Deep-freezing Longline Fisheries: India:

1. Petersen, L., Honig, M., Ryan, P., Underhill, G., and Compagno, L. (2009). Pelagic shark bycatch in the tuna- and swordfish-directed longline fishery off southern Africa. *African Journal of Marine Science*, 31:2: 215-225.
2. Sabarros, P., Romanov, E., Le Foulgoc, L., Richard, E., Lamoureux, J. and Bach, P. (2013). Commercial catch and discards of pelagic longline fishery of Reunion Island based on the self-reporting data collection program. IOTC-2013-WPEB09-37 Rev_1.
3. Varghese, S. and Somvanshi, V. (2010). Impact of tuna longline fishery on the sea turtles of Indian seas. *Current Science*, 98:10, 1378-1384.
4. Varghese, S., Vijayakumaran, K. and Gulati, D. (2013). Pelagic megafauna bycatch in the tuna longline fisheries off India. IOTC-2013-WPEB09-36.
5. Varghese, S., Vijayakumaran, K., Tiburtius, A. and Mhatre, V. (2015). Diversity, abundance and size structure of pelagic sharks caught in tuna longline survey in the Indian seas. *Indian Journal of Geo-Marine Science*, 44: 26-36.

References Deep-freezing Longline Fisheries: Indonesia:

1. Novianto, D., Rochman, F. and Nugraha, B. (2014). Species composition, CPUE and length frecuency of oceanic sharks based on observer data from the Indonesian Longline Fishery in the Indian Ocean. IOTC-2014-WPEB10-13 Rev_1.
2. Petersen, L., Honig, M., Ryan, P., Underhill, G., and Compagno, L. (2009). Pelagic shark bycatch in the tuna- and swordfish-directed longline fishery off southern Africa. *African Journal of Marine Science*, 31:2: 215-225.
3. Sabarros, P., Romanov, E., Le Foulgoc, L., Richard, E., Lamoureux, J. and Bach, P. (2013). Commercial catch and discards of pelagic longline fishery of Reunion Island based on the self-reporting data collection program. IOTC-2013-WPEB09-37 Rev_1.

4. Setyadji, B. and Nugraha, B. (2013). Discards of the Indonesian Tuna Longline Fishery in Indian Ocean. *Indonesian Fisheries Research Journal*, 19:1, 25-32.
5. Varghese, S., Vijayakumaran, K., Tiburtius, A. and Mhatre, V. (2015). Diversity, abundance and size structure of pelagic sharks caught in tuna longline survey in the Indian seas. *Indian Journal of Geo-Marine Science*, 44: 26-36.
6. Zainudin, I., Patria, M., Rahardjo, P., Yasman, Y., Gautama, D. and Prawira, W. (2017). Bycatch of sharks, marine mammals and seabirds in Indonesian Tuna Longline Fishery. *Biodiversitas*, 18:3, 1179-1189.

References Deep-freezing Longline Fisheries: Indonesia:

1. Okamoto, K. and Oshima, K. (2017). Bycatch records of sea turtles obtained through Japanese Observer Program in the IOTC Convention Area. IOTC-2017-WPEB13-37 Rev_1.
2. Petersen, L., Honig, M., Ryan, P., Underhill, G., and Compagno, L. (2009). Pelagic shark bycatch in the tuna- and swordfish-directed longline fishery off southern Africa. *African Journal of Marine Science*, 31:2: 215-225.
3. Sabarros, P., Romanov, E., Le Foulgoc, L., Richard, E., Lamoureux, J. and Bach, P. (2013). Commercial catch and discards of pelagic longline fishery of Reunion Island based on the self-reporting data collection program. IOTC-2013-WPEB09-37 Rev_1.
4. Varghese, S., Vijayakumaran, K., Tiburtius, A. and Mhatre, V. (2015). Diversity, abundance and size structure of pelagic sharks caught in tuna longline survey in the Indian seas. *Indian Journal of Geo-Marine Science*, 44: 26-36.

References Deep-freezing Longline Fisheries: Republic of Korea: Nil**.**

References Deep-freezing Longline Fisheries: Maldives:

1. Ahusan, M., Adam, S., Ziyad, A., Ali, K. and Shifaz, A. (2017). Maldives National Report submitted to the Indian Ocean Tuna Commission Scientific Committee, 2017. IOTC-2017-SC20-NR16.
2. Anderson, C., Adam, S. and Saleem, M. (2011). Shark longline fishery in the Northern Maldives. IOTC-2011-WPEB07-27 Rev_1.
3. Petersen, L., Honig, M., Ryan, P., Underhill, G., and Compagno, L. (2009). Pelagic shark bycatch in the tuna- and swordfish-directed longline fishery off southern Africa. *African Journal of Marine Science*, 31:2: 215-225.
4. Sabarros, P., Romanov, E., Le Foulgoc, L., Richard, E., Lamoureux, J. and Bach, P. (2013). Commercial catch and discards of pelagic longline fishery of Reunion Island based on the self-reporting data collection program. IOTC-2013-WPEB09-37 Rev_1.
5. Varghese, S., Vijayakumaran, K., Tiburtius, A. and Mhatre, V. (2015). Diversity, abundance and size structure of pelagic sharks caught in tuna longline survey in the Indian seas. *Indian Journal of Geo-Marine Science*, 44: 26-36.

References Deep-freezing Longline Fisheries: Nei: Nil**.**

References Deep-freezing Longline Fisheries: Oman: Nil**.**

References Deep-freezing Longline Fisheries: Seychelles: Nil**.**

References Deep-freezing Longline Fisheries: Taiwan:

1. Huang, H. and Liu, K. (2010). Bycatch and discards by Taiwanese large-scale tuna longline fleets in the Indian Ocean. *Fisheries Research*, 106, 261-270.
2. Petersen, L., Honig, M., Ryan, P., Underhill, G., and Compagno, L. (2009). Pelagic shark bycatch in the tuna- and swordfish-directed longline fishery off southern Africa. *African Journal of Marine Science*, 31:2: 215-225.
3. Varghese, S., Vijayakumaran, K., Tiburtius, A. and Mhatre, V. (2015). Diversity, abundance and size structure of pelagic sharks caught in tuna longline survey in the Indian seas. *Indian Journal of Geo-Marine Science*, 44: 26-36.

References Deep-freezing Longline Fisheries: Tanzania: Nil**.**

References Deep-freezing Longline Fisheries: Thailand: Nil**.**

References Fresh Tuna Longline Fisheries: China:

1. Gao, C. and Dai, X. (2016). Estimating the composition and capture status of bycatch using Chinese longline observer data in the Indian Ocean. IOTC-2016-WPEB12-16 Rev_1.
2. Petersen, L., Honig, M., Ryan, P., Underhill, G., and Compagno, L. (2009). Pelagic shark bycatch in the tuna- and swordfish-directed longline fishery off southern Africa. *African Journal of Marine Science*, 31:2: 215-225.
3. Varghese, S., Vijayakumaran, K., Tiburtius, A. and Mhatre, V. (2015). Diversity, abundance and size structure of pelagic sharks caught in tuna longline survey in the Indian seas. *Indian Journal of Geo-Marine Science*, 44: 26-36.
4. Xu, L., Wang, X., Chen, Y., Wu, F., Zhu, J. and Yang, X. (2017). China National Report to the Scientific Committee of the Indian Ocean Tuna Commission, 2017. IOTC-2017-SC20-NR02.

References Fresh Tuna Longline Fisheries: India:

1. Petersen, L., Honig, M., Ryan, P., Underhill, G., and Compagno, L. (2009). Pelagic shark bycatch in the tuna- and swordfish-directed longline fishery off southern Africa. *African Journal of Marine Science*, 31:2: 215-225.
2. Sabarros, P., Romanov, E., Le Foulgoc, L., Richard, E., Lamoureux, J. and Bach, P. (2013). Commercial catch and discards of pelagic longline fishery of Reunion Island based on the self-reporting data collection program. IOTC-2013-WPEB09-37 Rev_1.
3. Varghese, S. and Somvanshi, V. (2010). Impact of tuna longline fishery on the sea turtles of Indian seas. *Current Science*, 98:10, 1378-1384.
4. Varghese, S., Vijayakumaran, K. and Gulati, D. (2013). Pelagic megafauna bycatch in the tuna longline fisheries off India. IOTC-2013-WPEB09-36.

5. Varghese, S., Vijayakumaran, K., Tiburtius, A. and Mhatre, V. (2015). Diversity, abundance and size structure of pelagic sharks caught in tuna longline survey in the Indian seas. *Indian Journal of Geo-Marine Science*, 44: 26-36.

References Fresh Tuna Longline Fisheries: Indonesia:

1. Novianto, D., Rochman, F. and Nugraha, B. (2014). Species composition, CPUE and length frecuency of oceanic sharks based on observer data from the Indonesian Longline Fishery in the Indian Ocean. IOTC-2014-WPEB10-13 Rev_1.
2. Petersen, L., Honig, M., Ryan, P., Underhill, G., and Compagno, L. (2009). Pelagic shark bycatch in the tuna- and swordfish-directed longline fishery off southern Africa. *African Journal of Marine Science*, 31:2: 215-225.
3. Sabarros, P., Romanov, E., Le Foulgoc, L., Richard, E., Lamoureux, J. and Bach, P. (2013). Commercial catch and discards of pelagic longline fishery of Reunion Island based on the self-reporting data collection program. IOTC-2013-WPEB09-37 Rev_1.
4. Setyadji, B. and Nugraha, B. (2013). Discards of the Indonesian Tuna Longline Fishery in Indian Ocean. *Indonesian Fisheries Research Journal*, 19:1, 25-32.
5. Varghese, S., Vijayakumaran, K., Tiburtius, A. and Mhatre, V. (2015). Diversity, abundance and size structure of pelagic sharks caught in tuna longline survey in the Indian seas. *Indian Journal of Geo-Marine Science*, 44: 26-36.
6. Zainudin, I., Patria, M., Rahardjo, P., Yasman, Y., Gautama, D. and Prawira, W. (2017). Bycatch of sharks, marine mammals and seabirds in Indonesian Tuna Longline Fishery. *Biodiversitas*, 18:3, 1179-1189.

References Fresh Tuna Longline Fisheries: Malasya: Nil**.**

References Fresh Tuna Longline Fisheries: Nei: Nil**.**

References Fresh Tuna Longline Fisheries: Sri Lanka:

1. Herath, H. and Maldeniya, R. (2013). Status of Shark fishery in Sri Lanka. IOTC-2013-WPEB09-18.
2. Petersen, L., Honig, M., Ryan, P., Underhill, G., and Compagno, L. (2009). Pelagic shark bycatch in the tuna- and swordfish-directed longline fishery off southern Africa. African Journal of Marine Science, 31:2: 215-225.
3. Sabarros, P., Romanov, E., Le Foulgoc, L., Richard, E., Lamoureux, J. and Bach, P. (2013). Commercial catch and discards of pelagic longline fishery of Reunion Island based on the self-reporting data collection program. IOTC-2013-WPEB09-37 Rev_1.
4. Varghese, S. and Somvanshi, V. (2010). Impact of tuna longline fishery on the sea turtles of Indian seas. *Current Science*, 98:10, 1378-1384.
5. Varghese, S., Vijayakumaran, K., Tiburtius, A. and Mhatre, V. (2015). Diversity, abundance and size structure of pelagic sharks caught in tuna longline survey in the Indian seas. Indian Journal of Geo-Marine Science, 44: 26-36.

References Fresh Tuna Longline Fisheries: Taiwan:

1. Huang, H. and Liu, K. (2010). Bycatch and discards by Taiwanese large-scale tuna longline fleets in the Indian Ocean. *Fisheries Research*, 106, 261-270.
2. Petersen, L., Honig, M., Ryan, P., Underhill, G., and Compagno, L. (2009). Pelagic shark bycatch in the tuna- and swordfish-directed longline fishery off southern Africa. *African Journal of Marine Science*, 31:2: 215-225.
3. Varghese, S., Vijayakumaran, K., Tiburtius, A. and Mhatre, V. (2015). Diversity, abundance and size structure of pelagic sharks caught in tuna longline survey in the Indian seas. *Indian Journal of Geo-Marine Science*, 44: 26-36.

References Coastal Longline Fisheries: Reunion (France):

1. Bach, P., Chassot, E., Bourjea, J., Evano, H., Huet, J., Chavance, P., Floch, L., Cauquil, P., Sabarros, P., Giannasi, P. and Marsac, F. (2015). Rapport national destine au Comité scientifique de la Commission des thons de l' ocean Indien, 2015. IOTC-2015-SC18-NR06.
2. Bach, P., Chassot, E., Bonhommeau, S., Sabarros, P., Billet, N., Floch, L., Cauquil, P., Evano, H., Huet, J., Damiano, A., Giannasi, P. and Marsac, F. (2016). Rapport national destiné au Comité scientifique de la Commission des thons de l'océan Indien, 2016. IOTC-2016-SC19-NR06_Rev_1.
3. Bach, P., Sabarros, P., Billet, N., Floch, L., Cauquil, P., Lebranchu, J., Chassot, E., Bonhommeau, S., Evano, H., Huet, J., Damiano, A., Giannasi, P, and Marsac, F. (2017). Rapport national destine au Comité scientifique de la Commission des thons de l'océan Indien, 2017. IOTC-2017-SC20-NR05_EU_Rev1.
4. Petersen, L., Honig, M., Ryan, P., Underhill, G., and Compagno, L. (2009). Pelagic shark bycatch in the tuna- and swordfish-directed longline fishery off southern Africa. *African Journal of Marine Science*, 31:2: 215-225.
5. Varghese, S., Vijayakumaran, K., Tiburtius, A. and Mhatre, V. (2015). Diversity, abundance and size structure of pelagic sharks caught in tuna longline survey in the Indian seas. *Indian Journal of Geo-Marine Science*, 44: 26-36.

References Coastal Longline Fisheries: Indonesia:

1. Novianto, D., Rochman, F. and Nugraha, B. (2014). Species composition, CPUE and length frecuency of oceanic sharks based on observer data from the Indonesian Longline Fishery in the Indian Ocean. IOTC-2014-WPEB10-13 Rev_1.
2. Petersen, L., Honig, M., Ryan, P., Underhill, G., and Compagno, L. (2009). Pelagic shark bycatch in the tuna- and swordfish-directed longline fishery off southern Africa. *African Journal of Marine Science*, 31:2: 215-225.
3. Sabarros, P., Romanov, E., Le Foulgoc, L., Richard, E., Lamoureux, J. and Bach, P. (2013). Commercial catch and discards of pelagic longline fishery of Reunion Island based on the self-reporting data collection program. IOTC-2013-WPEB09-37 Rev_1.
4. Setyadji, B. and Nugraha, B. (2013). Discards of the Indonesian Tuna Longline Fishery in Indian Ocean. *Indonesian Fisheries Research Journal*, 19:1, 25-32.

5. Varghese, S., Vijayakumaran, K., Tiburtius, A. and Mhatre, V. (2015). Diversity, abundance and size structure of pelagic sharks caught in tuna longline survey in the Indian seas. *Indian Journal of Geo-Marine Science*, 44: 26-36.
6. Zainudin, I., Patria, M., Rahardjo, P., Yasman, Y., Gautama, D. and Prawira, W. (2017). Bycatch of sharks, marine mammals and seabirds in Indonesian Tuna Longline Fishery. *Biodiversitas*, 18:3, 1179-1189.

References Coastal Longline Fisheries: Maldives:

1. Ahusan, M., Adam, S., Ziyad, A., Ali, K. and Shifaz, A. (2017). Maldives National Report submitted to the Indian Ocean Tuna Commission Scientific Committee, 2017. IOTC-2017-SC20-NR16.
2. Anderson, C., Adam, S. and Saleem, M. (2011). Shark longline fishery in the Northern Maldives. IOTC-2011-WPEB07-27 Rev_1.
3. Petersen, L., Honig, M., Ryan, P., Underhill, G., and Compagno, L. (2009). Pelagic shark bycatch in the tuna- and swordfish-directed longline fishery off southern Africa. African Journal of Marine Science, 31:2: 215-225.
4. Sabarros, P., Romanov, E., Le Foulgoc, L., Richard, E., Lamoureux, J. and Bach, P. (2013). Commercial catch and discards of pelagic longline fishery of Reunion Island based on the self-reporting data collection program. IOTC-2013-WPEB09-37 Rev_1.
5. Varghese, S., Vijayakumaran, K., Tiburtius, A. and Mhatre, V. (2015). Diversity, abundance and size structure of pelagic sharks caught in tuna longline survey in the Indian seas. Indian Journal of Geo-Marine Science, 44: 26-36.

References Coastal Longline Fisheries: Sri Lanka:

1. Herath, H. and Maldeniya, R. (2013). Status of Shark fishery in Sri Lanka. IOTC-2013-WPEB09-18.
2. Petersen, L., Honig, M., Ryan, P., Underhill, G., and Compagno, L. (2009). Pelagic shark bycatch in the tuna- and swordfish-directed longline fishery off southern Africa. African Journal of Marine Science, 31:2: 215-225.
3. Sabarros, P., Romanov, E., Le Foulgoc, L., Richard, E., Lamoureux, J. and Bach, P. (2013). Commercial catch and discards of pelagic longline fishery of Reunion Island based on the self-reporting data collection program. IOTC-2013-WPEB09-37 Rev_1.
4. Varghese, S. and Somvanshi, V. (2010). Impact of tuna longline fishery on the sea turtles of Indian seas. *Current Science*, 98:10, 1378-1384.
5. Varghese, S., Vijayakumaran, K., Tiburtius, A. and Mhatre, V. (2015). Diversity, abundance and size structure of pelagic sharks caught in tuna longline survey in the Indian seas. Indian Journal of Geo-Marine Science, 44: 26-36.

References Coastal Longline Fisheries: India:

1. Petersen, L., Honig, M., Ryan, P., Underhill, G., and Compagno, L. (2009). Pelagic shark bycatch in the tuna- and swordfish-directed longline fishery off southern Africa. *African Journal of Marine Science*, 31:2: 215-225.
2. Sabarros, P., Romanov, E., Le Foulgoc, L., Richard, E., Lamoureux, J. and Bach, P. (2013). Commercial catch and discards of pelagic longline fishery of Reunion Island based on the self-reporting data collection program. IOTC-2013-WPEB09-37 Rev_1.
3. Varghese, S. and Somvanshi, V. (2010). Impact of tuna longline fishery on the sea turtles of Indian seas. *Current Science*, 98:10, 1378-1384.
4. Varghese, S., Vijayakumaran, K. and Gulati, D. (2013). Pelagic megafauna bycatch in the tuna longline fisheries off India. IOTC-2013-WPEB09-36.
5. Varghese, S., Vijayakumaran, K., Tiburtius, A. and Mhatre, V. (2015). Diversity, abundance and size structure of pelagic sharks caught in tuna longline survey in the Indian seas. *Indian Journal of Geo-Marine Science*, 44: 26-36.

References Trolling-Longline Fisheries: India:

1. Petersen, L., Honig, M., Ryan, P., Underhill, G., and Compagno, L. (2009). Pelagic shark bycatch in the tuna- and swordfish-directed longline fishery off southern Africa. *African Journal of Marine Science*, 31:2: 215-225.
2. Sabarros, P., Romanov, E., Le Foulgoc, L., Richard, E., Lamoureux, J. and Bach, P. (2013). Commercial catch and discards of pelagic longline fishery of Reunion Island based on the self-reporting data collection program. IOTC-2013-WPEB09-37 Rev_1.
3. Varghese, S. and Somvanshi, V. (2010). Impact of tuna longline fishery on the sea turtles of Indian seas. *Current Science*, 98:10, 1378-1384.
4. Varghese, S., Vijayakumaran, K. and Gulati, D. (2013). Pelagic megafauna bycatch in the tuna longline fisheries off India. IOTC-2013-WPEB09-36.
5. Varghese, S., Vijayakumaran, K., Tiburtius, A. and Mhatre, V. (2015). Diversity, abundance and size structure of pelagic sharks caught in tuna longline survey in the Indian seas. *Indian Journal of Geo-Marine Science*, 44: 26-36.

Gillnet/Driftnet Fisheries: Pakistan.

Table 1. Pakistan gillnet/driftnet fleets: Levels of bycatch fishing mortality estimated and main data sources used

The section *Scenarios* contains the estimates used for this study (*Base Case*) and upper (Upper Bound) and lower (*Lower Bound*) estimates, the latter two only when the use of alternative estimates of bycatch was available (*na*: catch not available/unknown; 0: nil catch).

Catches for most shark species are recorded in metric tons while the catches of whale shark, marine mammals and marine turtles are in number.

Key to *Data Sources* (**O** when used): IOTC Nominal Catch Table (**NC**); IOTC Effort (**EF**); CPC National Report (**NR**); IOTC Regional Observer Scheme (**OB**); Biological data (**BD**); Data from other Fleet used as Proxy (**PX**); Data from various scientific publications (**PB**).

NºREF Proxy: Key to the data (e.g. Proxy fleet used) and literature used to carry out the estimates. For numbers see the **Reference** for details.

Group Code	Species (*latin name*) / [Group]	Record in	Scenarios			Data Sources							NºREF Proxy
			Base Case	Lower Bound	Upper Bound	NC	EF	NR	BD	OB	PX	PB	
SKH	Total sharks *Elasmobranchia*	Weight	8066.2	na	na	O							
BSH	Blue shark *Prionace glauca*	Weight	na	na	na								
MAK	Mako sharks *Isurus spp.*	Weight	3225.1	na	na							O	5
POR	Porbeagle shark *Lamna nasus*	Weight	na	na	na								
SPN	Hammerhead sharks *Sphyrna spp.*	Weight	350.6	na	na							O	5
THR	Thresher sharks *Alopias spp.*	Weight	1682.6	na	na							O	5
FAL	Silky shark *Carcharhinus falciformis*	Weight	490.8	na	na							O	5
OCS	Oceanic whitetip shark *Carcharhinus longimanus*	Weight	na	na	na								
PSK	Crocodile shark *Pseudocarcharias kamoharai*	Weight	na	na	na								
	Other sharks SKH and Sharks nei	Weight	1262.0	na	nan							O	5
RHN	Whale shark *Rhincodon typus*	Number	125	9	175							O	5
MAN	Mantas and devil rays *Mobulidae*	Weight	1055.2	na	na						O		GILL-IDN
PLS	Pelagic stingray *Pteroplatytrygon violacea*	Weight	na	na	na								
ODN	Small marine mammals *Odontoceti*	Number	13450	12000	30000							O	3,4,5
MYS	Whales *Mysticetti*	Number	1	1	2							O	2
TTX	Marine turtles *Testudines*	Number	1008	na	1215							O	1,3,4
LKV	Olive ridley turtle *Lepidochelys olivacea*	Number	875	na	987							O	1,3,4
TUG	Green turtle *Chelonia mydas*	Number	105	na	200							O	1,3,4
TTL	Loggerhead turtle *Caretta caretta*	Number	na	na	na								
DKK	Leatherback turtle *Dermochelys coriacea*	Number	7	na	7							O	1,3,4
TTH	Hawksbill turtle *Eretmochelys imbricata*	Number	21	na	21							O	1,3,4

Gillnet/Driftnet Fisheries: Iran.

Table 2. Iran gillnet/driftnet fleets: Levels of bycatch fishing mortality estimated and main data sources used

The section *Scenarios* contains the estimates used for this study (*Base Case*) and upper (Upper Bound) and lower (*Lower Bound*) estimates, the latter two only when the use of alternative estimates of bycatch was available (*na*: catch not available/unknown; 0: nil catch).

Catches for most shark species are recorded in metric tons while the catches of whale shark, marine mammals and marine turtles are in number.

Key to *Data Sources* (**O** when used): IOTC Nominal Catch Table (**NC**); IOTC Effort (**EF**); CPC National Report (**NR**); IOTC Regional Observer Scheme (**OB**); Biological data (**BD**); Data from other Fleet used as Proxy (**PX**); Data from various scientific publications (**PB**).

NºREF Proxy: Key to the data (e.g. Proxy fleet used) and literature used to carry out the estimates. For numbers see the **Reference** for details.

Group Code	Species (*latin name*) / [Group]	Record in	Scenarios			Data Sources							NºREF Proxy
			Base Case	Lower Bound	Upper Bound	NC	EF	NR	BD	OB	PX	PB	
SKH	Total sharks *Elasmobranchia*	Weight	40071.1	na	na						O		GILL-PAK
BSH	Blue shark *Prionace glauca*	Weight	na	na	na								
MAK	Mako sharks *Isurus spp.*	Weight	16021.4	na	na						O		GILL-PAK
POR	Porbeagle shark *Lamna nasus*	Weight	na	na	na								
SPN	Hammerhead sharks *Sphyrna spp.*	Weight	1741.5	na	na						O		GILL-PAK
THR	Thresher sharks *Alopias spp.*	Weight	8359.0	na	na						O		GILL-PAK
FAL	Silky shark *Carcharhinus falciformis*	Weight	2438.0	na	na						O		GILL-PAK
OCS	Oceanic whitetip shark *Carcharhinus longimanus*	Weight	na	na	na								
PSK	Crocodile shark *Pseudocarcharias kamoharai*	Weight	na	na	na								
	Other sharks SKH and Sharks nei	Weight	6269.3	na	na						O		GILL-PAK
RHN	Whale shark *Rhincodon typus*	Number	621	45	869						O		GILL-PAK
MAN	Mantas and devil rays *Mobulidae*	Weight	5241.9	na	na						O		GILL-IDN
PLS	Pelagic stingray *Pteroplatytrygon violacea*	Weight	na	na	na								
ODN	Small marine mammals *Odontoceti*	Number	66817	59614	149034						O		GILL-PAK
MYS	Whales *Mysticetti*	Number	5	na	10						O		GILL-PAK
TTX	Marine turtles *Testudines*	Number	5008	na	6036						O		GILL-PAK
LKV	Olive ridley turtle *Lepidochelys olivacea*	Number	4347	na	4903						O		GILL-PAK
TUG	Green turtle *Chelonia mydas*	Number	522	na	994						O		GILL-PAK
TTL	Loggerhead turtle *Caretta caretta*	Number	na	na	na								
DKK	Leatherback turtle *Dermochelys coriacea*	Number	35	na	35						O		GILL-PAK
TTH	Hawksbill turtle *Eretmochelys imbricata*	Number	104	na	104						O		GILL-PAK

Gillnet/Driftnet Fisheries: Yemen.

Table 3. Yemen gillnet/driftnet fleets: Levels of bycatch fishing mortality estimated and main data sources used

The section *Scenarios* contains the estimates used for this study (*Base Case*) and upper (Upper Bound) and lower (*Lower Bound*) estimates, the latter two only when the use of alternative estimates of bycatch was available (*na*: catch not available/unknown; 0: nil catch).

Catches for most shark species are recorded in metric tons while the catches of whale shark, marine mammals and marine turtles are in number.

Key to *Data Sources* (**O** when used): IOTC Nominal Catch Table (**NC**); IOTC Effort (**EF**); CPC National Report (**NR**); IOTC Regional Observer Scheme (**OB**); Biological data (**BD**); Data from other Fleet used as Proxy (**PX**); Data from various scientific publications (**PB**).

NºREF Proxy: Key to the data (e.g. Proxy fleet used) and literature used to carry out the estimates. For numbers see the **Reference** for details.

Group Code	Species (*latin name*) / [Group]	Record in	Scenarios			Data Sources							NºREF Proxy
			Base Case	Lower Bound	Upper Bound	NC	EF	NR	BD	OB	PX	PB	
SKH	Total sharks *Elasmobranchia*	Weight	9803.4	na	na	O							
BSH	Blue shark *Prionace glauca*	Weight	na	na	na								
MAK	Mako sharks *Isurus spp.*	Weight	4446.7	na	na						O		GILL-PAK
POR	Porbeagle shark *Lamna nasus*	Weight	na	na	na								
SPN	Hammerhead sharks *Sphyrna spp.*	Weight	483.3	na	na						O		GILL-PAK
THR	Thresher sharks *Alopias spp.*	Weight	2320.0	na	na						O		GILL-PAK
FAL	Silky shark *Carcharhinus falciformis*	Weight	676.7	na	na						O		GILL-PAK
OCS	Oceanic whitetip shark *Carcharhinus longimanus*	Weight	na	na	na								
PSK	Crocodile shark *Pseudocarcharias kamoharai*	Weight	na	na	na								
	Other sharks SKH and Sharks nei	Weight	1740.0	na	na						O		GILL-PAK
RHN	Whale shark *Rhincodon typus*	Number	16	1	23						O		GILL-PAK
MAN	Mantas and devil rays *Mobulidae*	Weight	136.7	na	na						O		GILL-IDN
PLS	Pelagic stingray *Pteroplatytrygon violacea*	Weight	na	na	na								
ODN	Small marine mammals *Odontoceti*	Number	1743	1555	3887						O		GILL-PAK
MYS	Whales *Mysticetti*	Number	0	0	0						O		GILL-PAK
TTX	Marine turtles *Testudines*	Number	131	na	158						O		GILL-PAK
LKV	Olive ridley turtle *Lepidochelys olivacea*	Number	113	na	128						O		GILL-PAK
TUG	Green turtle *Chelonia mydas*	Number	14	na	26						O		GILL-PAK
TTL	Loggerhead turtle *Caretta caretta*	Number	na	na	na								
DKK	Leatherback turtle *Dermochelys coriacea*	Number	1	na	1						O		GILL-PAK
TTH	Hawksbill turtle *Eretmochelys imbricata*	Number	3	na	3						O		GILL-PAK

Gillnet/Driftnet Fisheries: Tanzania.

Table 4. Tanzania gillnet/driftnet fleets: Levels of bycatch fishing mortality estimated and main data sources used

The section *Scenarios* contains the estimates used for this study (*Base Case*) and upper (Upper Bound) and lower (*Lower Bound*) estimates, the latter two only when the use of alternative estimates of bycatch was available (*na*: catch not available/unknown; 0: nil catch).

Catches for most shark species are recorded in metric tons while the catches of whale shark, marine mammals and marine turtles are in number.

Key to *Data Sources* (**O** when used): IOTC Nominal Catch Table (**NC**); IOTC Effort (**EF**); CPC National Report (**NR**); IOTC Regional Observer Scheme (**OB**); Biological data (**BD**); Data from other Fleet used as Proxy (**PX**); Data from various scientific publications (**PB**).

NºREF Proxy: Key to the data (e.g. Proxy fleet used) and literature used to carry out the estimates. For numbers see the **Reference** for details.

Group Code	Species (*latin name*) / [Group]	Record in	Scenarios			Data Sources							NºREF Proxy
			Base Case	Lower Bound	Upper Bound	NC	EF	NR	BD	OB	PX	PB	
SKH	Total sharks *Elasmobranchia*	Weight	4901.6	na	na	O							
BSH	Blue shark *Prionace glauca*	Weight	na	na	na								
MAK	Mako sharks *Isurus spp.*	Weight	2185.4	na	na						O		GILL-PAK
POR	Porbeagle shark *Lamna nasus*	Weight	na	na	na								
SPN	Hammerhead sharks *Sphyrna spp.*	Weight	237.5	na	na						O		GILL-PAK
THR	Thresher sharks *Alopias spp.*	Weight	1140.2	na	na						O		GILL-PAK
FAL	Silky shark *Carcharhinus falciformis*	Weight	332.6	na	na						O		GILL-PAK
OCS	Oceanic whitetip shark *Carcharhinus longimanus*	Weight	na	na	na								
PSK	Crocodile shark *Pseudocarcharias kamoharai*	Weight	na	na	na								
	Other sharks SKH and Sharks nei	Weight	855.2	na	na						O		GILL-PAK
RHN	Whale shark *Rhincodon typus*	Number	18	1	25						O		GILL-PAK
MAN	Mantas and devil rays *Mobulidae*	Weight	150.7	na	na						O		GILL-IDN
PLS	Pelagic stingray *Pteroplatytrygon violacea*	Weight	na	na	na								
ODN	Small marine mammals *Odontoceti*	Number	1921	1714	4285						O		GILL-PAK
MYS	Whales *Mysticetti*	Number	0	0	0						O		GILL-PAK
TTX	Marine turtles *Testudines*	Number	144	na	174						O		GILL-PAK
LKV	Olive ridley turtle *Lepidochelys olivacea*	Number	125	na	141						O		GILL-PAK
TUG	Green turtle *Chelonia mydas*	Number	15	na	29						O		GILL-PAK
TTL	Loggerhead turtle *Caretta caretta*	Number	na	na	na								
DKK	Leatherback turtle *Dermochelys coriacea*	Number	1	na	1						O		GILL-PAK
TTH	Hawksbill turtle *Eretmochelys imbricata*	Number	3	na	3						O		GILL-PAK

Gillnet/Driftnet Fisheries: Oman.

Table 5. Oman gillnet/driftnet fleets: Levels of bycatch fishing mortality estimated and main data sources used

The section *Scenarios* contains the estimates used for this study (*Base Case*) and upper (Upper Bound) and lower (*Lower Bound*) estimates, the latter two only when the use of alternative estimates of bycatch was available (*na*: catch not available/unknown; 0: nil catch).

Catches for most shark species are recorded in metric tons while the catches of whale shark, marine mammals and marine turtles are in number.

Key to *Data Sources* (**O** when used): IOTC Nominal Catch Table (**NC**); IOTC Effort (**EF**); CPC National Report (**NR**); IOTC Regional Observer Scheme (**OB**); Biological data (**BD**); Data from other Fleet used as Proxy (**PX**); Data from various scientific publications (**PB**).

NºREF Proxy: Key to the data (e.g. Proxy fleet used) and literature used to carry out the estimates. For numbers see the **Reference** for details.

Group Code	Species (*latin name*) / [Group]	Record in	Scenarios			Data Sources							NºREF Proxy
			Base Case	Lower Bound	Upper Bound	NC	EF	NR	BD	OB	PX	PB	
SKH	Total sharks *Elasmobranchia*	Weight	5125.1	4330.8	na	O					O		GILL-PAK
BSH	Blue shark *Prionace glauca*	Weight	na	na	na								
MAK	Mako sharks *Isurus spp.*	Weight	2096.9	1731.6	na						O		GILL-PAK
POR	Porbeagle shark *Lamna nasus*	Weight	na	na	na								
SPN	Hammerhead sharks *Sphyrna spp.*	Weight	227.9	188.2	na						O		GILL-PAK
THR	Thresher sharks *Alopias spp.*	Weight	1094.1	903.4	na						O		GILL-PAK
FAL	Silky shark *Carcharhinus falciformis*	Weight	319.1	263.5	na						O		GILL-PAK
OCS	Oceanic whitetip shark *Carcharhinus longimanus*	Weight	na	na	na								
PSK	Crocodile shark *Pseudocarcharias kamoharai*	Weight	na	na	na								
	Other sharks SKH and Sharks nei	Weight	820.5	677.6	na						O		GILL-PAK
RHN	Whale shark *Rhincodon typus*	Number	67	5	94						O		GILL-PAK
MAN	Mantas and devil rays *Mobulidae*	Weight	566.5	566.5	na						O		GILL-IDN
PLS	Pelagic stingray *Pteroplatytrygon violacea*	Weight	na	na	na								
ODN	Small marine mammals *Odontoceti*	Number	7221	6443	16107						O		GILL-PAK
MYS	Whales *Mysticetti*	Number	1	0	1						O		GILL-PAK
TTX	Marine turtles *Testudines*	Number	541	na	652						O		GILL-PAK
LKV	Olive ridley turtle *Lepidochelys olivacea*	Number	470	na	530						O		GILL-PAK
TUG	Green turtle *Chelonia mydas*	Number	56	na	107						O		GILL-PAK
TTL	Loggerhead turtle *Caretta caretta*	Number	na	na	na								
DKK	Leatherback turtle *Dermochelys coriacea*	Number	4	na	4						O		GILL-PAK
TTH	Hawksbill turtle *Eretmochelys imbricata*	Number	11	na	101						O		GILL-PAK

Gillnet/Driftnet Fisheries: Other.

Table 6. Other gillnet/driftnet fleets: Levels of bycatch fishing mortality estimated and main data sources used

The section *Scenarios* contains the estimates used for this study (*Base Case*) and upper (Upper Bound) and lower (*Lower Bound*) estimates, the latter two only when the use of alternative estimates of bycatch was available (*na*: catch not available/unknown; 0: nil catch).

Catches for most shark species are recorded in metric tons while the catches of whale shark, marine mammals and marine turtles are in number.

Key to *Data Sources* (**O** when used): IOTC Nominal Catch Table (**NC**); IOTC Effort (**EF**); CPC National Report (**NR**); IOTC Regional Observer Scheme (**OB**); Biological data (**BD**); Data from other Fleet used as Proxy (**PX**); Data from various scientific publications (**PB**).

NºREF Proxy: Key to the data (e.g. Proxy fleet used) and literature used to carry out the estimates. For numbers see the **Reference** for details.

Group Code	Species (*latin name*) / [Group]	Record in	Scenarios			Data Sources							NºREF Proxy
			Base Case	Lower Bound	Upper Bound	NC	EF	NR	BD	OB	PX	PB	
SKH	Total sharks *Elasmobranchia*	Weight	519.7	na	na						O		GILL-PAK
BSH	Blue shark *Prionace glauca*	Weight	na	na	na								
MAK	Mako sharks *Isurus spp.*	Weight	207.8	na	na						O		GILL-PAK
POR	Porbeagle shark *Lamna nasus*	Weight	na	na	na								
SPN	Hammerhead sharks *Sphyrna spp.*	Weight	22.6	na	na						O		GILL-PAK
THR	Thresher sharks *Alopias spp.*	Weight	108.4	na	na						O		GILL-PAK
FAL	Silky shark *Carcharhinus falciformis*	Weight	31.6	na	na						O		GILL-PAK
OCS	Oceanic whitetip shark *Carcharhinus longimanus*	Weight	na	na	na								
PSK	Crocodile shark *Pseudocarcharias kamoharai*	Weight	na	na	na								
	Other sharks SKH and Sharks nei	Weight	81.3	na	na						O		GILL-PAK
RHN	Whale shark *Rhincodon typus*	Number	8	1	11						O		GILL-PAK
MAN	Mantas and devil rays *Mobulidae*	Weight	68.0	na	na						O		GILL-IDN
PLS	Pelagic stingray *Pteroplatytrygon violacea*	Weight	na	na	na								
ODN	Small marine mammals *Odontoceti*	Number	866	773	1933						O		GILL-PAK
MYS	Whales *Mysticetti*	Number	0	0	0						O		GILL-PAK
TTX	Marine turtles *Testudines*	Number	65	na	78						O		GILL-PAK
LKV	Olive ridley turtle *Lepidochelys olivacea*	Number	56	na	64						O		GILL-PAK
TUG	Green turtle *Chelonia mydas*	Number	7	na	13						O		GILL-PAK
TTL	Loggerhead turtle *Caretta caretta*	Number	na	na	na								
DKK	Leatherback turtle *Dermochelys coriacea*	Number	0	na	0						O		GILL-PAK
TTH	Hawksbill turtle *Eretmochelys imbricata*	Number	1	na	1						O		GILL-PAK

Gillnet/Driftnet Fisheries: India.

Table 7. India gillnet/driftnet fleets: Levels of bycatch fishing mortality estimated and main data sources used

The section *Scenarios* contains the estimates used for this study (*Base Case*) and upper (Upper Bound) and lower (*Lower Bound*) estimates, the latter two only when the use of alternative estimates of bycatch was available (*na*: catch not available/unknown; 0: nil catch).

Catches for most shark species are recorded in metric tons while the catches of whale shark, marine mammals and marine turtles are in number.

Key to *Data Sources* (**O** when used): IOTC Nominal Catch Table (**NC**); IOTC Effort (**EF**); CPC National Report (**NR**); IOTC Regional Observer Scheme (**OB**); Biological data (**BD**); Data from other Fleet used as Proxy (**PX**); Data from various scientific publications (**PB**).

NºREF Proxy: Key to the data (e.g. Proxy fleet used) and literature used to carry out the estimates. For numbers see the **Reference** for details.

Group Code	Species (*latin name*) / [Group]	Record in	Scenarios			Data Sources							NºREF Proxy
			Base Case	Lower Bound	Upper Bound	NC	EF	NR	BD	OB	PX	PB	
SKH	Total sharks *Elasmobranchia*	Weight	15196.7	na	na	O							
BSH	Blue shark *Prionace glauca*	Weight	967.2	na	na	O						O	1
MAK	Mako sharks *Isurus spp.*	Weight	2129.6	na	na	O					O	O	1/GILL-PAK
POR	Porbeagle shark *Lamna nasus*	Weight	na	na	na								
SPN	Hammerhead sharks *Sphyrna spp.*	Weight	626.3	na	na	O					O	O	1/GILL-PAK
THR	Thresher sharks *Alopias spp.*	Weight	3522.1	na	na	O					O	O	1/GILL-PAK
FAL	Silky shark *Carcharhinus falciformis*	Weight	4251.3	na	na	O					O	O	1/GILL-PAK
OCS	Oceanic whitetip shark *Carcharhinus longimanus*	Weight	537.3	na	na	O						O	1
PSK	Crocodile shark *Pseudocarcharias kamoharai*	Weight	na	na	na	O							
	Other sharks SKH and Sharks nei	Weight	2641.6	na	na	O					O	O	1/GILL-PAK
RHN	Whale shark *Rhincodon typus*	Number	62	4	86						O		GILL-PAK
MAN	Mantas and devil rays *Mobulidae*	Weight	521.3	na	na						O		GILL-IDN
PLS	Pelagic stingray *Pteroplatytrygon violacea*	Weight	na	na	na								
ODN	Small marine mammals *Odontoceti*	Number	8924	4333	20246	O					O		GILL-PAK, GILL-LKA
MYS	Whales *Mysticetti*	Number	0	0	1	O					O		GILL-PAK, GILL-LKA
TTX	Marine turtles *Testudines*	Number	5270	531	na	O					O	O	2/GILL-PAK, GILL-LKA
LKV	Olive ridley turtle *Lepidochelys olivacea*	Number	3433	353	na	O					O	O	2/GILL-PAK, GILL-LKA
TUG	Green turtle *Chelonia mydas*	Number	882	69	na	O					O	O	2/GILL-PAK, GILL-LKA
TTL	Loggerhead turtle *Caretta caretta*	Number	422	48	na	O					O	O	2/GILL-PAK, GILL-LKA
DKK	Leatherback turtle *Dermochelys coriacea*	Number	159	18	na	O					O	O	2/GILL-PAK, GILL-LKA
TTH	Hawksbill turtle *Eretmochelys imbricata*	Number	325	37	na	O					O	O	2/GILL-PAK, GILL-LKA

Gillnet/Driftnet Fisheries: Sri Lanka.

Table 8. Sri Lanka gillnet/driftnet fleets: Levels of bycatch fishing mortality estimated and main data sources used

The section *Scenarios* contains the estimates used for this study (*Base Case*) and upper (Upper Bound) and lower (*Lower Bound*) estimates, the latter two only when the use of alternative estimates of bycatch was available (*na*: catch not available/unknown; 0: nil catch).

Catches for most shark species are recorded in metric tons while the catches of whale shark, marine mammals and marine turtles are in number.

Key to *Data Sources* (**O** when used): IOTC Nominal Catch Table (**NC**); IOTC Effort (**EF**); CPC National Report (**NR**); IOTC Regional Observer Scheme (**OB**); Biological data (**BD**); Data from other Fleet used as Proxy (**PX**); Data from various scientific publications (**PB**).

NºREF Proxy: Key to the data (e.g. Proxy fleet used) and literature used to carry out the estimates. For numbers see the **Reference** for details.

Group Code	Species (*latin name*) / [Group]	Record in	Scenarios			Data Sources							NºREF Proxy
			Base Case	Lower Bound	Upper Bound	NC	EF	NR	BD	OB	PX	PB	
SKH	Total sharks *Elasmobranchia*	Weight	13311.7	4634.3	na	O					O		2/GILL-PAK
BSH	Blue shark *Prionace glauca*	Weight	1041.3	174.1	na							O	2,3
MAK	Mako sharks *Isurus spp.*	Weight	347.1	23.2	na							O	2,3
POR	Porbeagle shark *Lamna nasus*	Weight	na	na	na								
SPN	Hammerhead sharks *Sphyrna spp.*	Weight	462.8	72.5	na							O	2,3
THR	Thresher sharks *Alopias spp.*	Weight	2776.9	na	na							O	3
FAL	Silky shark *Carcharhinus falciformis*	Weight	4281.0	1923.8	na							O	2,3
OCS	Oceanic whitetip shark *Carcharhinus longimanus*	Weight	578.5	177.0	na							O	2,3
PSK	Crocodile shark *Pseudocarcharias kamoharai*	Weight	na	na	na								
	Other sharks SKH and Sharks nei	Weight	2082.7	522.3	na							O	2,3
RHN	Whale shark *Rhincodon typus*	Number	206	15	289						O		GILL-PAK
MAN	Mantas and devil rays *Mobulidae*	Weight	1741.4	1741.4	na						O		GILL-IDN
PLS	Pelagic stingray *Pteroplatytrygon violacea*	Weight	na	na	na								
ODN	Small marine mammals *Odontoceti*	Number	45968	3171	106080			O				O	1,4,6,8
MYS	Whales *Mysticetti*	Number	1	0	1			O					4
TTX	Marine turtles *Testudines*	Number	2006	3136	17605						O	O	5,7/GILL-PAK
LKV	Olive ridley turtle *Lepidochelys olivacea*	Number	622	2744	5462						O	O	5,7/GILL-PAK
TUG	Green turtle *Chelonia mydas*	Number	348	329	3050						O	O	5,7/GILL-PAK
TTL	Loggerhead turtle *Caretta caretta*	Number	501	na	4400							O	5,7
DKK	Leatherback turtle *Dermochelys coriacea*	Number	165	16	1448						O	O	5,7/GILL-PAK
TTH	Hawksbill turtle *Eretmochelys imbricata*	Number	313	47	2748						O	O	5,7/GILL-PAK

Gillnet/Driftnet Fisheries: Indonesia.

Table 9. Indonesia gillnet/driftnet fleets: Levels of bycatch fishing mortality estimated and main data sources used

The section *Scenarios* contains the estimates used for this study (*Base Case*) and upper (Upper Bound) and lower (*Lower Bound*) estimates, the latter two only when the use of alternative estimates of bycatch was available (*na*: catch not available/unknown; 0: nil catch).

Catches for most shark species are recorded in metric tons while the catches of whale shark, marine mammals and marine turtles are in number.

Key to *Data Sources* (**O** when used): IOTC Nominal Catch Table (**NC**); IOTC Effort (**EF**); CPC National Report (**NR**); IOTC Regional Observer Scheme (**OB**); Biological data (**BD**); Data from other Fleet used as Proxy (**PX**); Data from various scientific publications (**PB**).

NºREF Proxy: Key to the data (e.g. Proxy fleet used) and literature used to carry out the estimates. For numbers see the **Reference** for details.

Group Code	Species (*latin name*) / [Group]	Record in	Scenarios			Data Sources							NºREF Proxy
			Base Case	Lower Bound	Upper Bound	NC	EF	NR	BD	OB	PX	PB	
SKH	Total sharks *Elasmobranchia*	Weight	6972.0	2327.6	na	O					O		GILL-PAK
BSH	Blue shark *Prionace glauca*	Weight	551.5	128.8	na							O	2
MAK	Mako sharks *Isurus spp.*	Weight	375.7	87.8	na							O	2
POR	Porbeagle shark *Lamna nasus*	Weight	na	na	na								
SPN	Hammerhead sharks *Sphyrna spp.*	Weight	na	na	na								
THR	Thresher sharks *Alopias spp.*	Weight	3754.1	876.9	na							O	2
FAL	Silky shark *Carcharhinus falciformis*	Weight	364.8	85.2	na							O	2
OCS	Oceanic whitetip shark *Carcharhinus longimanus*	Weight	na	na	na								
PSK	Crocodile shark *Pseudocarcharias kamoharai*	Weight	na	na	na								
	Other sharks SKH and Sharks nei	Weight	1013.8	236.8	na							O	2
RHN	Whale shark *Rhincodon typus*	Number	108	8	151						O		GILL-PAK
MAN	Mantas and devil rays *Mobulidae*	Weight	912.0	912.0	na							O	4
PLS	Pelagic stingray *Pteroplatytrygon violacea*	Weight	na	na	na								
ODN	Small marine mammals *Odontoceti*	Number	24076	1661	55559						O		GILL-LKA
MYS	Whales *Mysticetti*	Number	0	0	0						O		GILL-LKA
TTX	Marine turtles *Testudines*	Number	1051	na	9221						O	O	1,3/ GILL-LKA
LKV	Olive ridley turtle *Lepidochelys olivacea*	Number	326	na	2861						O	O	1,3/ GILL-LKA
TUG	Green turtle *Chelonia mydas*	Number	182	na	1597						O	O	1,3/ GILL-LKA
TTL	Loggerhead turtle *Caretta caretta*	Number	263	na	2305						O	O	1,3/ GILL-LKA
DKK	Leatherback turtle *Dermochelys coriacea*	Number	86	na	758						O	O	1,3/ GILL-LKA
TTH	Hawksbill turtle *Eretmochelys imbricata*	Number	164	na	1439						O	O	1,3/ GILL-LKA

Gillnet/Driftnet Fisheries: Malasya.

Table 10. Malasya gillnet/driftnet fleets: Levels of bycatch fishing mortality estimated and main data sources used

The section *Scenarios* contains the estimates used for this study (*Base Case*) and upper (Upper Bound) and lower (*Lower Bound*) estimates, the latter two only when the use of alternative estimates of bycatch was available (*na*: catch not available/unknown; 0: nil catch).

Catches for most shark species are recorded in metric tons while the catches of whale shark, marine mammals and marine turtles are in number.

Key to *Data Sources* (**O** when used): IOTC Nominal Catch Table (**NC**); IOTC Effort (**EF**); CPC National Report (**NR**); IOTC Regional Observer Scheme (**OB**); Biological data (**BD**); Data from other Fleet used as Proxy (**PX**); Data from various scientific publications (**PB**).

NºREF Proxy: Key to the data (e.g. Proxy fleet used) and literature used to carry out the estimates. For numbers see the **Reference** for details.

Group Code	Species (*latin name*) / [Group]	Record in	Scenarios			Data Sources							NºREF Proxy
			Base Case	Lower Bound	Upper Bound	NC	EF	NR	BD	OB	PX	PB	
SKH	Total sharks *Elasmobranchia*	Weight	341.0	113.8	na						O		GILL-IDN
BSH	Blue shark *Prionace glauca*	Weight	27.0	6.3	na						O		GILL-IDN
MAK	Mako sharks *Isurus spp.*	Weight	18.4	4.3	na						O		GILL-IDN
POR	Porbeagle shark *Lamna nasus*	Weight	na	na	na								
SPN	Hammerhead sharks *Sphyrna spp.*	Weight	na	na	na								
THR	Thresher sharks *Alopias spp.*	Weight	183.6	42.9	na						O		GILL-IDN
FAL	Silky shark *Carcharhinus falciformis*	Weight	17.8	4.2	na						O		GILL-IDN
OCS	Oceanic whitetip shark *Carcharhinus longimanus*	Weight	na	na	na								
PSK	Crocodile shark *Pseudocarcharias kamoharai*	Weight	na	na	na								
	Other sharks SKH and Sharks nei	Weight	49.6	11.6	na						O		GILL-IDN
RHN	Whale shark *Rhincodon typus*	Number	5	0	7						O		GILL-PAK
MAN	Mantas and devil rays *Mobulidae*	Weight	44.6	44.6	na						O		GILL-IDN
PLS	Pelagic stingray *Pteroplatytrygon violacea*	Weight	na	na	na								
ODN	Small marine mammals *Odontoceti*	Number	1177	81	2717						O		GILL-LKA
MYS	Whales *Mysticetti*	Number	0	0	0						O		GILL-LKA
TTX	Marine turtles *Testudines*	Number	51	na	451						O		GILL-IDN
LKV	Olive ridley turtle *Lepidochelys olivacea*	Number	16	na	140						O		GILL-IDN
TUG	Green turtle *Chelonia mydas*	Number	9	na	78						O		GILL-IDN
TTL	Loggerhead turtle *Caretta caretta*	Number	13	na	113						O		GILL-IDN
DKK	Leatherback turtle *Dermochelys coriacea*	Number	4	na	37						O		GILL-IDN
TTH	Hawksbill turtle *Eretmochelys imbricata*	Number	8	na	70						O		GILL-IDN

Gillnet/Driftnet Fisheries: Thailand.

Table 11. Thailand gillnet/driftnet fleets: Levels of bycatch fishing mortality estimated and main data sources used

The section *Scenarios* contains the estimates used for this study (*Base Case*) and upper (Upper Bound) and lower (*Lower Bound*) estimates, the latter two only when the use of alternative estimates of bycatch was available (*na*: catch not available/unknown; 0: nil catch).

Catches for most shark species are recorded in metric tons while the catches of whale shark, marine mammals and marine turtles are in number.

Key to *Data Sources* (**O** when used): IOTC Nominal Catch Table (**NC**); IOTC Effort (**EF**); CPC National Report (**NR**); IOTC Regional Observer Scheme (**OB**); Biological data (**BD**); Data from other Fleet used as Proxy (**PX**); Data from various scientific publications (**PB**).

NºREF Proxy: Key to the data (e.g. Proxy fleet used) and literature used to carry out the estimates. For numbers see the **Reference** for details.

Group Code	Species (*latin name*) / [Group]	Record in	Scenarios			Data Sources							NºREF Proxy
			Base Case	Lower Bound	Upper Bound	NC	EF	NR	BD	OB	PX	PB	
SKH	Total sharks *Elasmobranchia*	Weight	17.1	5.7	na						O		GILL-IDN
BSH	Blue shark *Prionace glauca*	Weight	1.4	0.3	na						O		GILL-IDN
MAK	Mako sharks *Isurus spp.*	Weight	0.9	0.2	na						O		GILL-IDN
POR	Porbeagle shark *Lamna nasus*	Weight	na	na	na								
SPN	Hammerhead sharks *Sphyrna spp.*	Weight	na	na	na								
THR	Thresher sharks *Alopias spp.*	Weight	9.2	2.1	na						O		GILL-IDN
FAL	Silky shark *Carcharhinus falciformis*	Weight	0.9	0.2	na						O		GILL-IDN
OCS	Oceanic whitetip shark *Carcharhinus longimanus*	Weight	na	na	na								
PSK	Crocodile shark *Pseudocarcharias kamoharai*	Weight	na	na	na								
	Other sharks SKH and Sharks nei	Weight	2.5	0.6	na						O		GILL-IDN
RHN	Whale shark *Rhincodon typus*	Number	0	0	0						O		GILL-PAK
MAN	Mantas and devil rays *Mobulidae*	Weight	2.2	2.2	na						O		GILL-IDN
PLS	Pelagic stingray *Pteroplatytrygon violacea*	Weight	na	na	na								
ODN	Small marine mammals *Odontoceti*	Number	59	4	136						O		GILL-LKA
MYS	Whales *Mysticetti*	Number	0	0	0						O		GILL-LKA
TTX	Marine turtles *Testudines*	Number	3	na	23						O		GILL-IDN
LKV	Olive ridley turtle *Lepidochelys olivacea*	Number	1	na	7						O		GILL-IDN
TUG	Green turtle *Chelonia mydas*	Number	0	na	4						O		GILL-IDN
TTL	Loggerhead turtle *Caretta caretta*	Number	1	na	6						O		GILL-IDN
DKK	Leatherback turtle *Dermochelys coriacea*	Number	0	na	2						O		GILL-IDN
TTH	Hawksbill turtle *Eretmochelys imbricata*	Number	0	na	4						O		GILL-IDN

Purse Seine Fisheries: Spain.

Table 12. Spain purse seine fleets: Levels of bycatch fishing mortality estimated and main data sources used

The section *Scenarios* contains the estimates used for this study (*Base Case*) and upper (Upper Bound) and lower (*Lower Bound*) estimates, the latter two only when the use of alternative estimates of bycatch was available (*na*: catch not available/unknown; 0: nil catch).

Catches for most shark species are recorded in metric tons while the catches of whale shark, marine mammals and marine turtles are in number.

Key to *Data Sources* (**O** when used): IOTC Nominal Catch Table (**NC**); IOTC Effort (**EF**); CPC National Report (**NR**); IOTC Regional Observer Scheme (**OB**); Biological data (**BD**); Data from other Fleet used as Proxy (**PX**); Data from various scientific publications (**PB**).

NºREF Proxy: Key to the data (e.g. Proxy fleet used) and literature used to carry out the estimates. For numbers see the **Reference** for details.

Group Code	Species (*latin name*) / [Group]	Record in	Scenarios			Data Sources							NºREF Proxy
			Base Case	Lower Bound	Upper Bound	NC	EF	NR	BD	OB	PX	PB	
SKH	Total sharks *Elasmobranchia*	Weight	132.1	na	na					O			
BSH	Blue shark *Prionace glauca*	Weight	0	na	na					O			
MAK	Mako sharks *Isurus spp.*	Weight	0	na	na					O			
POR	Porbeagle shark *Lamna nasus*	Weight	0	na	na					O			
SPN	Hammerhead sharks *Sphyrna spp.*	Weight	0	na	na					O			
THR	Thresher sharks *Alopias spp.*	Weight	0	na	na					O			
FAL	Silky shark *Carcharhinus falciformis*	Weight	123.6	na	na					O			
OCS	Oceanic whitetip shark *Carcharhinus longimanus*	Weight	4.2	na	na					O			
PSK	Crocodile shark *Pseudocarcharias kamoharai*	Weight	0	na	na					O			
	Other sharks SKH and Sharks nei	Weight	0	na	na					O			
RHN	Whale shark *Rhincodon typus*	Number	1	na	na					O		O	1
MAN	Mantas and devil rays *Mobulidae*	Weight	4.3	na	na					O			
PLS	Pelagic stingray *Pteroplatytrygon violacea*	Weight	0.02	na	na					O			
ODN	Small marine mammals *Odontoceti*	Number	0	na	na					O			
MYS	Whales *Mysticetti*	Number	0	na	na					O			
TTX	Marine turtles *Testudines*	Number	38	0	na					O		O	2
LKV	Olive ridley turtle *Lepidochelys olivacea*	Number	18	0	na					O		O	2
TUG	Green turtle *Chelonia mydas*	Number	6	0	na					O		O	2
TTL	Loggerhead turtle *Caretta caretta*	Number	5	0	na					O		O	2
DKK	Leatherback turtle *Dermochelys coriacea*	Number	2	0	na					O		O	2
TTH	Hawksbill turtle *Eretmochelys imbricata*	Number	7	0	na					O		O	2

Purse Seine Fisheries: France.

Table 13. France purse seine fleets: Levels of bycatch fishing mortality estimated and main data sources used

The section *Scenarios* contains the estimates used for this study (*Base Case*) and upper (Upper Bound) and lower (*Lower Bound*) estimates, the latter two only when the use of alternative estimates of bycatch was available (*na*: catch not available/unknown; 0: nil catch).

Catches for most shark species are recorded in metric tons while the catches of whale shark, marine mammals and marine turtles are in number.

Key to *Data Sources* (**O** when used): IOTC Nominal Catch Table (**NC**); IOTC Effort (**EF**); CPC National Report (**NR**); IOTC Regional Observer Scheme (**OB**); Biological data (**BD**); Data from other Fleet used as Proxy (**PX**); Data from various scientific publications (**PB**).

NºREF Proxy: Key to the data (e.g. Proxy fleet used) and literature used to carry out the estimates. For numbers see the **Reference** for details.

Group Code	Species (*latin name*) / [Group]	Record in	Scenarios			Data Sources							NºREF Proxy
			Base Case	Lower Bound	Upper Bound	NC	EF	NR	BD	OB	PX	PB	
SKH	Total sharks *Elasmobranchia*	Weight	61.0	na	na						O		PS-EU.ESP
BSH	Blue shark *Prionace glauca*	Weight	0	na	na						O		PS-EU.ESP
MAK	Mako sharks *Isurus spp.*	Weight	0	na	na						O		PS-EU.ESP
POR	Porbeagle shark *Lamna nasus*	Weight	0	na	na						O		PS-EU.ESP
SPN	Hammerhead sharks *Sphyrna spp.*	Weight	0	na	na						O		PS-EU.ESP
THR	Thresher sharks *Alopias spp.*	Weight	0	na	na						O		PS-EU.ESP
FAL	Silky shark *Carcharhinus falciformis*	Weight	57.1	na	na						O		PS-EU.ESP
OCS	Oceanic whitetip shark *Carcharhinus longimanus*	Weight	2.0	na	na						O		PS-EU.ESP
PSK	Crocodile shark *Pseudocarcharias kamoharai*	Weight	0	na	na						O		PS-EU.ESP
	Other sharks SKH and Sharks nei	Weight	0	na	na						O		PS-EU.ESP
RHN	Whale shark *Rhincodon typus*	Number	0	na	na						O		PS-EU.ESP
MAN	Mantas and devil rays *Mobulidae*	Weight	2.0	na	na						O		PS-EU.ESP
PLS	Pelagic stingray *Pteroplatytrygon violacea*	Weight	0.01	na	na						O		PS-EU.ESP
ODN	Small marine mammals *Odontoceti*	Number	0	na	na						O		PS-EU.ESP
MYS	Whales *Mysticetti*	Number	0	na	na						O		PS-EU.ESP
TTX	Marine turtles *Testudines*	Number	17	0	na						O		PS-EU.ESP
LKV	Olive ridley turtle *Lepidochelys olivacea*	Number	8	0	na						O		PS-EU.ESP
TUG	Green turtle *Chelonia mydas*	Number	3	0	na						O		PS-EU.ESP
TTL	Loggerhead turtle *Caretta caretta*	Number	2	0	na						O		PS-EU.ESP
DKK	Leatherback turtle *Dermochelys coriacea*	Number	1	0	na						O		PS-EU.ESP
TTH	Hawksbill turtle *Eretmochelys imbricata*	Number	3	0	na						O		PS-EU.ESP

Purse Seine Fisheries: Iran.

Table 14. Iran purse seine fleets: Levels of bycatch fishing mortality estimated and main data sources used

The section *Scenarios* contains the estimates used for this study (*Base Case*) and upper (Upper Bound) and lower (*Lower Bound*) estimates, the latter two only when the use of alternative estimates of bycatch was available (*na*: catch not available/unknown; 0: nil catch).

Catches for most shark species are recorded in metric tons while the catches of whale shark, marine mammals and marine turtles are in number.

Key to *Data Sources* (**O** when used): IOTC Nominal Catch Table (**NC**); IOTC Effort (**EF**); CPC National Report (**NR**); IOTC Regional Observer Scheme (**OB**); Biological data (**BD**); Data from other Fleet used as Proxy (**PX**); Data from various scientific publications (**PB**).

NºREF Proxy: Key to the data (e.g. Proxy fleet used) and literature used to carry out the estimates. For numbers see the **Reference** for details.

Group Code	Species (*latin name*) / [Group]	Record in	Scenarios			Data Sources							NºREF Proxy
			Base Case	Lower Bound	Upper Bound	NC	EF	NR	BD	OB	PX	PB	
SKH	Total sharks *Elasmobranchia*	Weight	5.0	na	na						O		PS-EU.ESP
BSH	Blue shark *Prionace glauca*	Weight	0	na	na						O		PS-EU.ESP
MAK	Mako sharks *Isurus spp.*	Weight	0	na	na						O		PS-EU.ESP
POR	Porbeagle shark *Lamna nasus*	Weight	0	na	na						O		PS-EU.ESP
SPN	Hammerhead sharks *Sphyrna spp.*	Weight	0	na	na						O		PS-EU.ESP
THR	Thresher sharks *Alopias spp.*	Weight	0	na	na						O		PS-EU.ESP
FAL	Silky shark *Carcharhinus falciformis*	Weight	4.7	na	na						O		PS-EU.ESP
OCS	Oceanic whitetip shark *Carcharhinus longimanus*	Weight	0.2	na	na						O		PS-EU.ESP
PSK	Crocodile shark *Pseudocarcharias kamoharai*	Weight	0	na	na						O		PS-EU.ESP
	Other sharks SKH and Sharks nei	Weight	0	na	na						O		PS-EU.ESP
RHN	Whale shark *Rhincodon typus*	Number	0	na	na						O		PS-EU.ESP
MAN	Mantas and devil rays *Mobulidae*	Weight	0.2	na	na						O		PS-EU.ESP
PLS	Pelagic stingray *Pteroplatytrygon violacea*	Weight	0	na	na						O		PS-EU.ESP
ODN	Small marine mammals *Odontoceti*	Number	0	na	na						O		PS-EU.ESP
MYS	Whales *Mysticetti*	Number	0	na	na						O		PS-EU.ESP
TTX	Marine turtles *Testudines*	Number	1	0	na						O		PS-EU.ESP
LKV	Olive ridley turtle *Lepidochelys olivacea*	Number	1	0	na						O		PS-EU.ESP
TUG	Green turtle *Chelonia mydas*	Number	0	0	na						O		PS-EU.ESP
TTL	Loggerhead turtle *Caretta caretta*	Number	0	0	na						O		PS-EU.ESP
DKK	Leatherback turtle *Dermochelys coriacea*	Number	0	0	na						O		PS-EU.ESP
TTH	Hawksbill turtle *Eretmochelys imbricata*	Number	0	0	na						O		PS-EU.ESP

Purse Seine Fisheries: Japan.

Table 15. Japan purse seine fleets: Levels of bycatch fishing mortality estimated and main data sources used

The section *Scenarios* contains the estimates used for this study (*Base Case*) and upper (Upper Bound) and lower (*Lower Bound*) estimates, the latter two only when the use of alternative estimates of bycatch was available (*na*: catch not available/unknown; 0: nil catch).

Catches for most shark species are recorded in metric tons while the catches of whale shark, marine mammals and marine turtles are in number.

Key to *Data Sources* (**O** when used): IOTC Nominal Catch Table (**NC**); IOTC Effort (**EF**); CPC National Report (**NR**); IOTC Regional Observer Scheme (**OB**); Biological data (**BD**); Data from other Fleet used as Proxy (**PX**); Data from various scientific publications (**PB**).

NºREF Proxy: Key to the data (e.g. Proxy fleet used) and literature used to carry out the estimates. For numbers see the **Reference** for details.

Group Code	Species (*latin name*) / [Group]	Record in	Scenarios			Data Sources							NºREF Proxy
			Base Case	Lower Bound	Upper Bound	NC	EF	NR	BD	OB	PX	PB	
SKH	Total sharks *Elasmobranchia*	Weight	2.4	na	na						O		PS-EU.ESP
BSH	Blue shark *Prionace glauca*	Weight	0	na	na						O		PS-EU.ESP
MAK	Mako sharks *Isurus spp.*	Weight	0	na	na						O		PS-EU.ESP
POR	Porbeagle shark *Lamna nasus*	Weight	0	na	na						O		PS-EU.ESP
SPN	Hammerhead sharks *Sphyrna spp.*	Weight	0	na	na						O		PS-EU.ESP
THR	Thresher sharks *Alopias spp.*	Weight	0	na	na						O		PS-EU.ESP
FAL	Silky shark *Carcharhinus falciformis*	Weight	2.2	na	na						O		PS-EU.ESP
OCS	Oceanic whitetip shark *Carcharhinus longimanus*	Weight	0.1	na	na						O		PS-EU.ESP
PSK	Crocodile shark *Pseudocarcharias kamoharai*	Weight	0	na	na						O		PS-EU.ESP
	Other sharks SKH and Sharks nei	Weight	0	na	na						O		PS-EU.ESP
RHN	Whale shark *Rhincodon typus*	Number	0	na	na						O		PS-EU.ESP
MAN	Mantas and devil rays *Mobulidae*	Weight	0.1	na	na						O		PS-EU.ESP
PLS	Pelagic stingray *Pteroplatytrygon violacea*	Weight	0	na	na						O		PS-EU.ESP
ODN	Small marine mammals *Odontoceti*	Number	0	na	na						O		PS-EU.ESP
MYS	Whales *Mysticetti*	Number	0	na	na						O		PS-EU.ESP
TTX	Marine turtles *Testudines*	Number	1	0	na						O		PS-EU.ESP
LKV	Olive ridley turtle *Lepidochelys olivacea*	Number	0	0	na						O		PS-EU.ESP
TUG	Green turtle *Chelonia mydas*	Number	0	0	na						O		PS-EU.ESP
TTL	Loggerhead turtle *Caretta caretta*	Number	0	0	na						O		PS-EU.ESP
DKK	Leatherback turtle *Dermochelys coriacea*	Number	0	0	na						O		PS-EU.ESP
TTH	Hawksbill turtle *Eretmochelys imbricata*	Number	0	0	na						O		PS-EU.ESP

Purse Seine Fisheries: Republic of Korea.

Table 16. Korea purse seine fleets: Levels of bycatch fishing mortality estimated and main data sources used

The section *Scenarios* contains the estimates used for this study (*Base Case*) and upper (Upper Bound) and lower (*Lower Bound*) estimates, the latter two only when the use of alternative estimates of bycatch was available (*na*: catch not available/unknown; 0: nil catch).

Catches for most shark species are recorded in metric tons while the catches of whale shark, marine mammals and marine turtles are in number.

Key to *Data Sources* (**O** when used): IOTC Nominal Catch Table (**NC**); IOTC Effort (**EF**); CPC National Report (**NR**); IOTC Regional Observer Scheme (**OB**); Biological data (**BD**); Data from other Fleet used as Proxy (**PX**); Data from various scientific publications (**PB**).

NºREF Proxy: Key to the data (e.g. Proxy fleet used) and literature used to carry out the estimates. For numbers see the **Reference** for details.

Group Code	Species (*latin name*) / [Group]	Record in	Scenarios			Data Sources							NºREF Proxy
			Base Case	Lower Bound	Upper Bound	NC	EF	NR	BD	OB	PX	PB	
SKH	Total sharks *Elasmobranchia*	Weight	18.8	na	na						O		PS-EU.ESP
BSH	Blue shark *Prionace glauca*	Weight	0	na	na						O		PS-EU.ESP
MAK	Mako sharks *Isurus spp.*	Weight	0	na	na						O		PS-EU.ESP
POR	Porbeagle shark *Lamna nasus*	Weight	0	na	na						O		PS-EU.ESP
SPN	Hammerhead sharks *Sphyrna spp.*	Weight	0	na	na						O		PS-EU.ESP
THR	Thresher sharks *Alopias spp.*	Weight	0	na	na						O		PS-EU.ESP
FAL	Silky shark *Carcharhinus falciformis*	Weight	17.6	na	na						O		PS-EU.ESP
OCS	Oceanic whitetip shark *Carcharhinus longimanus*	Weight	0.6	na	na						O		PS-EU.ESP
PSK	Crocodile shark *Pseudocarcharias kamoharai*	Weight	0	na	na						O		PS-EU.ESP
	Other sharks SKH and Sharks nei	Weight	0	na	na						O		PS-EU.ESP
RHN	Whale shark *Rhincodon typus*	Number	0	na	na						O		PS-EU.ESP
MAN	Mantas and devil rays *Mobulidae*	Weight	0.6	na	na						O		PS-EU.ESP
PLS	Pelagic stingray *Pteroplatytrygon violacea*	Weight	0	na	na						O		PS-EU.ESP
ODN	Small marine mammals *Odontoceti*	Number	0	na	na						O		PS-EU.ESP
MYS	Whales *Mysticetti*	Number	0	na	na						O		PS-EU.ESP
TTX	Marine turtles *Testudines*	Number	5	0	na						O		PS-EU.ESP
LKV	Olive ridley turtle *Lepidochelys olivacea*	Number	3	0	na						O		PS-EU.ESP
TUG	Green turtle *Chelonia mydas*	Number	1	0	na						O		PS-EU.ESP
TTL	Loggerhead turtle *Caretta caretta*	Number	1	0	na						O		PS-EU.ESP
DKK	Leatherback turtle *Dermochelys coriacea*	Number	0	0	na						O		PS-EU.ESP
TTH	Hawksbill turtle *Eretmochelys imbricata*	Number	1	0	na						O		PS-EU.ESP

Purse Seine Fisheries: Mauritius.

Table 17. Mauritius purse seine fleets: Levels of bycatch fishing mortality estimated and main data sources used

The section *Scenarios* contains the estimates used for this study (*Base Case*) and upper (Upper Bound) and lower (*Lower Bound*) estimates, the latter two only when the use of alternative estimates of bycatch was available (*na*: catch not available/unknown; 0: nil catch).

Catches for most shark species are recorded in metric tons while the catches of whale shark, marine mammals and marine turtles are in number.

Key to *Data Sources* (**O** when used): IOTC Nominal Catch Table (**NC**); IOTC Effort (**EF**); CPC National Report (**NR**); IOTC Regional Observer Scheme (**OB**); Biological data (**BD**); Data from other Fleet used as Proxy (**PX**); Data from various scientific publications (**PB**).

NºREF Proxy: Key to the data (e.g. Proxy fleet used) and literature used to carry out the estimates. For numbers see the **Reference** for details.

Group Code	Species (*latin name*) / [Group]	Record in	Scenarios			Data Sources							NºREF Proxy
			Base Case	Lower Bound	Upper Bound	NC	EF	NR	BD	OB	PX	PB	
SKH	Total sharks *Elasmobranchia*	Weight	10.1	na	na						O		PS-EU.ESP
BSH	Blue shark *Prionace glauca*	Weight	0	na	na						O		PS-EU.ESP
MAK	Mako sharks *Isurus spp.*	Weight	0	na	na						O		PS-EU.ESP
POR	Porbeagle shark *Lamna nasus*	Weight	0	na	na						O		PS-EU.ESP
SPN	Hammerhead sharks *Sphyrna spp.*	Weight	0	na	na						O		PS-EU.ESP
THR	Thresher sharks *Alopias spp.*	Weight	0	na	na						O		PS-EU.ESP
FAL	Silky shark *Carcharhinus falciformis*	Weight	9.5	na	na						O		PS-EU.ESP
OCS	Oceanic whitetip shark *Carcharhinus longimanus*	Weight	0.3	na	na						O		PS-EU.ESP
PSK	Crocodile shark *Pseudocarcharias kamoharai*	Weight	0	na	na						O		PS-EU.ESP
	Other sharks SKH and Sharks nei	Weight	0	na	na						O		PS-EU.ESP
RHN	Whale shark *Rhincodon typus*	Number	0	na	na						O		PS-EU.ESP
MAN	Mantas and devil rays *Mobulidae*	Weight	0.3	na	na						O		PS-EU.ESP
PLS	Pelagic stingray *Pteroplatytrygon violacea*	Weight	0	na	na						O		PS-EU.ESP
ODN	Small marine mammals *Odontoceti*	Number	0	na	na						O		PS-EU.ESP
MYS	Whales *Mysticetti*	Number	0	na	na						O		PS-EU.ESP
TTX	Marine turtles *Testudines*	Number	3	0	na						O		PS-EU.ESP
LKV	Olive ridley turtle *Lepidochelys olivacea*	Number	1	0	na						O		PS-EU.ESP
TUG	Green turtle *Chelonia mydas*	Number	0	0	na						O		PS-EU.ESP
TTL	Loggerhead turtle *Caretta caretta*	Number	0	0	na						O		PS-EU.ESP
DKK	Leatherback turtle *Dermochelys coriacea*	Number	0	0	na						O		PS-EU.ESP
TTH	Hawksbill turtle *Eretmochelys imbricata*	Number	1	0	na						O		PS-EU.ESP

Purse Seine Fisheries: Seychelles.

Table 18. Seychelles purse seine fleets: Levels of bycatch fishing mortality estimated and main data sources used

The section *Scenarios* contains the estimates used for this study (*Base Case*) and upper (Upper Bound) and lower (*Lower Bound*) estimates, the latter two only when the use of alternative estimates of bycatch was available (*na*: catch not available/unknown; 0: nil catch).

Catches for most shark species are recorded in metric tons while the catches of whale shark, marine mammals and marine turtles are in number.

Key to *Data Sources* (**O** when used): IOTC Nominal Catch Table (**NC**); IOTC Effort (**EF**); CPC National Report (**NR**); IOTC Regional Observer Scheme (**OB**); Biological data (**BD**); Data from other Fleet used as Proxy (**PX**); Data from various scientific publications (**PB**).

NºREF Proxy: Key to the data (e.g. Proxy fleet used) and literature used to carry out the estimates. For numbers see the **Reference** for details.

Group Code	Species (*latin name*) / [Group]	Record in	Scenarios			Data Sources							NºREF Proxy
			Base Case	Lower Bound	Upper Bound	NC	EF	NR	BD	OB	PX	PB	
SKH	Total sharks *Elasmobranchia*	Weight	87.0	na	na						O		PS-EU.ESP
BSH	Blue shark *Prionace glauca*	Weight	0	na	na						O		PS-EU.ESP
MAK	Mako sharks *Isurus spp.*	Weight	0	na	na						O		PS-EU.ESP
POR	Porbeagle shark *Lamna nasus*	Weight	0	na	na						O		PS-EU.ESP
SPN	Hammerhead sharks *Sphyrna spp.*	Weight	0	na	na						O		PS-EU.ESP
THR	Thresher sharks *Alopias spp.*	Weight	0	na	na						O		PS-EU.ESP
FAL	Silky shark *Carcharhinus falciformis*	Weight	81.4	na	na						O		PS-EU.ESP
OCS	Oceanic whitetip shark *Carcharhinus longimanus*	Weight	2.8	na	na						O		PS-EU.ESP
PSK	Crocodile shark *Pseudocarcharias kamoharai*	Weight	0	na	na						O		PS-EU.ESP
	Other sharks SKH and Sharks nei	Weight	0	na	na						O		PS-EU.ESP
RHN	Whale shark *Rhincodon typus*	Number	1	na	na						O		PS-EU.ESP
MAN	Mantas and devil rays *Mobulidae*	Weight	2.8	na	na						O		PS-EU.ESP
PLS	Pelagic stingray *Pteroplatytrygon violacea*	Weight	0.01	na	na						O		PS-EU.ESP
ODN	Small marine mammals *Odontoceti*	Number	0	na	na						O		PS-EU.ESP
MYS	Whales *Mysticetti*	Number	0	na	na						O		PS-EU.ESP
TTX	Marine turtles *Testudines*	Number	25	0	na						O		PS-EU.ESP
LKV	Olive ridley turtle *Lepidochelys olivacea*	Number	12	0	na						O		PS-EU.ESP
TUG	Green turtle *Chelonia mydas*	Number	4	0	na						O		PS-EU.ESP
TTL	Loggerhead turtle *Caretta caretta*	Number	3	0	na						O		PS-EU.ESP
DKK	Leatherback turtle *Dermochelys coriacea*	Number	2	0	na						O		PS-EU.ESP
TTH	Hawksbill turtle *Eretmochelys imbricata*	Number	5	0	na						O		PS-EU.ESP

Swordfish Longline Fisheries: Australia.

Table 19. Australia swordfish longline fleets: Levels of bycatch fishing mortality estimated and main data sources used

The section *Scenarios* contains the estimates used for this study (*Base Case*) and upper (Upper Bound) and lower (*Lower Bound*) estimates, the latter two only when the use of alternative estimates of bycatch was available (*na*: catch not available/unknown; 0: nil catch).

Catches for most shark species are recorded in metric tons while the catches of whale shark, marine mammals and marine turtles are in number.

Key to *Data Sources* (**O** when used): IOTC Nominal Catch Table (**NC**); IOTC Effort (**EF**); CPC National Report (**NR**); IOTC Regional Observer Scheme (**OB**); Biological data (**BD**); Data from other Fleet used as Proxy (**PX**); Data from various scientific publications (**PB**).

NºREF Proxy: Key to the data (e.g. Proxy fleet used) and literature used to carry out the estimates. For numbers see the **Reference** for details.

Group Code	Species (*latin name*) / [Group]	Record in	Scenarios			Data Sources							NºREF Proxy
			Base Case	Lower Bound	Upper Bound	NC	EF	NR	BD	OB	PX	PB	
SKH	Total sharks *Elasmobranchia*	Weight	50.3	na	na								
BSH	Blue shark *Prionace glauca*	Weight	26.1	na	na			O	O			O	1,2
MAK	Mako sharks *Isurus spp.*	Weight	9.2	na	na			O	O			O	1,2
POR	Porbeagle shark *Lamna nasus*	Weight	0.06	na	na			O	O			O	1,2
SPN	Hammerhead sharks *Sphyrna spp.*	Weight	2.8	na	na			O	O			O	1,2
THR	Thresher sharks *Alopias spp.*	Weight	0.6	na	na			O	O			O	1,2
FAL	Silky shark *Carcharhinus falciformis*	Weight	na	na	na								
OCS	Oceanic whitetip shark *Carcharhinus longimanus*	Weight	0.3	na	na			O	O			O	1,3
PSK	Crocodile shark *Pseudocarcharias kamoharai*	Weight	9.7	na	na			O	O			O	1,2
	Other sharks SKH and Sharks nei	Weight	1.5	na	na			O	O			O	1,2
RHN	Whale shark *Rhincodon typus*	Number	na	na	na								
MAN	Mantas and devil rays *Mobulidae*	Weight	na	na	na								
PLS	Pelagic stingray *Pteroplatytrygon violacea*	Weight	na	na	na								
ODN	Small marine mammals *Odontoceti*	Number	na	na	na								
MYS	Whales *Mysticetti*	Number	na	na	na								
TTX	Marine turtles *Testudines*	Number	1	0	na			O					1
LKV	Olive ridley turtle *Lepidochelys olivacea*	Number	0	0	na			O					1
TUG	Green turtle *Chelonia mydas*	Number	0	0	na			O					1
TTL	Loggerhead turtle *Caretta caretta*	Number	0	0	na			O					1
DKK	Leatherback turtle *Dermochelys coriacea*	Number	1	0	na			O					1
TTH	Hawksbill turtle *Eretmochelys imbricata*	Number	0	0	na			O					1

Swordfish Longline Fisheries: France (Mayotte).

Table 20. France (Mayotte) swordfish longline fleets: Levels of bycatch fishing mortality estimated and main data sources used

The section *Scenarios* contains the estimates used for this study (*Base Case*) and upper (Upper Bound) and lower (*Lower Bound*) estimates, the latter two only when the use of alternative estimates of bycatch was available (*na*: catch not available/unknown; 0: nil catch).

Catches for most shark species are recorded in metric tons while the catches of whale shark, marine mammals and marine turtles are in number.

Key to *Data Sources* (**O** when used): IOTC Nominal Catch Table (**NC**); IOTC Effort (**EF**); CPC National Report (**NR**); IOTC Regional Observer Scheme (**OB**); Biological data (**BD**); Data from other Fleet used as Proxy (**PX**); Data from various scientific publications (**PB**).

NºREF Proxy: Key to the data (e.g. Proxy fleet used) and literature used to carry out the estimates. For numbers see the **Reference** for details.

Group Code	Species (*latin name*) / [Group]	Record in	Scenarios			Data Sources							NºREF Proxy
			Base Case	Lower Bound	Upper Bound	NC	EF	NR	BD	OB	PX	PB	
SKH	Total sharks *Elasmobranchia*	Weight	8.9	na	na								
BSH	Blue shark *Prionace glauca*	Weight	1.3	na	na		O		O			O	1
MAK	Mako sharks *Isurus spp.*	Weight	na	na	na		O		O			O	1
POR	Porbeagle shark *Lamna nasus*	Weight	na	na	na								
SPN	Hammerhead sharks *Sphyrna spp.*	Weight	0.7	na	na		O		O			O	1
THR	Thresher sharks *Alopias spp.*	Weight	na	na	na								
FAL	Silky shark *Carcharhinus falciformis*	Weight	5.1	na	na		O		O			O	1
OCS	Oceanic whitetip shark *Carcharhinus longimanus*	Weight	1.5	na	na		O		O			O	1
PSK	Crocodile shark *Pseudocarcharias kamoharai*	Weight	na	na	na								
	Other sharks SKH and Sharks nei	Weight	0.2	na	na		O		O			O	1
RHN	Whale shark *Rhincodon typus*	Number	na	na	na								
MAN	Mantas and devil rays *Mobulidae*	Weight	na	na	na								
PLS	Pelagic stingray *Pteroplatytrygon violacea*	Weight	0.2	na	na		O		O			O	
ODN	Small marine mammals *Odontoceti*	Number	1	0	na		O		O			O	1,2
MYS	Whales *Mysticetti*	Number	na	na	na								
TTX	Marine turtles *Testudines*	Number	8	0	na								
LKV	Olive ridley turtle *Lepidochelys olivacea*	Number	na	0	na								
TUG	Green turtle *Chelonia mydas*	Number	na	0	na								
TTL	Loggerhead turtle *Caretta caretta*	Number	8	0	na		O		O			O	1,2
DKK	Leatherback turtle *Dermochelys coriacea*	Number	na	0	na								
TTH	Hawksbill turtle *Eretmochelys imbricata*	Number	na	0	na								

Swordfish Longline Fisheries: Reunion (France).

Table 21. Reunion (France) swordfish longline fleets: Levels of bycatch fishing mortality estimated and main data sources used

The section *Scenarios* contains the estimates used for this study (*Base Case*) and upper (Upper Bound) and lower (*Lower Bound*) estimates, the latter two only when the use of alternative estimates of bycatch was available (*na*: catch not available/unknown; 0: nil catch).

Catches for most shark species are recorded in metric tons while the catches of whale shark, marine mammals and marine turtles are in number.

Key to *Data Sources* (**O** when used): IOTC Nominal Catch Table (**NC**); IOTC Effort (**EF**); CPC National Report (**NR**); IOTC Regional Observer Scheme (**OB**); Biological data (**BD**); Data from other Fleet used as Proxy (**PX**); Data from various scientific publications (**PB**).

NºREF Proxy: Key to the data (e.g. Proxy fleet used) and literature used to carry out the estimates. For numbers see the **Reference** for details.

Group Code	Species (*latin name*) / [Group]	Record in	Scenarios			Data Sources							NºREF Proxy
			Base Case	Lower Bound	Upper Bound	NC	EF	NR	BD	OB	PX	PB	
SKH	Total sharks *Elasmobranchia*	Weight	120.2	na	na								
BSH	Blue shark *Prionace glauca*	Weight	61.8	na	na	O		O	O				1,2,3
MAK	Mako sharks *Isurus spp.*	Weight	13.6	na	na	O		O	O				1,2,3
POR	Porbeagle shark *Lamna nasus*	Weight	na	na	na								
SPN	Hammerhead sharks *Sphyrna spp.*	Weight	19.7	na	na			O	O				1,2,3
THR	Thresher sharks *Alopias spp.*	Weight	1.5	na	na			O	O				1,2,3
FAL	Silky shark *Carcharhinus falciformis*	Weight	3.3	na	na			O	O				1,2,3
OCS	Oceanic whitetip shark *Carcharhinus longimanus*	Weight	8.8	na	na			O	O				1,2,3
PSK	Crocodile shark *Pseudocarcharias kamoharai*	Weight	0.08	na	na			O	O				1,2,3
	Other sharks SKH and Sharks nei	Weight	4.6	na	na			O	O				1,2,3
RHN	Whale shark *Rhincodon typus*	Number	na	na	na								
MAN	Mantas and devil rays *Mobulidae*	Weight	na	na	na								
PLS	Pelagic stingray *Pteroplatytrygon violacea*	Weight	6.7	na	na			O	O				1,2,3
ODN	Small marine mammals *Odontoceti*	Number	9	0	na			O				O	1,2,3,4
MYS	Whales *Mysticetti*	Number	3	1	na			O				O	1,2,3,4
TTX	Marine turtles *Testudines*	Number	113	34	na			O				O	1,2,3,4
LKV	Olive ridley turtle *Lepidochelys olivacea*	Number	12	7	na			O				O	1,2,3,4
TUG	Green turtle *Chelonia mydas*	Number	23	10	na			O				O	1,2,3,4
TTL	Loggerhead turtle *Caretta caretta*	Number	56	3	na			O				O	1,2,3,4
DKK	Leatherback turtle *Dermochelys coriacea*	Number	10	3	na			O				O	1,2,3,4
TTH	Hawksbill turtle *Eretmochelys imbricata*	Number	7	7	na			O				O	1,2,3,4

Swordfish Longline Fisheries: Portugal.

Table 22. Portugal swordfish longline fleets: Levels of bycatch fishing mortality estimated and main data sources used

The section *Scenarios* contains the estimates used for this study (*Base Case*) and upper (Upper Bound) and lower (*Lower Bound*) estimates, the latter two only when the use of alternative estimates of bycatch was available (*na*: catch not available/unknown; 0: nil catch).

Catches for most shark species are recorded in metric tons while the catches of whale shark, marine mammals and marine turtles are in number.

Key to *Data Sources* (**O** when used): IOTC Nominal Catch Table (**NC**); IOTC Effort (**EF**); CPC National Report (**NR**); IOTC Regional Observer Scheme (**OB**); Biological data (**BD**); Data from other Fleet used as Proxy (**PX**); Data from various scientific publications (**PB**).

NºREF Proxy: Key to the data (e.g. Proxy fleet used) and literature used to carry out the estimates. For numbers see the **Reference** for details.

Group Code	Species (*latin name*) / [Group]	Record in	Scenarios			Data Sources							NºREF Proxy
			Base Case	Lower Bound	Upper Bound	NC	EF	NR	BD	OB	PX	PB	
SKH	Total sharks *Elasmobranchia*	Weight	1695.1	na	na								
BSH	Blue shark *Prionace glauca*	Weight	1429.9	na	na	O		O	O				1,2,3
MAK	Mako sharks *Isurus spp.*	Weight	237.7	na	na	O		O	O				1,2,3
POR	Porbeagle shark *Lamna nasus*	Weight	3.9	na	na			O	O				1,2,3
SPN	Hammerhead sharks *Sphyrna spp.*	Weight	2.0	na	na			O	O				1,2,3
THR	Thresher sharks *Alopias spp.*	Weight	4.2	na	na			O	O				1,2,3
FAL	Silky shark *Carcharhinus falciformis*	Weight	0.09	na	na			O	O				1,2,3
OCS	Oceanic whitetip shark *Carcharhinus longimanus*	Weight	0.9	na	na			O	O				1,2,3
PSK	Crocodile shark *Pseudocarcharias kamoharai*	Weight	0.04	na	na			O	O				1,2,3
	Other sharks SKH and Sharks nei	Weight	16.3	na	na			O	O				1,2,3
RHN	Whale shark *Rhincodon typus*	Number	na	na	na								
MAN	Mantas and devil rays *Mobulidae*	Weight	na	na	na								
PLS	Pelagic stingray *Pteroplatytrygon violacea*	Weight	na	na	na								
ODN	Small marine mammals *Odontoceti*	Number	0	0	na			O				O	1,2,3,4
MYS	Whales *Mysticetti*	Number	0	0	na			O				O	1,2,3,4
TTX	Marine turtles *Testudines*	Number	13	0	na			O				O	1,2,3,4
LKV	Olive ridley turtle *Lepidochelys olivacea*	Number	4	0	na			O				O	1,2,3,4
TUG	Green turtle *Chelonia mydas*	Number	4	0	na			O				O	1,2,3,4
TTL	Loggerhead turtle *Caretta caretta*	Number	5	0	na			O				O	1,2,3,4
DKK	Leatherback turtle *Dermochelys coriacea*	Number	1	0	na			O				O	1,2,3,4
TTH	Hawksbill turtle *Eretmochelys imbricata*	Number	na	na	na								

Swordfish Longline Fisheries: Spain.

Table 23. Spain swordfish longline fleets: Levels of bycatch fishing mortality estimated and main data sources used

The section *Scenarios* contains the estimates used for this study (*Base Case*) and upper (Upper Bound) and lower (*Lower Bound*) estimates, the latter two only when the use of alternative estimates of bycatch was available (*na*: catch not available/unknown; 0: nil catch).

Catches for most shark species are recorded in metric tons while the catches of whale shark, marine mammals and marine turtles are in number.

Key to *Data Sources* (**O** when used): IOTC Nominal Catch Table (**NC**); IOTC Effort (**EF**); CPC National Report (**NR**); IOTC Regional Observer Scheme (**OB**); Biological data (**BD**); Data from other Fleet used as Proxy (**PX**); Data from various scientific publications (**PB**).

NºREF Proxy: Key to the data (e.g. Proxy fleet used) and literature used to carry out the estimates. For numbers see the **Reference** for details.

Group Code	Species (*latin name*) / [Group]	Record in	Scenarios			Data Sources							NºREF Proxy
			Base Case	Lower Bound	Upper Bound	NC	EF	NR	BD	OB	PX	PB	
SKH	Total sharks *Elasmobranchia*	Weight	4892.7	na	na								
BSH	Blue shark *Prionace glauca*	Weight	3983.9	na	na	O							
MAK	Mako sharks *Isurus spp.*	Weight	571.9	na	na	O							
POR	Porbeagle shark *Lamna nasus*	Weight	na	na	na								
SPN	Hammerhead sharks *Sphyrna spp.*	Weight	na	na	na								
THR	Thresher sharks *Alopias spp.*	Weight	na	na	na								
FAL	Silky shark *Carcharhinus falciformis*	Weight	73.7	na	na							O	1
OCS	Oceanic whitetip shark *Carcharhinus longimanus*	Weight	64.9	na	na							O	1
PSK	Crocodile shark *Pseudocarcharias kamoharai*	Weight	na	na	na								
	Other sharks SKH and Sharks nei	Weight	198.4	na	na							O	1
RHN	Whale shark *Rhincodon typus*	Number	na	na	na								
MAN	Mantas and devil rays *Mobulidae*	Weight	na	na	na								
PLS	Pelagic stingray *Pteroplatytrygon violacea*	Weight	na	na	na								
ODN	Small marine mammals *Odontoceti*	Number	2	0	na						O		ELL-EU.POR
MYS	Whales *Mysticetti*	Number	2	0	na						O		ELL-EU.POR
TTX	Marine turtles *Testudines*	Number	77	14	na			O				O	2,3,4,5
LKV	Olive ridley turtle *Lepidochelys olivacea*	Number	na	na	na								
TUG	Green turtle *Chelonia mydas*	Number	na	na	na								
TTL	Loggerhead turtle *Caretta caretta*	Number	na	na	na								
DKK	Leatherback turtle *Dermochelys coriacea*	Number	na	na	na								
TTH	Hawksbill turtle *Eretmochelys imbricata*	Number	na	na	na								

Swordfish Longline Fisheries: United Kingdom.

Table 24. United Kingdom swordfish longline fleets: Levels of bycatch fishing mortality estimated and main data sources used

The section *Scenarios* contains the estimates used for this study (*Base Case*) and upper (Upper Bound) and lower (*Lower Bound*) estimates, the latter two only when the use of alternative estimates of bycatch was available (*na*: catch not available/unknown; 0: nil catch).

Catches for most shark species are recorded in metric tons while the catches of whale shark, marine mammals and marine turtles are in number.

Key to *Data Sources* (**O** when used): IOTC Nominal Catch Table (**NC**); IOTC Effort (**EF**); CPC National Report (**NR**); IOTC Regional Observer Scheme (**OB**); Biological data (**BD**); Data from other Fleet used as Proxy (**PX**); Data from various scientific publications (**PB**).

NºREF Proxy: Key to the data (e.g. Proxy fleet used) and literature used to carry out the estimates. For numbers see the **Reference** for details.

Group Code	Species (*latin name*) / [Group]	Record in	Scenarios			Data Sources							NºREF Proxy
			Base Case	Lower Bound	Upper Bound	NC	EF	NR	BD	OB	PX	PB	
SKH	Total sharks *Elasmobranchia*	Weight	483.7	na	na								
BSH	Blue shark *Prionace glauca*	Weight	393.8	na	na						O		ELL-EU.ESP
MAK	Mako sharks *Isurus spp.*	Weight	56.5	na	na						O		ELL-EU.ESP
POR	Porbeagle shark *Lamna nasus*	Weight	na	na	na								
SPN	Hammerhead sharks *Sphyrna spp.*	Weight	na	na	na								
THR	Thresher sharks *Alopias spp.*	Weight	na	na	na								
FAL	Silky shark *Carcharhinus falciformis*	Weight	7.3	na	na						O		ELL-EU.ESP
OCS	Oceanic whitetip shark *Carcharhinus longimanus*	Weight	6.4	na	na						O		ELL-EU.ESP
PSK	Crocodile shark *Pseudocarcharias kamoharai*	Weight	na	na	na								
	Other sharks SKH and Sharks nei	Weight	19.6	na	na						O		ELL-EU.ESP
RHN	Whale shark *Rhincodon typus*	Number	na	na	na								
MAN	Mantas and devil rays *Mobulidae*	Weight	na	na	na								
PLS	Pelagic stingray *Pteroplatytrygon violacea*	Weight	na	na	na								
ODN	Small marine mammals *Odontoceti*	Number	0	0	na						O		ELL-EU.POR
MYS	Whales *Mysticetti*	Number	0	0	na						O		ELL-EU.POR
TTX	Marine turtles *Testudines*	Number	8	1	na						O		ELL-EU.ESP
LKV	Olive ridley turtle *Lepidochelys olivacea*	Number	na	na	na								
TUG	Green turtle *Chelonia mydas*	Number	na	na	na								
TTL	Loggerhead turtle *Caretta caretta*	Number	na	na	na								
DKK	Leatherback turtle *Dermochelys coriacea*	Number	na	na	na								
TTH	Hawksbill turtle *Eretmochelys imbricata*	Number	na	na	na								

Swordfish Longline Fisheries: Madagascar.

Table 25. Madagascar swordfish longline fleets: Levels of bycatch fishing mortality estimated and main data sources used

The section *Scenarios* contains the estimates used for this study (*Base Case*) and upper (Upper Bound) and lower (*Lower Bound*) estimates, the latter two only when the use of alternative estimates of bycatch was available (*na*: catch not available/unknown; 0: nil catch).

Catches for most shark species are recorded in metric tons while the catches of whale shark, marine mammals and marine turtles are in number.

Key to *Data Sources* (**O** when used): IOTC Nominal Catch Table (**NC**); IOTC Effort (**EF**); CPC National Report (**NR**); IOTC Regional Observer Scheme (**OB**); Biological data (**BD**); Data from other Fleet used as Proxy (**PX**); Data from various scientific publications (**PB**).

NºREF Proxy: Key to the data (e.g. Proxy fleet used) and literature used to carry out the estimates. For numbers see the **Reference** for details.

Group Code	Species (*latin name*) / [Group]	Record in	Scenarios			Data Sources							NºREF Proxy
			Base Case	Lower Bound	Upper Bound	NC	EF	NR	BD	OB	PX	PB	
SKH	Total sharks *Elasmobranchia*	Weight	77.8	na	na								
BSH	Blue shark *Prionace glauca*	Weight	40.0	na	na	O						O	1
MAK	Mako sharks *Isurus spp.*	Weight	8.8	na	na						O		ELL-FRA.REU
POR	Porbeagle shark *Lamna nasus*	Weight	na	na	na								
SPN	Hammerhead sharks *Sphyrna spp.*	Weight	12.7	na	na						O		ELL-FRA.REU
THR	Thresher sharks *Alopias spp.*	Weight	1.0	na	na						O		ELL-FRA.REU
FAL	Silky shark *Carcharhinus falciformis*	Weight	2.7	na	na						O		ELL-FRA.REU
OCS	Oceanic whitetip shark *Carcharhinus longimanus*	Weight	5.7	na	na						O		ELL-FRA.REU
PSK	Crocodile shark *Pseudocarcharias kamoharai*	Weight	0.05	na	na						O		ELL-FRA.REU
	Other sharks SKH and Sharks nei	Weight	3.0	na	na						O		ELL-FRA.REU
RHN	Whale shark *Rhincodon typus*	Number	na	na	na								
MAN	Mantas and devil rays *Mobulidae*	Weight	na	na	na								
PLS	Pelagic stingray *Pteroplatytrygon violacea*	Weight	4.4	na	na						O		ELL-FRA.REU
ODN	Small marine mammals *Odontoceti*	Number	1	0	na						O		ELL-FRA.REU
MYS	Whales *Mysticetti*	Number	1	0	na						O		ELL-FRA.REU
TTX	Marine turtles *Testudines*	Number	16	5	na						O		ELL-FRA.REU
LKV	Olive ridley turtle *Lepidochelys olivacea*	Number	2	1	na						O		ELL-FRA.REU
TUG	Green turtle *Chelonia mydas*	Number	3	1	na						O		ELL-FRA.REU
TTL	Loggerhead turtle *Caretta caretta*	Number	8	0	na						O		ELL-FRA.REU
DKK	Leatherback turtle *Dermochelys coriacea*	Number	1	0	na						O		ELL-FRA.REU
TTH	Hawksbill turtle *Eretmochelys imbricata*	Number	1	1	na						O		ELL-FRA.REU

Swordfish Longline Fisheries: Mauritius.

Table 26. Mauritius swordfish longline fleets: Levels of bycatch fishing mortality estimated and main data sources used

The section *Scenarios* contains the estimates used for this study (*Base Case*) and upper (Upper Bound) and lower (*Lower Bound*) estimates, the latter two only when the use of alternative estimates of bycatch was available (*na*: catch not available/unknown; 0: nil catch).

Catches for most shark species are recorded in metric tons while the catches of whale shark, marine mammals and marine turtles are in number.

Key to *Data Sources* (**O** when used): IOTC Nominal Catch Table (**NC**); IOTC Effort (**EF**); CPC National Report (**NR**); IOTC Regional Observer Scheme (**OB**); Biological data (**BD**); Data from other Fleet used as Proxy (**PX**); Data from various scientific publications (**PB**).

NºREF Proxy: Key to the data (e.g. Proxy fleet used) and literature used to carry out the estimates. For numbers see the **Reference** for details.

Group Code	Species (*latin name*) / [Group]	Record in	Scenarios			Data Sources							NºREF Proxy
			Base Case	Lower Bound	Upper Bound	NC	EF	NR	BD	OB	PX	PB	
SKH	Total sharks *Elasmobranchia*	Weight	8.5	na	na						O		ELL-FRA.REU
BSH	Blue shark *Prionace glauca*	Weight	4.4	na	na						O		ELL-FRA.REU
MAK	Mako sharks *Isurus spp.*	Weight	1.0	na	na						O		ELL-FRA.REU
POR	Porbeagle shark *Lamna nasus*	Weight	na	na	na								
SPN	Hammerhead sharks *Sphyrna spp.*	Weight	1.4	na	na						O		ELL-FRA.REU
THR	Thresher sharks *Alopias spp.*	Weight	0.1	na	na						O		ELL-FRA.REU
FAL	Silky shark *Carcharhinus falciformis*	Weight	0.2	na	na						O		ELL-FRA.REU
OCS	Oceanic whitetip shark *Carcharhinus longimanus*	Weight	0.6	na	na						O		ELL-FRA.REU
PSK	Crocodile shark *Pseudocarcharias kamoharai*	Weight	0.01	na	na						O		ELL-FRA.REU
	Other sharks SKH and Sharks nei	Weight	0.3	na	na						O		ELL-FRA.REU
RHN	Whale shark *Rhincodon typus*	Number	na	na	na								
MAN	Mantas and devil rays *Mobulidae*	Weight	na	na	na								
PLS	Pelagic stingray *Pteroplatytrygon violacea*	Weight	0.5	na	na						O		ELL-FRA.REU
ODN	Small marine mammals *Odontoceti*	Number	1	0	na						O		ELL-FRA.REU
MYS	Whales *Mysticetti*	Number	0	0	na						O		ELL-FRA.REU
TTX	Marine turtles *Testudines*	Number	8	2	na						O		ELL-FRA.REU
LKV	Olive ridley turtle *Lepidochelys olivacea*	Number	1	0	na						O		ELL-FRA.REU
TUG	Green turtle *Chelonia mydas*	Number	2	1	na						O		ELL-FRA.REU
TTL	Loggerhead turtle *Caretta caretta*	Number	4	0	na						O		ELL-FRA.REU
DKK	Leatherback turtle *Dermochelys coriacea*	Number	1	0	na						O		ELL-FRA.REU
TTH	Hawksbill turtle *Eretmochelys imbricata*	Number	0	0	na						O		ELL-FRA.REU

Swordfish Longline Fisheries: Mozambique.

Table 27. Mozambique swordfish longline fleets: Levels of bycatch fishing mortality estimated and main data sources used

The section *Scenarios* contains the estimates used for this study (*Base Case*) and upper (Upper Bound) and lower (*Lower Bound*) estimates, the latter two only when the use of alternative estimates of bycatch was available (*na*: catch not available/unknown; 0: nil catch).

Catches for most shark species are recorded in metric tons while the catches of whale shark, marine mammals and marine turtles are in number.

Key to *Data Sources* (**O** when used): IOTC Nominal Catch Table (**NC**); IOTC Effort (**EF**); CPC National Report (**NR**); IOTC Regional Observer Scheme (**OB**); Biological data (**BD**); Data from other Fleet used as Proxy (**PX**); Data from various scientific publications (**PB**).

NºREF Proxy: Key to the data (e.g. Proxy fleet used) and literature used to carry out the estimates. For numbers see the **Reference** for details.

Group Code	Species (*latin name*) / [Group]	Record in	Scenarios			Data Sources							NºREF Proxy
			Base Case	Lower Bound	Upper Bound	NC	EF	NR	BD	OB	PX	PB	
SKH	Total sharks *Elasmobranchia*	Weight	18.6	na	na	O						O	3
BSH	Blue shark *Prionace glauca*	Weight	4.7	na	na				O			O	1,3
MAK	Mako sharks *Isurus spp.*	Weight	0.8	na	na				O			O	1,3
POR	Porbeagle shark *Lamna nasus*	Weight	na	na	na								
SPN	Hammerhead sharks *Sphyrna spp.*	Weight	0.7	na	na				O			O	1,3
THR	Thresher sharks *Alopias spp.*	Weight	na	na	na								
FAL	Silky shark *Carcharhinus falciformis*	Weight	0.3	na	na				O			O	1,3
OCS	Oceanic whitetip shark *Carcharhinus longimanus*	Weight	6.5	na	na				O			O	2,3
PSK	Crocodile shark *Pseudocarcharias kamoharai*	Weight	na	na	na								
	Other sharks SKH and Sharks nei	Weight	5.6	na	na				O			O	1,3
RHN	Whale shark *Rhincodon typus*	Number	na	na	na								
MAN	Mantas and devil rays *Mobulidae*	Weight	na	na	na								
PLS	Pelagic stingray *Pteroplatytrygon violacea*	Weight	na	na	na								
ODN	Small marine mammals *Odontoceti*	Number	na	na	na								
MYS	Whales *Mysticetti*	Number	na	na	na								
TTX	Marine turtles *Testudines*	Number	8	0	na		O					O	3
LKV	Olive ridley turtle *Lepidochelys olivacea*	Number	0	0	na								
TUG	Green turtle *Chelonia mydas*	Number	3	0	na							O	3,4
TTL	Loggerhead turtle *Caretta caretta*	Number	0	0	na								
DKK	Leatherback turtle *Dermochelys coriacea*	Number	5	0	na							O	3,4
TTH	Hawksbill turtle *Eretmochelys imbricata*	Number	0	0	na								

Swordfish Longline Fisheries: Seychelles.

Table 28. Seychelles swordfish longline fleets: Levels of bycatch fishing mortality estimated and main data sources used

The section *Scenarios* contains the estimates used for this study (*Base Case*) and upper (Upper Bound) and lower (*Lower Bound*) estimates, the latter two only when the use of alternative estimates of bycatch was available (*na*: catch not available/unknown; 0: nil catch).

Catches for most shark species are recorded in metric tons while the catches of whale shark, marine mammals and marine turtles are in number.

Key to *Data Sources* (**O** when used): IOTC Nominal Catch Table (**NC**); IOTC Effort (**EF**); CPC National Report (**NR**); IOTC Regional Observer Scheme (**OB**); Biological data (**BD**); Data from other Fleet used as Proxy (**PX**); Data from various scientific publications (**PB**).

NºREF Proxy: Key to the data (e.g. Proxy fleet used) and literature used to carry out the estimates. For numbers see the **Reference** for details.

Group Code	Species (*latin name*) / [Group]	Record in	Scenarios			Data Sources							NºREF Proxy
			Base Case	Lower Bound	Upper Bound	NC	EF	NR	BD	OB	PX	PB	
SKH	Total sharks *Elasmobranchia*	Weight	27.4	na	na						O		ELL-FRA.REU
BSH	Blue shark *Prionace glauca*	Weight	14.1	na	na						O		ELL-FRA.REU
MAK	Mako sharks *Isurus spp.*	Weight	3.1	na	na						O		ELL-FRA.REU
POR	Porbeagle shark *Lamna nasus*	Weight	na	na	na								
SPN	Hammerhead sharks *Sphyrna spp.*	Weight	4.5	na	na						O		ELL-FRA.REU
THR	Thresher sharks *Alopias spp.*	Weight	0.3	na	na						O		ELL-FRA.REU
FAL	Silky shark *Carcharhinus falciformis*	Weight	0.8	na	na						O		ELL-FRA.REU
OCS	Oceanic whitetip shark *Carcharhinus longimanus*	Weight	2.0	na	na						O		ELL-FRA.REU
PSK	Crocodile shark *Pseudocarcharias kamoharai*	Weight	0.02	na	na						O		ELL-FRA.REU
	Other sharks SKH and Sharks nei	Weight	1.1	na	na						O		ELL-FRA.REU
RHN	Whale shark *Rhincodon typus*	Number	na	na	na								
MAN	Mantas and devil rays *Mobulidae*	Weight	na	na	na								
PLS	Pelagic stingray *Pteroplatytrygon violacea*	Weight	1.5	na	na						O		ELL-FRA.REU
ODN	Small marine mammals *Odontoceti*	Number	2	0	na						O		ELL-FRA.REU
MYS	Whales *Mysticetti*	Number	1	0	na						O		ELL-FRA.REU
TTX	Marine turtles *Testudines*	Number	26	8	na						O		ELL-FRA.REU
LKV	Olive ridley turtle *Lepidochelys olivacea*	Number	3	2	na						O		ELL-FRA.REU
TUG	Green turtle *Chelonia mydas*	Number	5	2	na						O		ELL-FRA.REU
TTL	Loggerhead turtle *Caretta caretta*	Number	13	1	na						O		ELL-FRA.REU
DKK	Leatherback turtle *Dermochelys coriacea*	Number	2	1	na						O		ELL-FRA.REU
TTH	Hawksbill turtle *Eretmochelys imbricata*	Number	2	2	na						O		ELL-FRA.REU

Swordfish Longline Fisheries: South Africa.

Table 29. South Africa swordfish longline fleets: Levels of bycatch fishing mortality estimated and main data sources used

The section *Scenarios* contains the estimates used for this study (*Base Case*) and upper (Upper Bound) and lower (*Lower Bound*) estimates, the latter two only when the use of alternative estimates of bycatch was available (*na*: catch not available/unknown; 0: nil catch).

Catches for most shark species are recorded in metric tons while the catches of whale shark, marine mammals and marine turtles are in number.

Key to *Data Sources* (**O** when used): IOTC Nominal Catch Table (**NC**); IOTC Effort (**EF**); CPC National Report (**NR**); IOTC Regional Observer Scheme (**OB**); Biological data (**BD**); Data from other Fleet used as Proxy (**PX**); Data from various scientific publications (**PB**).

NºREF Proxy: Key to the data (e.g. Proxy fleet used) and literature used to carry out the estimates. For numbers see the **Reference** for details.

Group Code	Species (*latin name*) / [Group]	Record in	Scenarios			Data Sources							NºREF Proxy
			Base Case	Lower Bound	Upper Bound	NC	EF	NR	BD	OB	PX	PB	
SKH	Total sharks *Elasmobranchia*	Weight	1512.4	na	na								
BSH	Blue shark *Prionace glauca*	Weight	629.3	na	na			O				O	1,5,7
MAK	Mako sharks *Isurus spp.*	Weight	602.2	na	na			O				O	1,3,4,5,7
POR	Porbeagle shark *Lamna nasus*	Weight	5.7	na	na							O	1,7
SPN	Hammerhead sharks *Sphyrna spp.*	Weight	31.9	na	na							O	1,7
THR	Thresher sharks *Alopias spp.*	Weight	76.9	na	na							O	1,7
FAL	Silky shark *Carcharhinus falciformis*	Weight	na	na	na								
OCS	Oceanic whitetip shark *Carcharhinus longimanus*	Weight	21.0	na	na							O	2,7
PSK	Crocodile shark *Pseudocarcharias kamoharai*	Weight	28.4	na	na							O	1,7
	Other sharks SKH and Sharks nei	Weight	117.1	na	na							O	1,7
RHN	Whale shark *Rhincodon typus*	Number	na	na	na								
MAN	Mantas and devil rays *Mobulidae*	Weight	na	na	na								
PLS	Pelagic stingray *Pteroplatytrygon violacea*	Weight	na	na	na								
ODN	Small marine mammals *Odontoceti*	Number	na	na	na								
MYS	Whales *Mysticetti*	Number	na	na	na								
TTX	Marine turtles *Testudines*	Number	21	10	na		O	O				O	5,6,8
LKV	Olive ridley turtle *Lepidochelys olivacea*	Number	na	na	na								
TUG	Green turtle *Chelonia mydas*	Number	1	0	na		O	O				O	5,6,8
TTL	Loggerhead turtle *Caretta caretta*	Number	9	5	na		O	O				O	5,6,8
DKK	Leatherback turtle *Dermochelys coriacea*	Number	5	3	na		O	O				O	5,6,8
TTH	Hawksbill turtle *Eretmochelys imbricata*	Number	1	0	na		O	O				O	5,6,8

Deep-freezing Longline Fisheries: China.

Table 30. China deep-freezing longline fleets: Levels of bycatch fishing mortality estimated and main data sources used

The section *Scenarios* contains the estimates used for this study (*Base Case*) and upper (Upper Bound) and lower (*Lower Bound*) estimates, the latter two only when the use of alternative estimates of bycatch was available (*na*: catch not available/unknown; 0: nil catch).

Catches for most shark species are recorded in metric tons while the catches of whale shark, marine mammals and marine turtles are in number.

Key to *Data Sources* (**O** when used): IOTC Nominal Catch Table (**NC**); IOTC Effort (**EF**); CPC National Report (**NR**); IOTC Regional Observer Scheme (**OB**); Biological data (**BD**); Data from other Fleet used as Proxy (**PX**); Data from various scientific publications (**PB**).

NºREF Proxy: Key to the data (e.g. Proxy fleet used) and literature used to carry out the estimates. For numbers see the **Reference** for details.

Group Code	Species (*latin name*) / [Group]	Record in	Scenarios			Data Sources							NºREF Proxy
			Base Case	Lower Bound	Upper Bound	NC	EF	NR	BD	OB	PX	PB	
SKH	Total sharks *Elasmobranchia*	Weight	2149.8	1097.8	na	O						O	2,3
BSH	Blue shark *Prionace glauca*	Weight	1601.5	817.8	na				O			O	1
MAK	Mako sharks *Isurus spp.*	Weight	141.5	72.3	na				O			O	1
POR	Porbeagle shark *Lamna nasus*	Weight	na	na	na								
SPN	Hammerhead sharks *Sphyrna spp.*	Weight	29.7	15.2	na				O			O	1
THR	Thresher sharks *Alopias spp.*	Weight	42.2	21.6	na				O			O	1
FAL	Silky shark *Carcharhinus falciformis*	Weight	19.9	10.2	na				O			O	1
OCS	Oceanic whitetip shark *Carcharhinus longimanus*	Weight	32.9	16.8	na				O			O	1
PSK	Crocodile shark *Pseudocarcharias kamoharai*	Weight	3.2	1.6	na				O			O	1
	Other sharks SKH and Sharks nei	Weight	7.4	3.8	na				O			O	1
RHN	Whale shark *Rhincodon typus*	Number	na	na	na								
MAN	Mantas and devil rays *Mobulidae*	Weight	na	na	na								
PLS	Pelagic stingray *Pteroplatytrygon violacea*	Weight	271.5	138.6	na				O			O	1
ODN	Small marine mammals *Odontoceti*	Number	20	0	na			O				O	1,4
MYS	Whales *Mysticetti*	Number	na	na	na								
TTX	Marine turtles *Testudines*	Number	41	36	na								
LKV	Olive ridley turtle *Lepidochelys olivacea*	Number	20	36	na			O				O	1,4
TUG	Green turtle *Chelonia mydas*	Number	na	na	na								
TTL	Loggerhead turtle *Caretta caretta*	Number	na	na	na								
DKK	Leatherback turtle *Dermochelys coriacea*	Number	20	0	na			O				O	1,4
TTH	Hawksbill turtle *Eretmochelys imbricata*	Number	na	na	na								

Deep-freezing Longline Fisheries: India.

Table 31. India deep-freezing longline fleets: Levels of bycatch fishing mortality estimated and main data sources used

The section *Scenarios* contains the estimates used for this study (*Base Case*) and upper (Upper Bound) and lower (*Lower Bound*) estimates, the latter two only when the use of alternative estimates of bycatch was available (*na*: catch not available/unknown; 0: nil catch).

Catches for most shark species are recorded in metric tons while the catches of whale shark, marine mammals and marine turtles are in number.

Key to *Data Sources* (**O** when used): IOTC Nominal Catch Table (**NC**); IOTC Effort (**EF**); CPC National Report (**NR**); IOTC Regional Observer Scheme (**OB**); Biological data (**BD**); Data from other Fleet used as Proxy (**PX**); Data from various scientific publications (**PB**).

NºREF Proxy: Key to the data (e.g. Proxy fleet used) and literature used to carry out the estimates. For numbers see the **Reference** for details.

Group Code	Species (*latin name*) / [Group]	Record in	Scenarios			Data Sources							NºREF Proxy
			Base Case	Lower Bound	Upper Bound	NC	EF	NR	BD	OB	PX	PB	
SKH	Total sharks *Elasmobranchia*	Weight	374.5	191.2	na	O						O	1,5
BSH	Blue shark *Prionace glauca*	Weight	na	na	na								
MAK	Mako sharks *Isurus spp.*	Weight	2.9	1.5	na							O	4
POR	Porbeagle shark *Lamna nasus*	Weight	na	na	na								
SPN	Hammerhead sharks *Sphyrna spp.*	Weight	9.4	4.8	na							O	4
THR	Thresher sharks *Alopias spp.*	Weight	230.7	117.8	na							O	4
FAL	Silky shark *Carcharhinus falciformis*	Weight	4.3	2.2	na							O	4
OCS	Oceanic whitetip shark *Carcharhinus longimanus*	Weight	0.6	0.3	na							O	4
PSK	Crocodile shark *Pseudocarcharias kamoharai*	Weight	na	na	na								
	Other sharks SKH and Sharks nei	Weight	114.1	58.3	na							O	4
RHN	Whale shark *Rhincodon typus*	Number	na	na	na								
MAN	Mantas and devil rays *Mobulidae*	Weight	1.3	0.7	na							O	4
PLS	Pelagic stingray *Pteroplatytrygon violacea*	Weight	11.2	5.7	na							O	4
ODN	Small marine mammals *Odontoceti*	Number	na	na	na								
MYS	Whales *Mysticetti*	Number	na	na	na								
TTX	Marine turtles *Testudines*	Number	87	72	na		O					O	3,4
LKV	Olive ridley turtle *Lepidochelys olivacea*	Number	79	66	na							O	2,3
TUG	Green turtle *Chelonia mydas*	Number	5	5	na							O	2,3
TTL	Loggerhead turtle *Caretta caretta*	Number	na	na	na								
DKK	Leatherback turtle *Dermochelys coriacea*	Number	na	na	na								
TTH	Hawksbill turtle *Eretmochelys imbricata*	Number	0	2	na							O	2,3

Deep-freezing Longline Fisheries: Indonesia.

Table 32. Indonesia deep-freezing longline fleets: Levels of bycatch fishing mortality estimated and main data sources used

The section *Scenarios* contains the estimates used for this study (*Base Case*) and upper (Upper Bound) and lower (*Lower Bound*) estimates, the latter two only when the use of alternative estimates of bycatch was available (*na*: catch not available/unknown; 0: nil catch).

Catches for most shark species are recorded in metric tons while the catches of whale shark, marine mammals and marine turtles are in number.

Key to *Data Sources* (**O** when used): IOTC Nominal Catch Table (**NC**); IOTC Effort (**EF**); CPC National Report (**NR**); IOTC Regional Observer Scheme (**OB**); Biological data (**BD**); Data from other Fleet used as Proxy (**PX**); Data from various scientific publications (**PB**).

NºREF Proxy: Key to the data (e.g. Proxy fleet used) and literature used to carry out the estimates. For numbers see the **Reference** for details.

Group Code	Species (*latin name*) / [Group]	Record in	Scenarios			Data Sources							NºREF Proxy
			Base Case	Lower Bound	Upper Bound	NC	EF	NR	BD	OB	PX	PB	
SKH	Total sharks *Elasmobranchia*	Weight	2661.8	1359.3	na	O						O	2,5
BSH	Blue shark *Prionace glauca*	Weight	1679.3	857.6	na				O			O	1
MAK	Mako sharks *Isurus spp.*	Weight	146.6	74.9	na				O			O	1
POR	Porbeagle shark *Lamna nasus*	Weight	na	na	na								
SPN	Hammerhead sharks *Sphyrna spp.*	Weight	67.7	34.6	na				O			O	1
THR	Thresher sharks *Alopias spp.*	Weight	131.3	67.0	na				O			O	1
FAL	Silky shark *Carcharhinus falciformis*	Weight	55.8	28.5	na				O			O	1
OCS	Oceanic whitetip shark *Carcharhinus longimanus*	Weight	48.5	24.8	na				O			O	1
PSK	Crocodile shark *Pseudocarcharias kamoharai*	Weight	180.7	92.3	na				O			O	1
	Other sharks SKH and Sharks nei	Weight	110.7	56.5	na				O			O	1
RHN	Whale shark *Rhincodon typus*	Number	na	na	na								
MAN	Mantas and devil rays *Mobulidae*	Weight	na	na	na								
PLS	Pelagic stingray *Pteroplatytrygon violacea*	Weight	241.3	123.2	na				O			O	1
ODN	Small marine mammals *Odontoceti*	Number	11	na	na		O					O	6
MYS	Whales *Mysticetti*	Number	7	na	na		O					O	6
TTX	Marine turtles *Testudines*	Number	125	na	na								
LKV	Olive ridley turtle *Lepidochelys olivacea*	Number	99	na	na		O					O	3,4
TUG	Green turtle *Chelonia mydas*	Number	na	na	na								
TTL	Loggerhead turtle *Caretta caretta*	Number	na	na	na								
DKK	Leatherback turtle *Dermochelys coriacea*	Number	26	na	na		O					O	3,4
TTH	Hawksbill turtle *Eretmochelys imbricata*	Number	na	na	na								

Deep-freezing Longline Fisheries: Japan.

Table 33. Japan deep-freezing longline fleets: Levels of bycatch fishing mortality estimated and main data sources used

The section *Scenarios* contains the estimates used for this study (*Base Case*) and upper (Upper Bound) and lower (*Lower Bound*) estimates, the latter two only when the use of alternative estimates of bycatch was available (*na*: catch not available/unknown; 0: nil catch).

Catches for most shark species are recorded in metric tons while the catches of whale shark, marine mammals and marine turtles are in number.

Key to *Data Sources* (**O** when used): IOTC Nominal Catch Table (**NC**); IOTC Effort (**EF**); CPC National Report (**NR**); IOTC Regional Observer Scheme (**OB**); Biological data (**BD**); Data from other Fleet used as Proxy (**PX**); Data from various scientific publications (**PB**).

NºREF Proxy: Key to the data (e.g. Proxy fleet used) and literature used to carry out the estimates. For numbers see the **Reference** for details.

Group Code	Species (*latin name*) / [Group]	Record in	Scenarios			Data Sources							NºREF Proxy
			Base Case	Lower Bound	Upper Bound	NC	EF	NR	BD	OB	PX	PB	
SKH	Total sharks *Elasmobranchia*	Weight	4274.5	2182.9	na	O						O	2,4
BSH	Blue shark *Prionace glauca*	Weight	3666.0	1872.1	na					O			
MAK	Mako sharks *Isurus spp.*	Weight	218.1	111.4	na					O			
POR	Porbeagle shark *Lamna nasus*	Weight	82.8	42.3	na					O			
SPN	Hammerhead sharks *Sphyrna spp.*	Weight	6.3	3.2	na					O			
THR	Thresher sharks *Alopias spp.*	Weight	137.5	70.2	na					O			
FAL	Silky shark *Carcharhinus falciformis*	Weight	34.8	17.8	na					O			
OCS	Oceanic whitetip shark *Carcharhinus longimanus*	Weight	6.8	3.5	na					O			
PSK	Crocodile shark *Pseudocarcharias kamoharai*	Weight	107.5	54.9	na					O			
	Other sharks SKH and Sharks nei	Weight	0.3	0.1	na					O			
RHN	Whale shark *Rhincodon typus*	Number	na	na	na								
MAN	Mantas and devil rays *Mobulidae*	Weight	na	na	na								
PLS	Pelagic stingray *Pteroplatytrygon violacea*	Weight	14.5	7.4	na					O			
ODN	Small marine mammals *Odontoceti*	Number	na	na	na								
MYS	Whales *Mysticetti*	Number	na	na	na								
TTX	Marine turtles *Testudines*	Number	34	na	na								
LKV	Olive ridley turtle *Lepidochelys olivacea*	Number	14	na	na		O					O	1,3
TUG	Green turtle *Chelonia mydas*	Number	na	na	na								
TTL	Loggerhead turtle *Caretta caretta*	Number	3	na	na		O					O	1,3
DKK	Leatherback turtle *Dermochelys coriacea*	Number	2	na	na		O					O	1,3
TTH	Hawksbill turtle *Eretmochelys imbricata*	Number	na	na	na								

Deep-freezing Longline Fisheries: Republic of Korea.

Table 34. Korea deep-freezing longline fleets: Levels of bycatch fishing mortality estimated and main data sources used

The section *Scenarios* contains the estimates used for this study (*Base Case*) and upper (Upper Bound) and lower (*Lower Bound*) estimates, the latter two only when the use of alternative estimates of bycatch was available (*na*: catch not available/unknown; 0: nil catch).

Catches for most shark species are recorded in metric tons while the catches of whale shark, marine mammals and marine turtles are in number.

Key to *Data Sources* (**O** when used): IOTC Nominal Catch Table (**NC**); IOTC Effort (**EF**); CPC National Report (**NR**); IOTC Regional Observer Scheme (**OB**); Biological data (**BD**); Data from other Fleet used as Proxy (**PX**); Data from various scientific publications (**PB**).

NºREF Proxy: Key to the data (e.g. Proxy fleet used) and literature used to carry out the estimates. For numbers see the **Reference** for details.

Group Code	Species (*latin name*) / [Group]	Record in	Scenarios			Data Sources							NºREF Proxy
			Base Case	Lower Bound	Upper Bound	NC	EF	NR	BD	OB	PX	PB	
SKH	Total sharks *Elasmobranchia*	Weight	903.2	461.3	na								
BSH	Blue shark *Prionace glauca*	Weight	444.8	227.1	na						O		LL-TWN
MAK	Mako sharks *Isurus spp.*	Weight	100.7	51.4	na						O		LL-TWN
POR	Porbeagle shark *Lamna nasus*	Weight	na	na	na								
SPN	Hammerhead sharks *Sphyrna spp.*	Weight	2.6	1.3	na						O		LL-TWN
THR	Thresher sharks *Alopias spp.*	Weight	70.9	36.2	na						O		LL-TWN
FAL	Silky shark *Carcharhinus falciformis*	Weight	121.5	62.1	na						O		LL-TWN
OCS	Oceanic whitetip shark *Carcharhinus longimanus*	Weight	9.9	5.1	na						O		LL-TWN
PSK	Crocodile shark *Pseudocarcharias kamoharai*	Weight	na	na	na								
	Other sharks SKH and Sharks nei	Weight	152.9	78.1	na						O		LL-TWN
RHN	Whale shark *Rhincodon typus*	Number	na	na	na								
MAN	Mantas and devil rays *Mobulidae*	Weight	na	na	na								
PLS	Pelagic stingray *Pteroplatytrygon violacea*	Weight	na	na	na								
ODN	Small marine mammals *Odontoceti*	Number	na	na	na								
MYS	Whales *Mysticetti*	Number	na	na	na								
TTX	Marine turtles *Testudines*	Number	43	na	na						O		LL-TWN
LKV	Olive ridley turtle *Lepidochelys olivacea*	Number	29	na	na						O		LL-TWN
TUG	Green turtle *Chelonia mydas*	Number	1	na	na						O		LL-TWN
TTL	Loggerhead turtle *Caretta caretta*	Number	3	na	na						O		LL-TWN
DKK	Leatherback turtle *Dermochelys coriacea*	Number	5	na	na						O		LL-TWN
TTH	Hawksbill turtle *Eretmochelys imbricata*	Number	na	na	na								

Deep-freezing Longline Fisheries: Maldives.

Table 35. Maldives deep-freezing longline fleets: Levels of bycatch fishing mortality estimated and main data sources used

The section *Scenarios* contains the estimates used for this study (*Base Case*) and upper (Upper Bound) and lower (*Lower Bound*) estimates, the latter two only when the use of alternative estimates of bycatch was available (*na*: catch not available/unknown; 0: nil catch).

Catches for most shark species are recorded in metric tons while the catches of whale shark, marine mammals and marine turtles are in number.

Key to *Data Sources* (**O** when used): IOTC Nominal Catch Table (**NC**); IOTC Effort (**EF**); CPC National Report (**NR**); IOTC Regional Observer Scheme (**OB**); Biological data (**BD**); Data from other Fleet used as Proxy (**PX**); Data from various scientific publications (**PB**).

NºREF Proxy: Key to the data (e.g. Proxy fleet used) and literature used to carry out the estimates. For numbers see the **Reference** for details.

Group Code	Species (*latin name*) / [Group]	Record in	Scenarios			Data Sources							NºREF Proxy
			Base Case	Lower Bound	Upper Bound	NC	EF	NR	BD	OB	PX	PB	
SKH	Total sharks *Elasmobranchia*	Weight	229.1	117.0	na	O						O	3,5
BSH	Blue shark *Prionace glauca*	Weight	10.3	5.3	na							O	2
MAK	Mako sharks *Isurus spp.*	Weight	9.8	5.0	na							O	2
POR	Porbeagle shark *Lamna nasus*	Weight	na	na	na								
SPN	Hammerhead sharks *Sphyrna spp.*	Weight	3.2	1.6	na							O	2
THR	Thresher sharks *Alopias spp.*	Weight	2.2	1.2	na							O	2
FAL	Silky shark *Carcharhinus falciformis*	Weight	182.9	93.4	na							O	2
OCS	Oceanic whitetip shark *Carcharhinus longimanus*	Weight	9.4	4.8	na							O	2
PSK	Crocodile shark *Pseudocarcharias kamoharai*	Weight	na	na	na								
	Other sharks SKH and Sharks nei	Weight	11.3	5.8	na							O	2
RHN	Whale shark *Rhincodon typus*	Number	na	na	na								
MAN	Mantas and devil rays *Mobulidae*	Weight	na	na	na								
PLS	Pelagic stingray *Pteroplatytrygon violacea*	Weight	na	na	na								
ODN	Small marine mammals *Odontoceti*	Number	na	na	na								
MYS	Whales *Mysticetti*	Number	na	na	na								
TTX	Marine turtles *Testudines*	Number	22	na	na	O		O				O	1,4
LKV	Olive ridley turtle *Lepidochelys olivacea*	Number	na	na	na								
TUG	Green turtle *Chelonia mydas*	Number	na	na	na								
TTL	Loggerhead turtle *Caretta caretta*	Number	na	na	na								
DKK	Leatherback turtle *Dermochelys coriacea*	Number	na	na	na								
TTH	Hawksbill turtle *Eretmochelys imbricata*	Number	na	na	na								

Deep-freezing Longline Fisheries: NEI.

Table 36. NEI deep-freezing longline fleets: Levels of bycatch fishing mortality estimated and main data sources used

The section *Scenarios* contains the estimates used for this study (*Base Case*) and upper (Upper Bound) and lower (*Lower Bound*) estimates, the latter two only when the use of alternative estimates of bycatch was available (*na*: catch not available/unknown; 0: nil catch).

Catches for most shark species are recorded in metric tons while the catches of whale shark, marine mammals and marine turtles are in number.

Key to *Data Sources* (**O** when used): IOTC Nominal Catch Table (**NC**); IOTC Effort (**EF**); CPC National Report (**NR**); IOTC Regional Observer Scheme (**OB**); Biological data (**BD**); Data from other Fleet used as Proxy (**PX**); Data from various scientific publications (**PB**).

NºREF Proxy: Key to the data (e.g. Proxy fleet used) and literature used to carry out the estimates. For numbers see the **Reference** for details.

Group Code	Species (*latin name*) / [Group]	Record in	Scenarios			Data Sources							NºREF Proxy
			Base Case	Lower Bound	Upper Bound	NC	EF	NR	BD	OB	PX	PB	
SKH	Total sharks *Elasmobranchia*	Weight	1085.6	554.4	na								
BSH	Blue shark *Prionace glauca*	Weight	534.6	273.0	na						O		LL-TWN
MAK	Mako sharks *Isurus spp.*	Weight	121.0	61.8	na						O		LL-TWN
POR	Porbeagle shark *Lamna nasus*	Weight	na	na	na								
SPN	Hammerhead sharks *Sphyrna spp.*	Weight	3.09	1.58	na						O		LL-TWN
THR	Thresher sharks *Alopias spp.*	Weight	85.2	43.5	na						O		LL-TWN
FAL	Silky shark *Carcharhinus falciformis*	Weight	146.1	74.6	na						O		LL-TWN
OCS	Oceanic whitetip shark *Carcharhinus longimanus*	Weight	11.9	6.1	na						O		LL-TWN
PSK	Crocodile shark *Pseudocarcharias kamoharai*	Weight	na	na	na								
	Other sharks SKH and Sharks nei	Weight	183.7	93.8	na						O		LL-TWN
RHN	Whale shark *Rhincodon typus*	Number	na	na	na								
MAN	Mantas and devil rays *Mobulidae*	Weight	na	na	na								
PLS	Pelagic stingray *Pteroplatytrygon violacea*	Weight	na	na	na								
ODN	Small marine mammals *Odontoceti*	Number	na	na	na								
MYS	Whales *Mysticetti*	Number	na	na	na								
TTX	Marine turtles *Testudines*	Number	37	na	na						O		LL-TWN
LKV	Olive ridley turtle *Lepidochelys olivacea*	Number	26	na	na						O		LL-TWN
TUG	Green turtle *Chelonia mydas*	Number	1	na	na						O		LL-TWN
TTL	Loggerhead turtle *Caretta caretta*	Number	3	na	na						O		LL-TWN
DKK	Leatherback turtle *Dermochelys coriacea*	Number	4	na	na						O		LL-TWN
TTH	Hawksbill turtle *Eretmochelys imbricata*	Number	na	na	na								

Deep-freezing Longline Fisheries: Oman.

Table 37. Oman deep-freezing longline fleets: Levels of bycatch fishing mortality estimated and main data sources used

The section *Scenarios* contains the estimates used for this study (*Base Case*) and upper (Upper Bound) and lower (*Lower Bound*) estimates, the latter two only when the use of alternative estimates of bycatch was available (*na*: catch not available/unknown; 0: nil catch).

Catches for most shark species are recorded in metric tons while the catches of whale shark, marine mammals and marine turtles are in number.

Key to *Data Sources* (**O** when used): IOTC Nominal Catch Table (**NC**); IOTC Effort (**EF**); CPC National Report (**NR**); IOTC Regional Observer Scheme (**OB**); Biological data (**BD**); Data from other Fleet used as Proxy (**PX**); Data from various scientific publications (**PB**).

NºREF Proxy: Key to the data (e.g. Proxy fleet used) and literature used to carry out the estimates. For numbers see the **Reference** for details.

Group Code	Species (*latin name*) / [Group]	Record in	Scenarios			Data Sources							NºREF Proxy
			Base Case	Lower Bound	Upper Bound	NC	EF	NR	BD	OB	PX	PB	
SKH	Total sharks *Elasmobranchia*	Weight	90.1	46.0	na								
BSH	Blue shark *Prionace glauca*	Weight	44.4	22.7	na						O		LL-TWN
MAK	Mako sharks *Isurus spp.*	Weight	10.0	5.1	na						O		LL-TWN
POR	Porbeagle shark *Lamna nasus*	Weight	na	na	na								
SPN	Hammerhead sharks *Sphyrna spp.*	Weight	0.3	0.1	na						O		LL-TWN
THR	Thresher sharks *Alopias spp.*	Weight	7.1	3.6	na						O		LL-TWN
FAL	Silky shark *Carcharhinus falciformis*	Weight	12.1	6.2	na						O		LL-TWN
OCS	Oceanic whitetip shark *Carcharhinus longimanus*	Weight	1.0	0.5	na						O		LL-TWN
PSK	Crocodile shark *Pseudocarcharias kamoharai*	Weight	na	na	na								
	Other sharks SKH and Sharks nei	Weight	15.3	7.8	na						O		LL-TWN
RHN	Whale shark *Rhincodon typus*	Number	na	na	na								
MAN	Mantas and devil rays *Mobulidae*	Weight	na	na	na								
PLS	Pelagic stingray *Pteroplatytrygon violacea*	Weight	na	na	na								
ODN	Small marine mammals *Odontoceti*	Number	na	na	na								
MYS	Whales *Mysticetti*	Number	na	na	na								
TTX	Marine turtles *Testudines*	Number	5	na	na						O		LL-TWN
LKV	Olive ridley turtle *Lepidochelys olivacea*	Number	4	na	na						O		LL-TWN
TUG	Green turtle *Chelonia mydas*	Number	na	na	na						O		LL-TWN
TTL	Loggerhead turtle *Caretta caretta*	Number	na	na	na						O		LL-TWN
DKK	Leatherback turtle *Dermochelys coriacea*	Number	1	na	na						O		LL-TWN
TTH	Hawksbill turtle *Eretmochelys imbricata*	Number	na	na	na								

Deep-freezing Longline Fisheries: Seychelles.

Table 38. Seychelles deep-freezing longline fleets: Levels of bycatch fishing mortality estimated and main data sources used

The section *Scenarios* contains the estimates used for this study (*Base Case*) and upper (Upper Bound) and lower (*Lower Bound*) estimates, the latter two only when the use of alternative estimates of bycatch was available (*na*: catch not available/unknown; 0: nil catch).

Catches for most shark species are recorded in metric tons while the catches of whale shark, marine mammals and marine turtles are in number.

Key to *Data Sources* (**O** when used): IOTC Nominal Catch Table (**NC**); IOTC Effort (**EF**); CPC National Report (**NR**); IOTC Regional Observer Scheme (**OB**); Biological data (**BD**); Data from other Fleet used as Proxy (**PX**); Data from various scientific publications (**PB**).

NºREF Proxy: Key to the data (e.g. Proxy fleet used) and literature used to carry out the estimates. For numbers see the **Reference** for details.

Group Code	Species (*latin name*) / [Group]	Record in	Scenarios			Data Sources							NºREF Proxy
			Base Case	Lower Bound	Upper Bound	NC	EF	NR	BD	OB	PX	PB	
SKH	Total sharks *Elasmobranchia*	Weight	3717.0	1898.1	na								
BSH	Blue shark *Prionace glauca*	Weight	1830.3	934.7	na						O		LL-TWN
MAK	Mako sharks *Isurus spp.*	Weight	414.4	211.6	na						O		LL-TWN
POR	Porbeagle shark *Lamna nasus*	Weight	na	na	na								
SPN	Hammerhead sharks *Sphyrna spp.*	Weight	10.6	5.4	na						O		LL-TWN
THR	Thresher sharks *Alopias spp.*	Weight	291.9	149.0	na						O		LL-TWN
FAL	Silky shark *Carcharhinus falciformis*	Weight	500.1	255.4	na						O		LL-TWN
OCS	Oceanic whitetip shark *Carcharhinus longimanus*	Weight	40.7	20.8	na						O		LL-TWN
PSK	Crocodile shark *Pseudocarcharias kamoharai*	Weight	na	na	na								
	Other sharks SKH and Sharks nei	Weight	629.1	321.2	na						O		LL-TWN
RHN	Whale shark *Rhincodon typus*	Number	na	na	na								
MAN	Mantas and devil rays *Mobulidae*	Weight	na	na	na								
PLS	Pelagic stingray *Pteroplatytrygon violacea*	Weight	na	na	na								
ODN	Small marine mammals *Odontoceti*	Number	na	na	na								
MYS	Whales *Mysticetti*	Number	na	na	na								
TTX	Marine turtles *Testudines*	Number	158	na	na						O		LL-TWN
LKV	Olive ridley turtle *Lepidochelys olivacea*	Number	108	na	na						O		LL-TWN
TUG	Green turtle *Chelonia mydas*	Number	5	na	na						O		LL-TWN
TTL	Loggerhead turtle *Caretta caretta*	Number	11	na	na						O		LL-TWN
DKK	Leatherback turtle *Dermochelys coriacea*	Number	18	na	na						O		LL-TWN
TTH	Hawksbill turtle *Eretmochelys imbricata*	Number	na	na	na								

Deep-freezing Longline Fisheries: Taiwan.

Table 39. Taiwan deep-freezing longline fleets: Levels of bycatch fishing mortality estimated and main data sources used

The section *Scenarios* contains the estimates used for this study (*Base Case*) and upper (Upper Bound) and lower (*Lower Bound*) estimates, the latter two only when the use of alternative estimates of bycatch was available (*na*: catch not available/unknown; 0: nil catch).

Catches for most shark species are recorded in metric tons while the catches of whale shark, marine mammals and marine turtles are in number.

Key to *Data Sources* (**O** when used): IOTC Nominal Catch Table (**NC**); IOTC Effort (**EF**); CPC National Report (**NR**); IOTC Regional Observer Scheme (**OB**); Biological data (**BD**); Data from other Fleet used as Proxy (**PX**); Data from various scientific publications (**PB**).

NºREF Proxy: Key to the data (e.g. Proxy fleet used) and literature used to carry out the estimates. For numbers see the **Reference** for details.

Group Code	Species (*latin name*) / [Group]	Record in	Scenarios			Data Sources							NºREF Proxy
			Base Case	Lower Bound	Upper Bound	NC	EF	NR	BD	OB	PX	PB	
SKH	Total sharks *Elasmobranchia*	Weight	13624.5	6957.5	na	O						O	2,3
BSH	Blue shark *Prionace glauca*	Weight	6708.8	3426.0	na				O			O	1
MAK	Mako sharks *Isurus spp.*	Weight	1518.9	775.7	na				O			O	1
POR	Porbeagle shark *Lamna nasus*	Weight	na	na	na								
SPN	Hammerhead sharks *Sphyrna spp.*	Weight	38.7	19.8	na				O			O	1
THR	Thresher sharks *Alopias spp.*	Weight	1069.8	546.3	na				O			O	1
FAL	Silky shark *Carcharhinus falciformis*	Weight	1833.2	936.2	na				O			O	1
OCS	Oceanic whitetip shark *Carcharhinus longimanus*	Weight	149.2	76.2	na				O			O	1
PSK	Crocodile shark *Pseudocarcharias kamoharai*	Weight	na	na	na								
	Other sharks SKH and Sharks nei	Weight	2305.8	1177.5	na				O			O	1
RHN	Whale shark *Rhincodon typus*	Number	na	na	na								
MAN	Mantas and devil rays *Mobulidae*	Weight	na	na	na								
PLS	Pelagic stingray *Pteroplatytrygon violacea*	Weight	na	na	na								
ODN	Small marine mammals *Odontoceti*	Number	na	na	na								
MYS	Whales *Mysticetti*	Number	na	na	na								
TTX	Marine turtles *Testudines*	Number	474	na	na	O						O	1
LKV	Olive ridley turtle *Lepidochelys olivacea*	Number	325	na	na	O						O	1
TUG	Green turtle *Chelonia mydas*	Number	15	na	na	O						O	1
TTL	Loggerhead turtle *Caretta caretta*	Number	33	na	na	O						O	1
DKK	Leatherback turtle *Dermochelys coriacea*	Number	55	na	na	O						O	1
TTH	Hawksbill turtle *Eretmochelys imbricata*	Number	na	na	na								

Deep-freezing Longline Fisheries: Tanzania.

Table 40. Tanzania deep-freezing longline fleets: Levels of bycatch fishing mortality estimated and main data sources used

The section *Scenarios* contains the estimates used for this study (*Base Case*) and upper (Upper Bound) and lower (*Lower Bound*) estimates, the latter two only when the use of alternative estimates of bycatch was available (*na*: catch not available/unknown; 0: nil catch).

Catches for most shark species are recorded in metric tons while the catches of whale shark, marine mammals and marine turtles are in number.

Key to *Data Sources* (**O** when used): IOTC Nominal Catch Table (**NC**); IOTC Effort (**EF**); CPC National Report (**NR**); IOTC Regional Observer Scheme (**OB**); Biological data (**BD**); Data from other Fleet used as Proxy (**PX**); Data from various scientific publications (**PB**).

NºREF Proxy: Key to the data (e.g. Proxy fleet used) and literature used to carry out the estimates. For numbers see the **Reference** for details.

Group Code	Species (*latin name*) / [Group]	Record in	Scenarios			Data Sources							NºREF Proxy
			Base Case	Lower Bound	Upper Bound	NC	EF	NR	BD	OB	PX	PB	
SKH	Total sharks *Elasmobranchia*	Weight	150.8	77.0	na								
BSH	Blue shark *Prionace glauca*	Weight	74.3	37.9	na						O		LL-TWN
MAK	Mako sharks *Isurus spp.*	Weight	16.8	8.6	na						O		LL-TWN
POR	Porbeagle shark *Lamna nasus*	Weight	na	na	na								
SPN	Hammerhead sharks *Sphyrna spp.*	Weight	0.4	0.2	na						O		LL-TWN
THR	Thresher sharks *Alopias spp.*	Weight	11.8	6.1	na						O		LL-TWN
FAL	Silky shark *Carcharhinus falciformis*	Weight	20.3	10.4	na						O		LL-TWN
OCS	Oceanic whitetip shark *Carcharhinus longimanus*	Weight	1.7	0.8	na						O		LL-TWN
PSK	Crocodile shark *Pseudocarcharias kamoharai*	Weight	na	na	na								
	Other sharks SKH and Sharks nei	Weight	25.5	13.0	na						O		LL-TWN
RHN	Whale shark *Rhincodon typus*	Number	na	na	na								
MAN	Mantas and devil rays *Mobulidae*	Weight	na	na	na								
PLS	Pelagic stingray *Pteroplatytrygon violacea*	Weight	na	na	na								
ODN	Small marine mammals *Odontoceti*	Number	na	na	na								
MYS	Whales *Mysticetti*	Number	na	na	na								
TTX	Marine turtles *Testudines*	Number	5	na	na						O		LL-TWN
LKV	Olive ridley turtle *Lepidochelys olivacea*	Number	3	na	na						O		LL-TWN
TUG	Green turtle *Chelonia mydas*	Number	0	na	na						O		LL-TWN
TTL	Loggerhead turtle *Caretta caretta*	Number	1	na	na						O		LL-TWN
DKK	Leatherback turtle *Dermochelys coriacea*	Number	0	na	na						O		LL-TWN
TTH	Hawksbill turtle *Eretmochelys imbricata*	Number	na	na	na								

Deep-freezing Longline Fisheries: Thailand.

Table 41. Thailand deep-freezing longline fleets: Levels of bycatch fishing mortality estimated and main data sources used

The section *Scenarios* contains the estimates used for this study (*Base Case*) and upper (Upper Bound) and lower (*Lower Bound*) estimates, the latter two only when the use of alternative estimates of bycatch was available (*na*: catch not available/unknown; 0: nil catch).

Catches for most shark species are recorded in metric tons while the catches of whale shark, marine mammals and marine turtles are in number.

Key to *Data Sources* (**O** when used): IOTC Nominal Catch Table (**NC**); IOTC Effort (**EF**); CPC National Report (**NR**); IOTC Regional Observer Scheme (**OB**); Biological data (**BD**); Data from other Fleet used as Proxy (**PX**); Data from various scientific publications (**PB**).

NºREF Proxy: Key to the data (e.g. Proxy fleet used) and literature used to carry out the estimates. For numbers see the **Reference** for details.

Group Code	Species (*latin name*) / [Group]	Record in	Scenarios			Data Sources							NºREF Proxy
			Base Case	Lower Bound	Upper Bound	NC	EF	NR	BD	OB	PX	PB	
SKH	Total sharks *Elasmobranchia*	Weight	202.4	103.3	na								
BSH	Blue shark *Prionace glauca*	Weight	173.5	88.6	na						O		LL-JAP
MAK	Mako sharks *Isurus spp.*	Weight	10.3	5.3	na						O		LL-JAP
POR	Porbeagle shark *Lamna nasus*	Weight	3.9	2.0	na						O		LL-JAP
SPN	Hammerhead sharks *Sphyrna spp.*	Weight	0.3	0.2	na						O		LL-JAP
THR	Thresher sharks *Alopias spp.*	Weight	6.5	3.3	na						O		LL-JAP
FAL	Silky shark *Carcharhinus falciformis*	Weight	1.7	0.8	na						O		LL-JAP
OCS	Oceanic whitetip shark *Carcharhinus longimanus*	Weight	0.3	0.2	na						O		LL-JAP
PSK	Crocodile shark *Pseudocarcharias kamoharai*	Weight	5.1	2.6	na						O		LL-JAP
	Other sharks SKH and Sharks nei	Weight	0.01	0.01	na						O		LL-JAP
RHN	Whale shark *Rhincodon typus*	Number	na	na	na								
MAN	Mantas and devil rays *Mobulidae*	Weight	na	na	na								
PLS	Pelagic stingray *Pteroplatytrygon violacea*	Weight	0.7	0.4	na						O		LL-JAP
ODN	Small marine mammals *Odontoceti*	Number	na	na	na								
MYS	Whales *Mysticetti*	Number	na	na	na								
TTX	Marine turtles *Testudines*	Number	2	na	na								
LKV	Olive ridley turtle *Lepidochelys olivacea*	Number	1	na	na								
TUG	Green turtle *Chelonia mydas*	Number	na	na	na						O		LL-JAP
TTL	Loggerhead turtle *Caretta caretta*	Number	0	na	na						O		LL-JAP
DKK	Leatherback turtle *Dermochelys coriacea*	Number	0	na	na						O		LL-JAP
TTH	Hawksbill turtle *Eretmochelys imbricata*	Number	na	na	na								

Fresh Tuna Longline Fisheries: China.

Table 42. China fresh tuna longline fleets: Levels of bycatch fishing mortality estimated and main data sources used

The section *Scenarios* contains the estimates used for this study (*Base Case*) and upper (Upper Bound) and lower (*Lower Bound*) estimates, the latter two only when the use of alternative estimates of bycatch was available (*na*: catch not available/unknown; 0: nil catch).

Catches for most shark species are recorded in metric tons while the catches of whale shark, marine mammals and marine turtles are in number.

Key to *Data Sources* (**O** when used): IOTC Nominal Catch Table (**NC**); IOTC Effort (**EF**); CPC National Report (**NR**); IOTC Regional Observer Scheme (**OB**); Biological data (**BD**); Data from other Fleet used as Proxy (**PX**); Data from various scientific publications (**PB**).

NºREF Proxy: Key to the data (e.g. Proxy fleet used) and literature used to carry out the estimates. For numbers see the **Reference** for details.

Group Code	Species (*latin name*) / [Group]	Record in	Scenarios			Data Sources							NºREF Proxy
			Base Case	Lower Bound	Upper Bound	NC	EF	NR	BD	OB	PX	PB	
SKH	Total sharks *Elasmobranchia*	Weight	644.6	329.2	na	O						O	2,3
BSH	Blue shark *Prionace glauca*	Weight	480.2	245.2	na					O		O	1
MAK	Mako sharks *Isurus spp.*	Weight	42.4	21.7	na					O		O	1
POR	Porbeagle shark *Lamna nasus*	Weight	na	na	na								
SPN	Hammerhead sharks *Sphyrna spp.*	Weight	8.9	4.6	na					O		O	1
THR	Thresher sharks *Alopias spp.*	Weight	12.7	6.5	na					O		O	1
FAL	Silky shark *Carcharhinus falciformis*	Weight	6.0	3.1	na					O		O	1
OCS	Oceanic whitetip shark *Carcharhinus longimanus*	Weight	9.9	5.0	na					O		O	1
PSK	Crocodile shark *Pseudocarcharias kamoharai*	Weight	1.0	0.5	na					O		O	1
	Other sharks SKH and Sharks nei	Weight	2.2	1.1	na					O		O	1
RHN	Whale shark *Rhincodon typus*	Number	na	na	na								
MAN	Mantas and devil rays *Mobulidae*	Weight	na	na	na								
PLS	Pelagic stingray *Pteroplatytrygon violacea*	Weight	81.4	41.6	na					O		O	1
ODN	Small marine mammals *Odontoceti*	Number	5	0	na			O				O	1,4
MYS	Whales *Mysticetti*	Number	na	na	na								
TTX	Marine turtles *Testudines*	Number	34	10	na								
LKV	Olive ridley turtle *Lepidochelys olivacea*	Number	14	5	na			O				O	1,4
TUG	Green turtle *Chelonia mydas*	Number	7	0	na			O					4
TTL	Loggerhead turtle *Caretta caretta*	Number	na	na	na								
DKK	Leatherback turtle *Dermochelys coriacea*	Number	14	5	na			O				O	1,4
TTH	Hawksbill turtle *Eretmochelys imbricata*	Number	na	na	na								

Fresh Tuna Longline Fisheries: India.

Table 43. India fresh tuna longline fleets: Levels of bycatch fishing mortality estimated and main data sources used

The section *Scenarios* contains the estimates used for this study (*Base Case*) and upper (Upper Bound) and lower (*Lower Bound*) estimates, the latter two only when the use of alternative estimates of bycatch was available (*na*: catch not available/unknown; 0: nil catch).

Catches for most shark species are recorded in metric tons while the catches of whale shark, marine mammals and marine turtles are in number.

Key to *Data Sources* (**O** when used): IOTC Nominal Catch Table (**NC**); IOTC Effort (**EF**); CPC National Report (**NR**); IOTC Regional Observer Scheme (**OB**); Biological data (**BD**); Data from other Fleet used as Proxy (**PX**); Data from various scientific publications (**PB**).

NºREF Proxy: Key to the data (e.g. Proxy fleet used) and literature used to carry out the estimates. For numbers see the **Reference** for details.

Group Code	Species (*latin name*) / [Group]	Record in	Scenarios			Data Sources							NºREF Proxy
			Base Case	Lower Bound	Upper Bound	NC	EF	NR	BD	OB	PX	PB	
SKH	Total sharks *Elasmobranchia*	Weight	815.5	416.4	na	O						O	1,5
BSH	Blue shark *Prionace glauca*	Weight	na	na	na								
MAK	Mako sharks *Isurus spp.*	Weight	6.3	3.2	na							O	4
POR	Porbeagle shark *Lamna nasus*	Weight	na	na	na								
SPN	Hammerhead sharks *Sphyrna spp.*	Weight	20.5	10.5	na							O	4
THR	Thresher sharks *Alopias spp.*	Weight	502.3	256.5	na							O	4
FAL	Silky shark *Carcharhinus falciformis*	Weight	9.4	4.8	na							O	4
OCS	Oceanic whitetip shark *Carcharhinus longimanus*	Weight	1.2	0.6	na							O	4
PSK	Crocodile shark *Pseudocarcharias kamoharai*	Weight	na	na	na								
	Other sharks SKH and Sharks nei	Weight	248.4	126.9	na							O	4
RHN	Whale shark *Rhincodon typus*	Number	na	na	na								
MAN	Mantas and devil rays *Mobulidae*	Weight	2.9	1.5	na							O	4
PLS	Pelagic stingray *Pteroplatytrygon violacea*	Weight	24.4	12.5	na							O	4
ODN	Small marine mammals *Odontoceti*	Number	na	na	na								
MYS	Whales *Mysticetti*	Number	na	na	na								
TTX	Marine turtles *Testudines*	Number	237	197	na	O						O	3,4
LKV	Olive ridley turtle *Lepidochelys olivacea*	Number	215	179	na							O	2,3
TUG	Green turtle *Chelonia mydas*	Number	15	14	na							O	2,3
TTL	Loggerhead turtle *Caretta caretta*	Number	na	na	na								
DKK	Leatherback turtle *Dermochelys coriacea*	Number	na	na	na								
TTH	Hawksbill turtle *Eretmochelys imbricata*	Number	0	5	na							O	2,3

Fresh Tuna Longline Fisheries: Indonesia.

Table 44. Indonesia fresh tuna longline fleets: Levels of bycatch fishing mortality estimated and main data sources used

The section *Scenarios* contains the estimates used for this study (*Base Case*) and upper (Upper Bound) and lower (*Lower Bound*) estimates, the latter two only when the use of alternative estimates of bycatch was available (*na*: catch not available/unknown; 0: nil catch).

Catches for most shark species are recorded in metric tons while the catches of whale shark, marine mammals and marine turtles are in number.

Key to *Data Sources* (**O** when used): IOTC Nominal Catch Table (**NC**); IOTC Effort (**EF**); CPC National Report (**NR**); IOTC Regional Observer Scheme (**OB**); Biological data (**BD**); Data from other Fleet used as Proxy (**PX**); Data from various scientific publications (**PB**).

NºREF Proxy: Key to the data (e.g. Proxy fleet used) and literature used to carry out the estimates. For numbers see the **Reference** for details.

Group Code	Species (*latin name*) / [Group]	Record in	Scenarios			Data Sources							NºREF Proxy
			Base Case	Lower Bound	Upper Bound	NC	EF	NR	BD	OB	PX	PB	
SKH	Total sharks *Elasmobranchia*	Weight	14526.5	7418.2	na	O						O	2,5
BSH	Blue shark *Prionace glauca*	Weight	9164.7	4680.1	na					O		O	1
MAK	Mako sharks *Isurus spp.*	Weight	800.2	408.6	na					O		O	1
POR	Porbeagle shark *Lamna nasus*	Weight	na	na	na								
SPN	Hammerhead sharks *Sphyrna spp.*	Weight	369.5	188.7	na					O		O	1
THR	Thresher sharks *Alopias spp.*	Weight	716.4	365.9	na					O		O	1
FAL	Silky shark *Carcharhinus falciformis*	Weight	304.3	155.4	na					O		O	1
OCS	Oceanic whitetip shark *Carcharhinus longimanus*	Weight	264.8	135.2	na					O		O	1
PSK	Crocodile shark *Pseudocarcharias kamoharai*	Weight	986.0	503.5	na					O		O	1
	Other sharks SKH and Sharks nei	Weight	604.0	308.4	na					O		O	1
RHN	Whale shark *Rhincodon typus*	Number	na	na	na								
MAN	Mantas and devil rays *Mobulidae*	Weight	na	na	na								
PLS	Pelagic stingray *Pteroplatytrygon violacea*	Weight	1316.7	672.4	na					O		O	1
ODN	Small marine mammals *Odontoceti*	Number	63	na	na		O					O	6
MYS	Whales *Mysticetti*	Number	39	na	na		O					O	6
TTX	Marine turtles *Testudines*	Number	694	na	na								
LKV	Olive ridley turtle *Lepidochelys olivacea*	Number	548	na	na		O					O	3,4
TUG	Green turtle *Chelonia mydas*	Number	na	na	na								
TTL	Loggerhead turtle *Caretta caretta*	Number	na	na	na								
DKK	Leatherback turtle *Dermochelys coriacea*	Number	146	na	na		O					O	3,4
TTH	Hawksbill turtle *Eretmochelys imbricata*	Number	na	na	na								

Fresh Tuna Longline Fisheries: Malaysia.

Table 45. Malaysia fresh tuna longline fleets: Levels of bycatch fishing mortality estimated and main data sources used

The section *Scenarios* contains the estimates used for this study (*Base Case*) and upper (Upper Bound) and lower (*Lower Bound*) estimates, the latter two only when the use of alternative estimates of bycatch was available (*na*: catch not available/unknown; 0: nil catch).

Catches for most shark species are recorded in metric tons while the catches of whale shark, marine mammals and marine turtles are in number.

Key to *Data Sources* (**O** when used): IOTC Nominal Catch Table (**NC**); IOTC Effort (**EF**); CPC National Report (**NR**); IOTC Regional Observer Scheme (**OB**); Biological data (**BD**); Data from other Fleet used as Proxy (**PX**); Data from various scientific publications (**PB**).

NºREF Proxy: Key to the data (e.g. Proxy fleet used) and literature used to carry out the estimates. For numbers see the **Reference** for details.

Group Code	Species (*latin name*) / [Group]	Record in	Scenarios			Data Sources							NºREF Proxy
			Base Case	Lower Bound	Upper Bound	NC	EF	NR	BD	OB	PX	PB	
SKH	Total sharks *Elasmobranchia*	Weight	422.7	215.9	na								
BSH	Blue shark *Prionace glauca*	Weight	208.1	106.3	na						O		FLL-TWN
MAK	Mako sharks *Isurus spp.*	Weight	47.1	24.1	na						O		FLL-TWN
POR	Porbeagle shark *Lamna nasus*	Weight	na	na	na								
SPN	Hammerhead sharks *Sphyrna spp.*	Weight	1.2	0.6	na						O		FLL-TWN
THR	Thresher sharks *Alopias spp.*	Weight	33.2	17.0	na						O		FLL-TWN
FAL	Silky shark *Carcharhinus falciformis*	Weight	56.9	29.0	na						O		FLL-TWN
OCS	Oceanic whitetip shark *Carcharhinus longimanus*	Weight	4.6	2.4	na						O		FLL-TWN
PSK	Crocodile shark *Pseudocarcharias kamoharai*	Weight	na	na	na								
	Other sharks SKH and Sharks nei	Weight	71.5	36.5	na						O		FLL-TWN
RHN	Whale shark *Rhincodon typus*	Number	na	na	na								
MAN	Mantas and devil rays *Mobulidae*	Weight	na	na	na								
PLS	Pelagic stingray *Pteroplatytrygon violacea*	Weight	na	na	na								
ODN	Small marine mammals *Odontoceti*	Number	na	na	na								
MYS	Whales *Mysticetti*	Number	na	na	na								
TTX	Marine turtles *Testudines*	Number	22	na	na						O		FLL-TWN
LKV	Olive ridley turtle *Lepidochelys olivacea*	Number	15	na	na						O		FLL-TWN
TUG	Green turtle *Chelonia mydas*	Number	1	na	na						O		FLL-TWN
TTL	Loggerhead turtle *Caretta caretta*	Number	2	na	na						O		FLL-TWN
DKK	Leatherback turtle *Dermochelys coriacea*	Number	3	na	na						O		FLL-TWN
TTH	Hawksbill turtle *Eretmochelys imbricata*	Number	na	na	na								

Fresh Tuna Longline Fisheries: NEI.

Table 46. NEI fresh tuna longline fleets: Levels of bycatch fishing mortality estimated and main data sources used

The section *Scenarios* contains the estimates used for this study (*Base Case*) and upper (Upper Bound) and lower (*Lower Bound*) estimates, the latter two only when the use of alternative estimates of bycatch was available (*na*: catch not available/unknown; 0: nil catch).

Catches for most shark species are recorded in metric tons while the catches of whale shark, marine mammals and marine turtles are in number.

Key to *Data Sources* (**O** when used): IOTC Nominal Catch Table (**NC**); IOTC Effort (**EF**); CPC National Report (**NR**); IOTC Regional Observer Scheme (**OB**); Biological data (**BD**); Data from other Fleet used as Proxy (**PX**); Data from various scientific publications (**PB**).

NºREF Proxy: Key to the data (e.g. Proxy fleet used) and literature used to carry out the estimates. For numbers see the **Reference** for details.

Group Code	Species (*latin name*) / [Group]	Record in	Scenarios			Data Sources							NºREF Proxy
			Base Case	Lower Bound	Upper Bound	NC	EF	NR	BD	OB	PX	PB	
SKH	Total sharks *Elasmobranchia*	Weight	1740.3	888.7	na								
BSH	Blue shark *Prionace glauca*	Weight	857.0	437.6	na						O		FLL-TWN
MAK	Mako sharks *Isurus spp.*	Weight	194.0	99.1	na						O		FLL-TWN
POR	Porbeagle shark *Lamna nasus*	Weight	na	na	na								
SPN	Hammerhead sharks *Sphyrna spp.*	Weight	5.0	2.5	na						O		FLL-TWN
THR	Thresher sharks *Alopias spp.*	Weight	136.7	69.8	na						O		FLL-TWN
FAL	Silky shark *Carcharhinus falciformis*	Weight	234.2	119.6	na						O		FLL-TWN
OCS	Oceanic whitetip shark *Carcharhinus longimanus*	Weight	19.1	9.7	na						O		FLL-TWN
PSK	Crocodile shark *Pseudocarcharias kamoharai*	Weight	na	na	na								
	Other sharks SKH and Sharks nei	Weight	294.5	150.4	na						O		FLL-TWN
RHN	Whale shark *Rhincodon typus*	Number	na	na	na								
MAN	Mantas and devil rays *Mobulidae*	Weight	na	na	na								
PLS	Pelagic stingray *Pteroplatytrygon violacea*	Weight	na	na	na								
ODN	Small marine mammals *Odontoceti*	Number	na	na	na								
MYS	Whales *Mysticetti*	Number	na	na	na								
TTX	Marine turtles *Testudines*	Number	85	na	na						O		FLL-TWN
LKV	Olive ridley turtle *Lepidochelys olivacea*	Number	59	na	na						O		FLL-TWN
TUG	Green turtle *Chelonia mydas*	Number	3	na	na						O		FLL-TWN
TTL	Loggerhead turtle *Caretta caretta*	Number	6	na	na						O		FLL-TWN
DKK	Leatherback turtle *Dermochelys coriacea*	Number	10	na	na						O		FLL-TWN
TTH	Hawksbill turtle *Eretmochelys imbricata*	Number	na	na	na								

Fresh Tuna Longline Fisheries: Sri Lanka.

Table 47. Sri Lanka fresh tuna longline fleets: Levels of bycatch fishing mortality estimated and main data sources used

The section *Scenarios* contains the estimates used for this study (*Base Case*) and upper (Upper Bound) and lower (*Lower Bound*) estimates, the latter two only when the use of alternative estimates of bycatch was available (*na*: catch not available/unknown; 0: nil catch).

Catches for most shark species are recorded in metric tons while the catches of whale shark, marine mammals and marine turtles are in number.

Key to *Data Sources* (**O** when used): IOTC Nominal Catch Table (**NC**); IOTC Effort (**EF**); CPC National Report (**NR**); IOTC Regional Observer Scheme (**OB**); Biological data (**BD**); Data from other Fleet used as Proxy (**PX**); Data from various scientific publications (**PB**).

NºREF Proxy: Key to the data (e.g. Proxy fleet used) and literature used to carry out the estimates. For numbers see the **Reference** for details.

Group Code	Species (*latin name*) / [Group]	Record in	Scenarios			Data Sources							NºREF Proxy
			Base Case	Lower Bound	Upper Bound	NC	EF	NR	BD	OB	PX	PB	
SKH	Total sharks *Elasmobranchia*	Weight	2975.5	1519.5	na	O						O	2,5
BSH	Blue shark *Prionace glauca*	Weight	267.8	136.8	na							O	1
MAK	Mako sharks *Isurus spp.*	Weight	89.3	45.6	na							O	1
POR	Porbeagle shark *Lamna nasus*	Weight	na	na	na								
SPN	Hammerhead sharks *Sphyrna spp.*	Weight	119.0	60.8	na							O	1
THR	Thresher sharks *Alopias spp.*	Weight	714.1	364.7	na							O	1
FAL	Silky shark *Carcharhinus falciformis*	Weight	1100.9	562.2	na							O	1
OCS	Oceanic whitetip shark *Carcharhinus longimanus*	Weight	148.8	76.0	na							O	1
PSK	Crocodile shark *Pseudocarcharias kamoharai*	Weight	na	na	na								
	Other sharks SKH and Sharks nei	Weight	535.6	273.5	na							O	1
RHN	Whale shark *Rhincodon typus*	Number	na	na	na								
MAN	Mantas and devil rays *Mobulidae*	Weight	na	na	na								
PLS	Pelagic stingray *Pteroplatytrygon violacea*	Weight	na	na	na								
ODN	Small marine mammals *Odontoceti*	Number	na	na	na								
MYS	Whales *Mysticetti*	Number	na	na	na								
TTX	Marine turtles *Testudines*	Number	3507	na	na		O					O	3,4
LKV	Olive ridley turtle *Lepidochelys olivacea*	Number	3280	na	na		O					O	3,4
TUG	Green turtle *Chelonia mydas*	Number	226	na	na		O					O	3,4
TTL	Loggerhead turtle *Caretta caretta*	Number	na	na	na								
DKK	Leatherback turtle *Dermochelys coriacea*	Number	na	na	na								
TTH	Hawksbill turtle *Eretmochelys imbricata*	Number	na	na	na								

Fresh Tuna Longline Fisheries: Taiwan.

Table 48. Taiwan fresh tuna longline fleets: Levels of bycatch fishing mortality estimated and main data sources used

The section *Scenarios* contains the estimates used for this study (*Base Case*) and upper (Upper Bound) and lower (*Lower Bound*) estimates, the latter two only when the use of alternative estimates of bycatch was available (*na*: catch not available/unknown; 0: nil catch).

Catches for most shark species are recorded in metric tons while the catches of whale shark, marine mammals and marine turtles are in number.

Key to *Data Sources* (**O** when used): IOTC Nominal Catch Table (**NC**); IOTC Effort (**EF**); CPC National Report (**NR**); IOTC Regional Observer Scheme (**OB**); Biological data (**BD**); Data from other Fleet used as Proxy (**PX**); Data from various scientific publications (**PB**).

NºREF Proxy: Key to the data (e.g. Proxy fleet used) and literature used to carry out the estimates. For numbers see the **Reference** for details.

Group Code	Species (*latin name*) / [Group]	Record in	Scenarios			Data Sources							NºREF Proxy
			Base Case	Lower Bound	Upper Bound	NC	EF	NR	BD	OB	PX	PB	
SKH	Total sharks *Elasmobranchia*	Weight	11734.7	5992.5	na	O						O	2,3
BSH	Blue shark *Prionace glauca*	Weight	5778.3	2950.8	na				O			O	1
MAK	Mako sharks *Isurus spp.*	Weight	1308.2	668.1	na				O			O	1
POR	Porbeagle shark *Lamna nasus*	Weight	na	na	na								
SPN	Hammerhead sharks *Sphyrna spp.*	Weight	33.4	17.0	na				O			O	1
THR	Thresher sharks *Alopias spp.*	Weight	921.4	470.5	na				O			O	1
FAL	Silky shark *Carcharhinus falciformis*	Weight	1579.0	806.3	na				O			O	1
OCS	Oceanic whitetip shark *Carcharhinus longimanus*	Weight	128.5	65.6	na				O			O	1
PSK	Crocodile shark *Pseudocarcharias kamoharai*	Weight	na	na	na								
	Other sharks SKH and Sharks nei	Weight	1986.0	1014.2	na				O			O	1
RHN	Whale shark *Rhincodon typus*	Number	na	na	na								
MAN	Mantas and devil rays *Mobulidae*	Weight	na	na	na								
PLS	Pelagic stingray *Pteroplatytrygon violacea*	Weight	na	na	na								
ODN	Small marine mammals *Odontoceti*	Number	na	na	na								
MYS	Whales *Mysticetti*	Number	na	na	na								
TTX	Marine turtles *Testudines*	Number	523	na	na	O						O	1
LKV	Olive ridley turtle *Lepidochelys olivacea*	Number	359	na	na	O						O	1
TUG	Green turtle *Chelonia mydas*	Number	16	na	na	O						O	1
TTL	Loggerhead turtle *Caretta caretta*	Number	36	na	na	O						O	1
DKK	Leatherback turtle *Dermochelys coriacea*	Number	61	na	na	O						O	1
TTH	Hawksbill turtle *Eretmochelys imbricata*	Number	na	na	na								

Coastal Longline Fisheries: Reunion (France).

Table 49. Reunion (France) coastal longline fleets: Levels of bycatch fishing mortality estimated and main data sources used

The section *Scenarios* contains the estimates used for this study (*Base Case*) and upper (Upper Bound) and lower (*Lower Bound*) estimates, the latter two only when the use of alternative estimates of bycatch was available (*na*: catch not available/unknown; 0: nil catch).

Catches for most shark species are recorded in metric tons while the catches of whale shark, marine mammals and marine turtles are in number.

Key to *Data Sources* (**O** when used): IOTC Nominal Catch Table (**NC**); IOTC Effort (**EF**); CPC National Report (**NR**); IOTC Regional Observer Scheme (**OB**); Biological data (**BD**); Data from other Fleet used as Proxy (**PX**); Data from various scientific publications (**PB**).

NºREF Proxy: Key to the data (e.g. Proxy fleet used) and literature used to carry out the estimates. For numbers see the **Reference** for details.

Group Code	Species (*latin name*) / [Group]	Record in	Scenarios			Data Sources							NºREF Proxy
			Base Case	Lower Bound	Upper Bound	NC	EF	NR	BD	OB	PX	PB	
SKH	Total sharks *Elasmobranchia*	Weight	98.4	50.2	na	O						O	1,5
BSH	Blue shark *Prionace glauca*	Weight	50.6	25.8	na						O		ELL-FRA.REU
MAK	Mako sharks *Isurus spp.*	Weight	11.2	5.7	na						O		ELL-FRA.REU
POR	Porbeagle shark *Lamna nasus*	Weight	na	na	na								
SPN	Hammerhead sharks *Sphyrna spp.*	Weight	16.1	8.2	na						O		ELL-FRA.REU
THR	Thresher sharks *Alopias spp.*	Weight	1.2	0.6	na						O		ELL-FRA.REU
FAL	Silky shark *Carcharhinus falciformis*	Weight	2.7	1.4	na						O		ELL-FRA.REU
OCS	Oceanic whitetip shark *Carcharhinus longimanus*	Weight	7.2	3.7	na						O		ELL-FRA.REU
PSK	Crocodile shark *Pseudocarcharias kamoharai*	Weight	0.07	0.04	na						O		ELL-FRA.REU
	Other sharks SKH and Sharks nei	Weight	3.8	1.9	na						O		ELL-FRA.REU
RHN	Whale shark *Rhincodon typus*	Number	na	na	na								
MAN	Mantas and devil rays *Mobulidae*	Weight	na	na	na								
PLS	Pelagic stingray *Pteroplatytrygon violacea*	Weight	5.5	2.8	na						O		ELL-FRA.REU
ODN	Small marine mammals *Odontoceti*	Number	na	na	na								
MYS	Whales *Mysticetti*	Number	na	na	na								
TTX	Marine turtles *Testudines*	Number	12	na	na						O		LLCO-IDN
LKV	Olive ridley turtle *Lepidochelys olivacea*	Number	2	na	na			O					1,2,3
TUG	Green turtle *Chelonia mydas*	Number	4	na	na			O					1,2,3
TTL	Loggerhead turtle *Caretta caretta*	Number	1	na	na			O					1,2,3
DKK	Leatherback turtle *Dermochelys coriacea*	Number	1	na	na			O					1,2,3
TTH	Hawksbill turtle *Eretmochelys imbricata*	Number	2	na	na			O					1,2,3

Coastal Longline Fisheries: Indonesia.

Table 50. Indonesia coastal longline fleets: Levels of bycatch fishing mortality estimated and main data sources used

The section *Scenarios* contains the estimates used for this study (*Base Case*) and upper (Upper Bound) and lower (*Lower Bound*) estimates, the latter two only when the use of alternative estimates of bycatch was available (*na*: catch not available/unknown; 0: nil catch).

Catches for most shark species are recorded in metric tons while the catches of whale shark, marine mammals and marine turtles are in number.

Key to *Data Sources* (**O** when used): IOTC Nominal Catch Table (**NC**); IOTC Effort (**EF**); CPC National Report (**NR**); IOTC Regional Observer Scheme (**OB**); Biological data (**BD**); Data from other Fleet used as Proxy (**PX**); Data from various scientific publications (**PB**).

NºREF Proxy: Key to the data (e.g. Proxy fleet used) and literature used to carry out the estimates. For numbers see the **Reference** for details.

Group Code	Species (*latin name*) / [Group]	Record in	Scenarios			Data Sources							NºREF Proxy
			Base Case	Lower Bound	Upper Bound	NC	EF	NR	BD	OB	PX	PB	
SKH	Total sharks *Elasmobranchia*	Weight	18895.1	9649.0	na	O						O	2,5
BSH	Blue shark *Prionace glauca*	Weight	11920.8	6087.5	na					O		O	1
MAK	Mako sharks *Isurus spp.*	Weight	1040.8	531.5	na					O		O	1
POR	Porbeagle shark *Lamna nasus*	Weight	na	na	na								
SPN	Hammerhead sharks *Sphyrna spp.*	Weight	480.6	245.4	na					O		O	1
THR	Thresher sharks *Alopias spp.*	Weight	931.9	475.9	na					O		O	1
FAL	Silky shark *Carcharhinus falciformis*	Weight	395.9	202.2	na					O		O	1
OCS	Oceanic whitetip shark *Carcharhinus longimanus*	Weight	344.4	175.9	na					O		O	1
PSK	Crocodile shark *Pseudocarcharias kamoharai*	Weight	1282.5	655.0	na					O		O	1
	Other sharks SKH and Sharks nei	Weight	785.6	401.2	na					O		O	1
RHN	Whale shark *Rhincodon typus*	Number	na	na	na								
MAN	Mantas and devil rays *Mobulidae*	Weight	na	na	na								
PLS	Pelagic stingray *Pteroplatytrygon violacea*	Weight	1712.6	874.6	na					O		O	1
ODN	Small marine mammals *Odontoceti*	Number	82	na	na		O					O	6
MYS	Whales *Mysticetti*	Number	50	na	na		O					O	6
TTX	Marine turtles *Testudines*	Number	900	na	na								
LKV	Olive ridley turtle *Lepidochelys olivacea*	Number	711	na	na		O					O	3,4
TUG	Green turtle *Chelonia mydas*	Number	na	na	na								
TTL	Loggerhead turtle *Caretta caretta*	Number	190	na	na								
DKK	Leatherback turtle *Dermochelys coriacea*	Number	na	na	na		O					O	3,4
TTH	Hawksbill turtle *Eretmochelys imbricata*	Number	na	na	na								

Coastal Longline Fisheries: Maldives.

Table 51. Maldives coastal longline fleets: Levels of bycatch fishing mortality estimated and main data sources used

The section *Scenarios* contains the estimates used for this study (*Base Case*) and upper (Upper Bound) and lower (*Lower Bound*) estimates, the latter two only when the use of alternative estimates of bycatch was available (*na*: catch not available/unknown; 0: nil catch).

Catches for most shark species are recorded in metric tons while the catches of whale shark, marine mammals and marine turtles are in number.

Key to *Data Sources* (**O** when used): IOTC Nominal Catch Table (**NC**); IOTC Effort (**EF**); CPC National Report (**NR**); IOTC Regional Observer Scheme (**OB**); Biological data (**BD**); Data from other Fleet used as Proxy (**PX**); Data from various scientific publications (**PB**).

NºREF Proxy: Key to the data (e.g. Proxy fleet used) and literature used to carry out the estimates. For numbers see the **Reference** for details.

Group Code	Species (*latin name*) / [Group]	Record in	Scenarios			Data Sources							NºREF Proxy
			Base Case	Lower Bound	Upper Bound	NC	EF	NR	BD	OB	PX	PB	
SKH	Total sharks *Elasmobranchia*	Weight	322.8	164.9	na	O						O	3,5
BSH	Blue shark *Prionace glauca*	Weight	14.5	7.4	na							O	2
MAK	Mako sharks *Isurus spp.*	Weight	13.8	7.1	na							O	2
POR	Porbeagle shark *Lamna nasus*	Weight	na	na	na								
SPN	Hammerhead sharks *Sphyrna spp.*	Weight	4.4	2.3	na							O	2
THR	Thresher sharks *Alopias spp.*	Weight	3.2	1.6	na							O	2
FAL	Silky shark *Carcharhinus falciformis*	Weight	257.8	131.6	na							O	2
OCS	Oceanic whitetip shark *Carcharhinus longimanus*	Weight	13.3	6.8	na							O	2
PSK	Crocodile shark *Pseudocarcharias kamoharai*	Weight	na	na	na								
	Other sharks SKH and Sharks nei	Weight	15.9	8.1	na							O	2
RHN	Whale shark *Rhincodon typus*	Number	na	na	na								
MAN	Mantas and devil rays *Mobulidae*	Weight	na	na	na								
PLS	Pelagic stingray *Pteroplatytrygon violacea*	Weight	na	na	na								
ODN	Small marine mammals *Odontoceti*	Number	na	na	na								
MYS	Whales *Mysticetti*	Number	na	na	na								
TTX	Marine turtles *Testudines*	Number	31	na	na	O		O				O	1,4
LKV	Olive ridley turtle *Lepidochelys olivacea*	Number	na	na	na								
TUG	Green turtle *Chelonia mydas*	Number	na	na	na								
TTL	Loggerhead turtle *Caretta caretta*	Number	na	na	na								
DKK	Leatherback turtle *Dermochelys coriacea*	Number	na	na	na								
TTH	Hawksbill turtle *Eretmochelys imbricata*	Number	na	na	na								

Coastal Longline Fisheries: Sri Lanka.

Table 52. Sri Lanka coastal longline fleets: Levels of bycatch fishing mortality estimated and main data sources used

The section *Scenarios* contains the estimates used for this study (*Base Case*) and upper (Upper Bound) and lower (*Lower Bound*) estimates, the latter two only when the use of alternative estimates of bycatch was available (*na*: catch not available/unknown; 0: nil catch).

Catches for most shark species are recorded in metric tons while the catches of whale shark, marine mammals and marine turtles are in number.

Key to *Data Sources* (**O** when used): IOTC Nominal Catch Table (**NC**); IOTC Effort (**EF**); CPC National Report (**NR**); IOTC Regional Observer Scheme (**OB**); Biological data (**BD**); Data from other Fleet used as Proxy (**PX**); Data from various scientific publications (**PB**).

NºREF Proxy: Key to the data (e.g. Proxy fleet used) and literature used to carry out the estimates. For numbers see the **Reference** for details.

Group Code	Species (*latin name*) / [Group]	Record in	Scenarios			Data Sources							NºREF Proxy
			Base Case	Lower Bound	Upper Bound	NC	EF	NR	BD	OB	PX	PB	
SKH	Total sharks *Elasmobranchia*	Weight	7401.8	3779.8	na	O						O	2,5
BSH	Blue shark *Prionace glauca*	Weight	666.2	340.2	na							O	1
MAK	Mako sharks *Isurus spp.*	Weight	222.1	113.4	na							O	1
POR	Porbeagle shark *Lamna nasus*	Weight	na	na	na								
SPN	Hammerhead sharks *Sphyrna spp.*	Weight	296.1	151.2	na							O	1
THR	Thresher sharks *Alopias spp.*	Weight	1776.4	907.2	na							O	1
FAL	Silky shark *Carcharhinus falciformis*	Weight	2738.7	1398.5	na							O	1
OCS	Oceanic whitetip shark *Carcharhinus longimanus*	Weight	370.1	189.0	na							O	1
PSK	Crocodile shark *Pseudocarcharias kamoharai*	Weight	na	na	na								
	Other sharks SKH and Sharks nei	Weight	1332.3	680.4	na							O	1
RHN	Whale shark *Rhincodon typus*	Number	na	na	na								
MAN	Mantas and devil rays *Mobulidae*	Weight	na	na	na								
PLS	Pelagic stingray *Pteroplatytrygon violacea*	Weight	na	na	na								
ODN	Small marine mammals *Odontoceti*	Number	na	na	na								
MYS	Whales *Mysticetti*	Number	na	na	na								
TTX	Marine turtles *Testudines*	Number	7805	na	na		O					O	3,4
LKV	Olive ridley turtle *Lepidochelys olivacea*	Number	7302	na	na		O					O	3,4
TUG	Green turtle *Chelonia mydas*	Number	504	na	na		O					O	3,4
TTL	Loggerhead turtle *Caretta caretta*	Number	na	na	na								
DKK	Leatherback turtle *Dermochelys coriacea*	Number	na	na	na								
TTH	Hawksbill turtle *Eretmochelys imbricata*	Number	na	na	na								

Exploratory Longline Fisheries: India.

Table 53. India exploratory longline fleets: Levels of bycatch fishing mortality estimated and main data sources used

The section *Scenarios* contains the estimates used for this study (*Base Case*) and upper (Upper Bound) and lower (*Lower Bound*) estimates, the latter two only when the use of alternative estimates of bycatch was available (*na*: catch not available/unknown; 0: nil catch).

Catches for most shark species are recorded in metric tons while the catches of whale shark, marine mammals and marine turtles are in number.

Key to *Data Sources* (**O** when used): IOTC Nominal Catch Table (**NC**); IOTC Effort (**EF**); CPC National Report (**NR**); IOTC Regional Observer Scheme (**OB**); Biological data (**BD**); Data from other Fleet used as Proxy (**PX**); Data from various scientific publications (**PB**).

NºREF Proxy: Key to the data (e.g. Proxy fleet used) and literature used to carry out the estimates. For numbers see the **Reference** for details.

Group Code	Species (*latin name*) / [Group]	Record in	Scenarios			Data Sources							NºREF Proxy
			Base Case	Lower Bound	Upper Bound	NC	EF	NR	BD	OB	PX	PB	
SKH	Total sharks *Elasmobranchia*	Weight	4.7	2.4	na	O						O	1,5
BSH	Blue shark *Prionace glauca*	Weight	na	na	na								
MAK	Mako sharks *Isurus spp.*	Weight	0.04	0.02	na							O	4
POR	Porbeagle shark *Lamna nasus*	Weight	na	na	na								
SPN	Hammerhead sharks *Sphyrna spp.*	Weight	0.12	0.06	na							O	4
THR	Thresher sharks *Alopias spp.*	Weight	2.9	1.5	na							O	4
FAL	Silky shark *Carcharhinus falciformis*	Weight	0.05	0.03	na							O	4
OCS	Oceanic whitetip shark *Carcharhinus longimanus*	Weight	0.01	0.00	na							O	4
PSK	Crocodile shark *Pseudocarcharias kamoharai*	Weight	na	na	na								
	Other sharks SKH and Sharks nei	Weight	1.4	0.7	na							O	4
RHN	Whale shark *Rhincodon typus*	Number	na	na	na								
MAN	Mantas and devil rays *Mobulidae*	Weight	0.02	0.01	na							O	4
PLS	Pelagic stingray *Pteroplatytrygon violacea*	Weight	0.14	0.07	na							O	4
ODN	Small marine mammals *Odontoceti*	Number	na	na	na								
MYS	Whales *Mysticetti*	Number	na	na	na								
TTX	Marine turtles *Testudines*	Number	11	9	na		O					O	3,4
LKV	Olive ridley turtle *Lepidochelys olivacea*	Number	10	8	na							O	2,3
TUG	Green turtle *Chelonia mydas*	Number	1	1	na							O	2,3
TTL	Loggerhead turtle *Caretta caretta*	Number	na	na	na								
DKK	Leatherback turtle *Dermochelys coriacea*	Number	na	na	na								
TTH	Hawksbill turtle *Eretmochelys imbricata*	Number	0	0	na							O	2,3

Trolling-Longline Fisheries: India.

Table 54. India trolling-longline fleets: Levels of bycatch fishing mortality estimated and main data sources used

The section *Scenarios* contains the estimates used for this study (*Base Case*) and upper (Upper Bound) and lower (*Lower Bound*) estimates, the latter two only when the use of alternative estimates of bycatch was available (*na*: catch not available/unknown; 0: nil catch).

Catches for most shark species are recorded in metric tons while the catches of whale shark, marine mammals and marine turtles are in number.

Key to *Data Sources* (**O** when used): IOTC Nominal Catch Table (**NC**); IOTC Effort (**EF**); CPC National Report (**NR**); IOTC Regional Observer Scheme (**OB**); Biological data (**BD**); Data from other Fleet used as Proxy (**PX**); Data from various scientific publications (**PB**).

NºREF Proxy: Key to the data (e.g. Proxy fleet used) and literature used to carry out the estimates. For numbers see the **Reference** for details.

Group Code	Species (*latin name*) / [Group]	Record in	Scenarios			Data Sources							NºREF Proxy
			Base Case	Lower Bound	Upper Bound	NC	EF	NR	BD	OB	PX	PB	
SKH	Total sharks *Elasmobranchia*	Weight	7159.3	3656.0	na	O						O	1,5
BSH	Blue shark *Prionace glauca*	Weight	na	na	na								
MAK	Mako sharks *Isurus spp.*	Weight	55.3	28.2	na							O	4
POR	Porbeagle shark *Lamna nasus*	Weight	na	na	na								
SPN	Hammerhead sharks *Sphyrna spp.*	Weight	179.7	91.7	na							O	4
THR	Thresher sharks *Alopias spp.*	Weight	4410.2	2252.1	na							O	4
FAL	Silky shark *Carcharhinus falciformis*	Weight	82.8	42.3	na							O	4
OCS	Oceanic whitetip shark *Carcharhinus longimanus*	Weight	10.7	5.5	na							O	4
PSK	Crocodile shark *Pseudocarcharias kamoharai*	Weight	na	na	na								
	Other sharks SKH and Sharks nei	Weight	2180.9	1113.7	na							O	4
RHN	Whale shark *Rhincodon typus*	Number	na	na	na								
MAN	Mantas and devil rays *Mobulidae*	Weight	25.5	13.0	na							O	4
PLS	Pelagic stingray *Pteroplatytrygon violacea*	Weight	214.2	109.4	na							O	4
ODN	Small marine mammals *Odontoceti*	Number	na	na	na								
MYS	Whales *Mysticetti*	Number	na	na	na								
TTX	Marine turtles *Testudines*	Number	1043	869	na		O					O	3,4
LKV	Olive ridley turtle *Lepidochelys olivacea*	Number	947	789	na							O	2,3
TUG	Green turtle *Chelonia mydas*	Number	65	60	na							O	2,3
TTL	Loggerhead turtle *Caretta caretta*	Number	na	na	na								
DKK	Leatherback turtle *Dermochelys coriacea*	Number	na	na	na								
TTH	Hawksbill turtle *Eretmochelys imbricata*	Number	2	20	na							O	2,3