IOTC–2017–WPDCS13–07

REPORT ON IOTC DATA COLLECTION AND STATISTICS

PREPARED BY: IOTC SECRETARIAT[1]

Purpose

To provide the IOTC Working Party on Data Collection and Statistics with an overview of the status of data holdings in the IOTC Secretariat, in particular statistics of catch, effort, size frequency and other biological data for IOTC species, sharks, and other species that are caught incidentally by fisheries directed at IOTC species.

Background

Prior to each IOTC Working Party (WP) meeting the IOTC Secretariat prepares a number of tables, figures and datasets that highlight historical and emerging trends in the fisheries data held by the IOTC Secretariat. This information is used during WP to inform discussions around stock status and in developing advice to the Scientific Committee.

This document presents the status of data in the IOTC databases, including: the status of reporting and availability of datasets related to catches up to 2016, as per the requirements set in IOTC Resolution 15/02 and other IOTC measures calling for IOTC CPCs to report data on their IOTC fisheries; an overview of the status of IOTC statistics over the time series; other datasets available at the Secretariat.

The report covers the following areas:

1. OVERVIEW

This document summarises the standing of a range of information received in accordance with IOTC resolutions and recommendations from its technical groups.

Table 1 presents an overview of the main IOTC datasets that need to be reported, while Table 2 provides a summary of the IOTC data related Resolutions and year in which each came into force. Appendix I includes more details on the Resolutions referred to below.

[1]Fabio Fiorellato (ff@iotc.org); James Geehan (James.Geehan@iotc.org); Lucia Pierre (lucia.pierre@iotc.org)

Table 1. Summary of IOTC Data Requirements applicable to species managed by the IOTC.

	Coastal fleets: EEZ vessels less than 24 m LOA	Industrial surface and longline fleets: Vessels with LOA ≥ 24 m and all high seas vessels		
Annual catches (Nominal catch + Discards)	Nominal catches (weight) by IOTC species, main species of pelagic sharks, other bycatch, per IOTC area, gear, species and year			
	Discard levels of IOTC species, sharks, seabirds, marine turtles, cetaceans per IOTC area, gear, species and year (in number and weight)			
Active fishing craft statistics	Number of fishing craft per boat-gear type category, per year	Individual vessel data for all fishing ships catching IOTC species		
Catch-and-effort (CE)	CE data by fishery (type of boat gear), area and period	Surface fisheries: CE by fishery, 1° grid and month	FADs anchored and drifting: CE by 1° grid and month (PS-BB)	Supply vessels: Effort 1° grid and month
Size data	Individual lengths of IOTC species sampled by fishery, species, 5° area and month			
Scientific observer data	Samples of catches landed to cover at least 5% of vessel activities	Sample of catches at-sea to cover at least 5% of fishing operations		
Socio-economic data	No standards have been set as yet			
Foreign fleets EEZ catch	No applicable	CE data for foreign licensed fishing vessels (as per the CE standards above)		

Table 2. Timeline of implementation of IOTC Resolutions as an indication of the year since which they are in force. For more details refer to **Appendix I**.

Res.	Description	Fisheries applies to:	Species applies to:	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
15/02	Min. data reporting requirements: Nominal catch	All fisheries	IOTC species																					
			Main sharks																					
	Min. data reporting requirements: Catch-and-effort	All fisheries	IOTC species																					
			Main sharks																					
	Min. data reporting requirements: Size data	All fisheries	IOTC species																					
			Main sharks																					
	FADs and Supply vessels requirements	Purse seine	N/A																					
15/01	Minimum data requirements: Logbooks	Purse seine	IOTC species and main sharks																					
		Longline																						
		Pole-and-line; gillnet																						
		Handline; trolling																						
15/08	FAD logbook reporting requirements	Purse seine, pole-and-line	As 15/02																					
11/04	Regional Observer Scheme	Coastal fleets	As 10/02																					
		Industrial fleets >=24m LOA	All species																					
		Industrial fleets <24m LOA	All species																					
05/05	Data requirements: Sharks	As per 15/02	Main sharks																					
13/06	Data requirements: Oceanic whitetip shark	Authorised vessels	Oceanic whitetip																					
12/09	Data requirements: Thresher shark		Thresher sharks																					
13/05	Data requirements: Whale shark		Whale shark																					
12/06	Data requirements: Seabirds		Seabirds																					
12/04	Data requirements: Marine turtles		Marine turtles																					
13/04	Data requirements: Cetaceans		Ceteceans																					

Major data categories covered by the report

Nominal catches which are highly aggregated statistics for each species estimated per fleet, gear and year for a large area. If these data are not reported the Secretariat estimates a total catch from a range of sources (including: partial catch and effort data; data in the FAO FishStat database; catches estimated by the IOTC from data collected through port sampling; data published through web pages or other means; and data reported by other parties on the activity of vessels, data collected through sampling at the landing place or at sea by scientific observers, or on imports of bigeye tuna from vessels under the flag concerned.

Catch-and-effort data which refer to the fine-scale data – usually from logbooks, and reported per fleet, year, gear, type of school, month, grid (1^{o} grid areas for surface fisheries, 5^{o} grid areas for longline fisheries, and the most convenient resolution for coastal fisheries) and species. Information on the use of fish aggregating devices (FADs) and supply vessels is also collected. The standards of reporting to the IOTC are defined in IOTC Resolution 15/02. IOTC Resolution 15/01 *on the recording of catch and effort data by fishing vessels in the IOTC area of competence* sets the minimal data requirement that IOTC CPCs shall implement for fleets using their flag or licensed to operate within their EEZs.

Length frequency data: individual body lengths of IOTC species per fleet, year, gear, type of school, month and 5^{o} grid areas, as defined in IOTC Resolution 15/02.

Biological data: data used to derive length-weight, non-standard weights-live weight, non-standard measurements-standard lengths, sex-ratios, maturity, or any other data required for the assessments of IOTC and shark species, as defined in IOTC Resolution 15/02.

Observer data: summaries of the data collected by observers on fishing vessels of IOTC CPCs implementing the Regional Observer Scheme (trip reports), as defined in IOTC Resolution 11/04**.**

Tag release and recovery data: information on the release and recovery of tunas with tags, as collected from the Regional Tuna Tagging Project-Indian Ocean (RTTP-IO), or other small-scale Projects implemented in the Indian Ocean.

2. TIMELINESS AND AVAILABILITY OF IOTC CATCH STATISTICS FOR YEAR 2015

Timeliness and completeness of data

Late reporting of data compromises the validation and verification of data by the IOTC Secretariat, as well as the data available for stock assessments prior to Working Parties, especially when data are submitted close to, or during Working Party meetings.

In 2017, 20 fishing parties either fully reported or partially reported IOTC statistics (i.e., nominal catch, catch-and-effort and size data) by the data submission deadline of June 30 (25 in 2016, and 22 in 2015). Requests were sent to over fifty countries[2] in March-April 2017, and in most cases second and third requests were also issued. Five CPCs have not reported statistics to the IOTC at all for a period longer than four years (Sierra Leone; Yemen; Eritrea; Sudan; Guinea).

Figure 1 shows the proportion of nominal catch, catch-and-effort, and size data, by species group, reported by the deadline and before the WPDCS meeting towards the end of each year[3], for 2011-2016. The following key points may be noted:

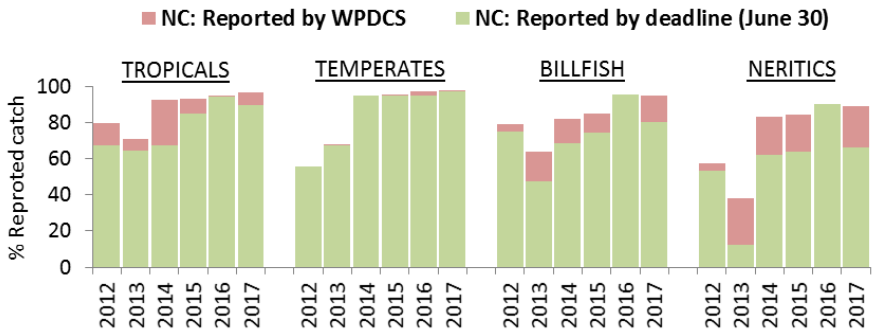
- Reporting coverage is highest for nominal catch, followed by catch-and-effort, while size data reporting levels are well below the levels reported by the other two datasets.

[2] Note that specific requests were sent to EU countries having vessels known to operate in the IOTC Area (France, Italy, Portugal, Spain and the UK).

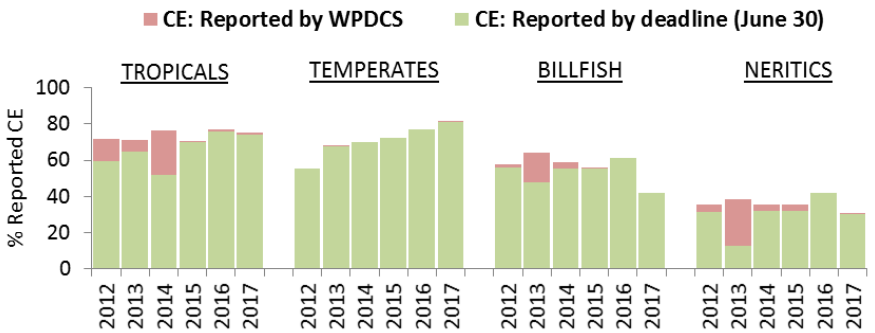
[3] Note that the IOTC Secretariat uses alternative sources to estimate the catches of non-reporting fleets; the percentages in this section represent the proportion that the NC, CE or SF reported before the deadline or the WPDCS compared to the total estimated by the Secretariat.

- Within each of the datasets (nominal catch, catch-and-effort, size data) levels of timeliness and reporting coverage vary substantially between species groups, e.g.,
  i. catch-and-effort and size data are particularly poorly reported for neritic species (i.e., between 20% to 55%, compared to around 70% for tropical tunas) – mostly as the majority of neritic catches are accounted for by coastal artisanal fleets.
  ii. similarly the proportion of size data available for billfish species is also very low (≈20% to 30%), compared to tropical and temperate tunas.
- In recent years there have been improvements in the timeliness of reporting. However in the last year (i.e., data year 2016) for reporting by the deadline in 2017, 81% of nominal catch were fully or partially reported, compared to 90% in 2016 (mostly the result of late reporting by India).
- However improvements in the *timeliness* of data reported by CPCs to the IOTC Secretariat have not been accompanied by comparable increases in the *quality* of the information submitted, and remains a major challenge for stock assessments which in some cases remain highly uncertain.

Nominal catches



Catch-and-effort



Size frequency

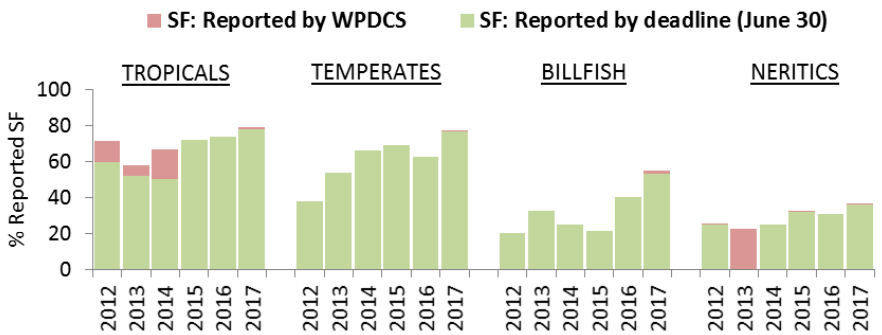


Fig.1 Timeliness of data: availability of data by the deadline for data submission (30 June) and at the time of the Working Party on Data Collection and Statistics Meeting each year, 2011-2016. Years refer to the year of reporting.

Definitions: NC: Proportion of total catch available; **CE**: Proportion of total catch for which catch-and-effort are reported; **SF**: Proportion of total catch for which size frequency data are reported.

Availability of IOTC datasets for year 2016

Tables 3i-3v list the fleets for which the Secretariat received or estimated catches for the year 2016 for the main species groups, and data sets (nominal catch, catch-and-effort and size frequency data). Fleets are listed according to the size of their most recent catches. Timeliness of reporting and data sources are also shown.

The availability of statistics on fishing crafts operating for each fleet is also presented in a separate table (3vi). Brief comments on bycatch, discards and Fishing craft statistics and active vessels are made at the end of this section.

Table 3: Availability of IOTC datasets for the year 2016[4]

Gear	Industrial purse seine (**PS**), industrial longline (**LL**) and artisanal gears (**ART**)		**NC**	Nominal Catch	Fully available
Catch	Recent catches amounting to (thousands of tonnes)		**CE**	Catch and Effort	Partially available
			SF	Size Frequency	Not available
TI	Timeliness	Good (before 1st July) Fair (within July) Poor (after 1st August)	**SO**	Data Source	Statistics fully available from flag country Statistics partially available from flag country Statistics available from sources other than flag country

Table 3i. – Tropical tunas (YFT, BET, SKJ)

Gear	Fleet	Availability of statistics					TI	SO	Comments
		Catch	Sps	NC	CE	SF			
PS	European Union	204.1	SY						
	SEYCHELLES	108.1	SY						
	KOREA REP.	24.6	SY						
	MAURITIUS	11.7	YS						SF only reported for YFT; Less than 1 fish per MT
	IRAN ISLAMIC REP.	4.8	YS						CE and SF not reported by IOTC standard
	JAPAN	3.0	YS						
LL	CHINA	5.9	BY						Less than 1 fish per metric ton measured
	TAIWAN,CHINA	32.4	YB						Less than 1 fish per metric ton measured on fresh-tuna longliners
	INDONESIA	24.8	YB						SF - From Port sampling; not reported by IOTC standard
	SEYCHELLES	8.7	BY						Less than 1 fish per metric ton measured
	JAPAN	7.0	BY						Less than 1 fish per metric ton measured for some species
	SRI LANKA	4.9	BY						SF for the deepfreezing longline
	NEI.FROZEN	1.8	Y						
	KOREA REP.	1.6	BY						Less than 1 fish per metric ton measured for some species
	European Union	1.5	YB						EU-ESP reported CE only for SWO; SF: Less than 1fish per MT measured; no SF for EU-MYT
	MALDIVES	0.6	BY						Less than 1 fish per metric ton measured; SF aggregated for all longline fleets
	NEI.FRESH	0.6	BY						
	MALAYSIA	0.3	YB						
	TANZANIA	0.2	YB						
	SOUTH AFRICA	0.2	BY						SF reported for foreign vessels only
	OMAN	0.2	Y						Downloaded data, species aggregated
	AUSTRALIA	0.1	Y						
	MADAGASCAR	0.1	BY						
	MAURITIUS	0.1	YB						SF not reported for vessels greater than 24m
	MOZAMBIQUE	0.0	YB						
	INDIA	0.0	YB						NC/CE not reported for all longline fleets
	BELIZE	0.0	Y						No activity in Indian Ocean in 2016
	PHILIPPINES	0.0							No activity in Indian Ocean in 2016
	THAILAND	0.0							No activity in Indian Ocean in 2016
	VANUATU								No activity in Indian Ocean in 2016
Other fleets	MALDIVES	125.1	SY						
	INDONESIA	111.4	SY						
	IRAN ISLAMIC REP.	82.5	YS						CE not by IOTC standard; Less than 1 fish per metric ton measured
	SRI LANKA	80.3	SY						Missing datasets fo artisanal fisheries;
	INDIA	31.5	YS						
	YEMEN	24.4	Y						
	OMAN	21.1	Y						Downloaded data, missing gear information
	PAKISTAN	13.0	YS						SF not by IOTC standard
	COMOROS	12.1	YS						
	TANZANIA	4.3	Y						
	MADAGASCAR	1.5	SY						
	European Union	0.7	Y						SF only reported for EU-Reunion
	MOZAMBIQUE	0.2	Y						CE effort reported as sets; SF not reported for all fisheries
	KENYA	0.2	Y						
	MALAYSIA	0.1	S						SF only reported for neritic species
	MAURITIUS	0.1	Y						
	JORDAN	0.1	SY						
	EAST TIMOR	0.0	Y						
	AUSTRALIA	0.0	Y						
	UK.TERRITORIES	0.0	Y						
	SEYCHELLES	0.0	Y						
	SOUTH AFRICA	0.0							
	Bangladesh	0.0							Catches aggregated by Species

Sps	Yellowfin tuna (**Y**), bigeye tuna (**B**) and skipjack tuna (**S**)
Gear	Industrial purse seine (PS), industrial longline (LL) or other gears (pole-and-line; small purse seines, large and small gillnets, and small lines)
1	Freezing longliners whose catches are not reported by the flag states concerned
2	Fresh-tuna longliners whose catches are not reported by the flag states concerned

[4] Note that Tables 4i-4v disregard blank reports, i.e. fishing parties that did not report statistics for a species group will not show in the corresponding table.

Table3ii. – Temperate tunas (ALB, SBF)

Gear	Fleet	Availability of statistics					TI	SO	Comments
		Catch	Sps	NC	CE	SF			
PS	AUSTRALIA	5.0	S						
	European Union	0.2	A						
	SEYCHELLES	0.1	A						SF not reported by IOTC grid
	MAURITIUS	0.1	A						
	KOREA REP.	0.0	A						
LL	CHINA	1.9	A						
	TAIWAN,CHINA	21.4	A						
	INDONESIA	5.6	A						
	JAPAN	4.0	AS						Size data from observer programme, less than 1 fish measured per MT
	MALAYSIA	1.3	A						
	NEI.FRESH	0.7	AS						
	KOREA REP.	0.4	A						Less than 1 fish measured per metric ton
	European Union	0.3	A						CE: EU-Spain only reported Swordfish; No data reported for EU Mayotte
	NEI.FROZEN	0.3	A						
	SEYCHELLES	0.2	A						Less than 1 fish measured per metric ton
	AUSTRALIA	0.2	A						
	MADAGASCAR	0.1	A						
	MAURITIUS	0.0	A						SF not reported for vessels greater than 24m
	TANZANIA	0.0	A						
	SOUTH AFRICA	0.0	AS						SF reported for foreign vessels only
	SRI LANKA	0.0	A						
	MALDIVES	0.0	A						
	MOZAMBIQUE	0.0	A						
	OMAN	0.0	A						Downloaded data, species aggregated
	INDIA								NC/CE not reported for all longline fleets
	BELIZE								No activity in Indian Ocean in 2016
	PHILIPPINES								No activity in Indian Ocean in 2016
	THAILAND								No activity in Indian Ocean in 2016
	VANUATU								No activity in Indian Ocean in 2016
OTH	INDONESIA	1.7	A						
	MAURITIUS	0.2	A						
	European Union	0.1	A						Less than 1 fish per metric ton measured
	SRI LANKA	0.0	A						Missing datasets fo artisanal fisheries;
	COMOROS	0.0	A						Less than 1 fish per metric ton measured for some fisheries
	MALDIVES	0.0							
	SOUTH AFRICA	0.0	A						
	AUSTRALIA	0.0	A						

Sps Southern bluefin tuna (**S**) and albacore (**A**)
Gear Industrial purse seine (PS), industrial longline (LL) or other gears (OTH: pole-and-line; small purse seines, large and small gillnets, and small lines)
1 Freezing longliners whose catches are not reported by the flag states concerned
2 Fresh-tuna longliners whose catches are not reported by the flag states concerned

Table 3iii – Billfish (SWO, BLM, BUM, MLS, SFA, SSP, SWO)

Gear	Fleet	Availability of statistics					TI	SO	Comments
		Catch	Sps	NC	CE	SF			
PS	European Union	0.016	M						Bycatch of billfish species reported by 1 EU fleet
LL	INDONESIA	17.6	SM						SF - From Port sampling; not reported by IOTC standard
	CHINA	2.5	SM						Less than 1 fish per metric ton measured
	TAIWAN,CHINA	15.4	SM						Less than 1 fish per metric ton measured
	European Union	6.3	SM						EU-Spain: CE only for SWO; no SF data reported for EU-Mayotte
	SEYCHELLES	3.6	SM						Less than 1 fish per metric ton measured
	SRI LANKA	1.4	SM						SF only reported for tuna species
	JAPAN	1.0	SM						Less than 1 fish per metric ton measured; data from observers
	NEI.FROZEN	0.7	SM						
	NEI.FRESH	0.4	SM						
	KOREA REP.	0.3	MS						
	MALDIVES	0.2	MS						SF only reported for tuna species
	AUSTRALIA	0.1	SM						
	MAURITIUS	0.1	SM						SF not reported for vessels greater than 24m
	TANZANIA	0.1	SM						
	SOUTH AFRICA	0.1	S						SF only for foreign vessels
	MALAYSIA	0.1	MS						
	MOZAMBIQUE	0.1	SM						
	MADAGASCAR	0.1	S						
	INDIA	0.0	S						NC/CE not reported for all longline fleets
	OMAN	0.0	M						Downloaded data, species aggregated
	BELIZE	0.0							No activity in Indian Ocean in 2016
	PHILIPPINES	0.0							No activity in Indian Ocean in 2016
	THAILAND	0.0							No activity in Indian Ocean in 2016
	VANUATU								No activity in Indian Ocean in 2016
Other fleets	IRAN ISLAMIC REP.	14.8	F						CE not reported by IOTC standard
	INDIA	12.0	FM						
	SRI LANKA	9.6	MF						Missing datasets fo artisanal fisheries;
	PAKISTAN	8.0	F						
	INDONESIA	4.1	MF						
	TANZANIA	2.7	F						
	COMOROS	2.1	FM						Less than 1 fish per metric ton measured for some fisheries
	OMAN	1.8	F						Downloaded data, missing gear information
	MADAGASCAR	0.8	F						
	MALDIVES	0.5	M						
	European Union	0.3	S						SF only reported for EU-Reunion
	YEMEN	0.3	F						
	KENYA	0.2	F						
	UN. ARAB EMIRATES	0.1	F						
	MOZAMBIQUE	0.1	M						CE effort reported as sets; SF not reported for all fisheries
	SAUDI ARABIA	0.0	F						
	ERITREA	0.0	M						
	SEYCHELLES	0.0							
	UK TERRITORIES	0.0							

Sps Swordfish (**S**), blue marlin and/or black marlin and/or striped marlin (**M**), Indo-Pacific sailfish (**F**) and short-billed spearfish (**P**)
Gear Industrial purse seine (PS), industrial longline (LL) or other gears (pole-and-line; small purse seines, large and small gillnets, and small lines)
1 Freezing longliners whose catches are not reported by the flag states concerned
2 Fresh-tuna longliners whose catches are not reported by the flag states concerned

Table 3iv – Neritic tunas (BLT, FRI, LOT, KAW, COM, GUT)

Gear	Fleet	Availability of statistics					TI	SO	Comments
		Catch	Sps	NC	CE	SF			
PS	IRAN ISLAMIC REP.	0.1	L						CE and SF not reported by IOTC standard
	European Union	0.0	F						Statistics incomplete; refers mostly to discards
	THAILAND	0.0	K						Vessel not targeting tuna species
	SEYCHELLES	0.0	F						Statistics incomplete; refers mostly to discards
LL	CHINA	0.0							
	TAIWAN,CHINA	0.3	L						
	INDONESIA	0.1	L						
	NEI.FRESH	0.0							
	NEI.FROZEN	0.0							
	SRI LANKA	0.0	F						SF only reported for 1 species
Other fleets	INDONESIA	175.5	FC						
	IRAN ISLAMIC REP.	130.6	LK						CE not by IOTC standard; SF: less than 1 fish measured per mt
	INDIA	109.7	CK						
	PAKISTAN	38.2	LK						SF not by IOTC standard, large size class
	OMAN	28.2	L						Downloaded data, missing gear information
	UN. ARAB EMIRATES	19.6	C						
	MALAYSIA	18.1	KL						Less than 1 fish per metric tonne measured
	SRI LANKA	15.4	FK						Missing datasets fo artisanal fisheries;
	YEMEN	12.3	CK						
	THAILAND	11.9	KL						Less than 1 fish per metric tonne measured
	MYANMAR	11.2	CG						
	SAUDI ARABIA	8.2	C						
	MADAGASCAR	6.0	C						
	TANZANIA	3.4	C						
	MOZAMBIQUE	3.1	C						CE effort reported as sets; SF not reported for all fisheries
	QATAR	1.6	C						
	BANGLADESH	0.9	C						NC aggregated by species group
	COMOROS	0.5	X						
	EGYPT	0.4	CG						
	KENYA	0.4	X						
	AUSTRALIA	0.3	C						
	DJIBOUTI	0.2	X						
	MALDIVES	0.2	F						
	KUWAIT	0.1	CG						
	European Union	0.1	X						No data reported for EU-Mayotte
	ERITREA	0.1	X						
	JORDAN	0.1	K						
	BAHRAIN	0.1	C						
	SEYCHELLES	0.1	K						
	SUDAN	0.0	C						
	UK.TERRITORIES	0.0	X						
	MAURITIUS	0.0	X						

Sps Longtail tuna (**L**), frigate tuna and/or bullet tuna (**F**), kawakawa (**K**), narrow-barred Spanish mackerel (**C**), Indo-Pacific king mackerel (**G**), Seerfish(X)
Gear Industrial purse seine (PS), industrial longline (LL) or other gears (pole-and-line; small purse seines, large and small gillnets, and small lines)
1 Freezing longliners whose catches are not reported by the flag states concerned
2 Fresh-tuna longliners whose catches are not reported by the flag states concerned

Bycatch levels (Table 3v): Some CPCs (China, Sri Lanka, Maldives, Mozambique, Australia, Korea, South Africa, EU) provided partial estimates of bycatch levels for their fisheries for 2016, including bycatch levels for sharks, seabirds or marine turtles. In spite of the better reporting levels recorded for bycatch data in 2017, few statistics are still available for sharks, seabirds and sea turtles (and other non-IOTC species caught by fleets targeting tunas and/or tuna-like species); for this reason, the quality of the data available is still poor. The statistics are seldom available by species and refer usually to the shark carcasses that are retained on board, not including the amounts of sharks that are discarded.

Table 3v – Sharks seabirds and sea turtles*

Gear	Fleet	Species									Comments
		Sharks			ALV	OCS	RHN	Cetaceans	Sea Birds	Marine Turtles	
		NC	CE	SF							
PS	EUROPEAN UNION								n/a		Refers only to discards from FRA only
	SEYCHELLES								n/a		
	IRAN I R								n/a		
	AUSTRALIA								n/a		
	JAPAN								n/a		
	KOREA REP								n/a		NC refers only to discards
	THAILAND								n/a		
	MAURITIUS								n/a		NC refers only to discards
LL	CHINA										SF reported for one species only; ALV/OCS refers only to discards
	TAIWAN,CHINA										
	European Union										EU-ESP: CE only reported for SWO; SF not available for all fleet
	INDONESIA										ALV/OCS Fate of the sharks not specified (Turtle, seabird, cetacean, RHN from NR)
	SOUTH AFRICA										SF reported for foreign vessels only
	JAPAN										less than 1 fish per metric ton; ALV/OCS Fate of the sharks not specified
	NEI.FROZEN										
	SEYCHELLES										ALV/OCS Fate of the sharks not specified
	KOREA REP.										ALV/OCS refers to discards
	SRI LANKA										ALV/OCS refers to discards
	NEI.FRESH										
	MADAGASCAR										BSH refers to all shark species
	TANZANIA										
	INDIA										OCS refers to all shark species
	MALAYSIA										NC aggregate by species; Report discard of BSH only
	MAURITIUS										SF reported for one species only
	AUSTRALIA										(Turtle, seabird, cetacean, RHN from NR)
	MOZAMBIQUE										
	MALDIVES										Maldives banned catches of sharks in 2010; NC refers to discards;
	OMAN										NC Aggregated for all species
	BELIZE	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	No activity in Indian Ocean in 2016
	PHILIPPINES	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	No activity in Indian Ocean in 2016
	THAILAND	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	No activity in Indian Ocean in 2016
	VANUATU	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	No activity in Indian Ocean in 2016
Other Offshore & Coastal	INDONESIA				n/a	n/a	n/a	n/a	n/a	n/a	
	YEMEN AR RP				n/a	n/a	n/a	n/a	n/a	n/a	
	OMAN								n/a		NC not by species
	IRAN I R								n/a		CE not by IOTC standard
	MADAGASCAR				n/a	n/a	n/a	n/a	n/a	n/a	
	PAKISTAN								n/a	n/a	NC not by species
	SRI LANKA								n/a		
	BANGLADESH				n/a	n/a	n/a	n/a	n/a	n/a	NC not by species
	UN ARAB EMIRATES				n/a	n/a	n/a	n/a	n/a	n/a	
	TANZANIA				n/a	n/a	n/a	n/a	n/a	n/a	
	MALAYSIA				n/a	n/a	n/a	n/a	n/a	n/a	NC/CE not by species
	SAUDI ARABIA				n/a	n/a	n/a	n/a	n/a	n/a	
	ERITREA				n/a	n/a	n/a	n/a	n/a	n/a	
	KENYA				n/a	n/a	n/a	n/a	n/a	n/a	
	SUDAN				n/a	n/a	n/a	n/a	n/a	n/a	
	SEYCHELLES				n/a	n/a	n/a	n/a	n/a	n/a	NC/CE not by species
	EGYPT				n/a	n/a	n/a	n/a	n/a	n/a	
	COMOROS				n/a	n/a	n/a	n/a	n/a	n/a	Sharks species reported only as BSH/OCS
	FRANCE OT				n/a	n/a	n/a	n/a	n/a	n/a	
	MAURITIUS				n/a	n/a	n/a	n/a	n/a	n/a	
	EUROPEAN UNION				n/a	n/a	n/a	n/a	n/a	n/a	NC/CE/SF not available for Mayotte
	AUSTRALIA				n/a	n/a	n/a	n/a	n/a	n/a	
	ERITREA				n/a	n/a	n/a	n/a	n/a	n/a	
	JORDAN				n/a	n/a	n/a	n/a	n/a	n/a	
	MALDIVES								n/a		Maldives banned catches of sharks in 2010
	BAHRAIN				n/a	n/a	n/a	n/a	n/a	n/a	
	DJIBOUTI				n/a	n/a	n/a	n/a	n/a	n/a	
	SUDAN				n/a	n/a	n/a	n/a	n/a	n/a	
	KUWAIT				n/a	n/a	n/a	n/a	n/a	n/a	
	SOUTH AFRICA				n/a	n/a	n/a	n/a	n/a	n/a	
	EAST TIMOR				n/a	n/a	n/a	n/a	n/a	n/a	
	INDIA				n/a	n/a	n/a	n/a	n/a	n/a	OCS refers to all shark species
	MOZAMBIQUE				n/a	n/a	n/a	n/a	n/a	n/a	

Catches of seabirds are not likely to occur (**n/a**) or may occur (**?**)

1 Freezing longliners whose catches are not reported by the flag states concerned

2 Fresh-tuna longliners whose catches are not reported by the flag states concerned

- **Fishing craft statistics and active vessels (Table 3vi)**: The number of vessels fishing for IOTC species in the Indian Ocean is thought to be more accurate in recent years thanks to information collected after the implementation of IOTC Resolutions that call for countries to report yearly lists of domestic and foreign fishing vessels, information collected through the IOTC Transhipment Programme and market data provided by the International Seafood Sustainability Foundation (ISSF). Fishing craft statistics are generally available for industrial fleets whose catches are available. Craft statistics are not available, incomplete or inaccurate for many artisanal fleets.

Table 3vi – Fishing craft statistics and list of active vessel

Gear	Fleet	Availability				SO	Comments
		Catch	Craft	FC	AV		
[illegible]	European Union	204.4	28				
	SEYCHELLES	108.2	13				
	KOREA REP.	24.6	5				
	MAURITIUS	11.8	2				
	AUSTRALIA	5.0	7				
	IRAN ISLAMIC REP.	4.9	7				
	JAPAN	3.0	3				
	THAILAND	0.0	1				
	SUPPLY VESSELS-NEI		12				Reported by flag countries and/or third parties
LL	CHINA	10.6	67				
	TAIWAN,CHINA	97.3	344				
	INDONESIA	60.5	1,237				Reported incomplete active vessels
	SEYCHELLES	16.1	71				Including semi-industrial longline
	European Union	14.4	71				
	JAPAN	12.7	45				
	SRI LANKA	6.6	4				
	NEI.FROZEN	4.8	4				
	KOREA REP.	2.7	13				
	NEI.FRESH	2.0					Vessels
	MALAYSIA	1.8	10				
	SOUTH AFRICA	1.1	16				
	MALDIVES	0.9	9				
	TANZANIA	0.6	3				
	AUSTRALIA	0.4	7				
	MADAGASCAR	0.3	7				
	MAURITIUS	0.2	11				
	OMAN	0.2	1				
	MOZAMBIQUE	0.1	4				
	INDIA	0.0					
	BELIZE						No activity
	PHILIPPINES						No activity
	THAILAND						No activity
	VANUATU						No activity
	SENEGAL						No activity
	SIERRA LEONE						No information
	GUINEA						No information
Other Offshore & Coastal	INDONESIA	315.0			n/a		
	IRAN ISLAMIC REP.	250.3	7,006				
	INDIA	176.9	792		n/a		Not inclusive of small boats
	SRI LANKA	149.9	4,538				Number refers to high seas boats only
	MALDIVES	125.9	372				Number refers to high seas boats only
	PAKISTAN	66.2	709				
	OMAN	58.5			n/a		
	YEMEN	46.5			n/a		
	UN. ARAB EMIRATES	20.1			n/a		
	MALAYSIA	18.2	9,601		n/a		
	TANZANIA	16.8			n/a		
	COMOROS	15.3	4,916		n/a		Refers to last boat survey conducted in 2014
	MADAGASCAR	14.0			n/a		
	THAILAND	11.9	268		n/a		
	MYANMAR	11.2			n/a		
	SAUDI ARABIA	8.5			n/a		
	MOZAMBIQUE	4.9	26		n/a		Refers only to semi-industrial vessels
	QATAR	2.1			n/a		
	BANGLADESH	1.5			n/a		
	European Union	1.4	271		n/a		
	KENYA	1.1			n/a		
	EGYPT	0.4			n/a		
	DJIBOUTI	0.4			n/a		
	AUSTRALIA	0.3	53		n/a		
	ERITREA	0.3			n/a		
	MAURITIUS	0.3			n/a		
	JORDAN	0.2			n/a		
	KUWAIT	0.1			n/a		
	SUDAN	0.1			n/a		
	SEYCHELLES	0.1			n/a		
	BAHRAIN	0.1			n/a		
	SOUTH AFRICA	0.0	2		n/a		Refers to (sport) baitboat vessels only
	UK.TERRITORIES	0.0	47		n/a		
	EAST TIMOR	0.0			n/a		
	SOMALIA				n/a		

1 Freezing longliners whose catches are not reported by the flag states concerned
2 Fresh-tuna longliners whose catches are not reported by the flag states concerned

Discard levels (Table 3vii): presents the information available for discards for the year 2016. Discard levels are only available for Australia longliners, EU,France purse seine and longliners, EU-Spain (purse seiners and longliners) Republic of Korea longliners and purse seiners, Maldives longliners, Malaysia, Mauritius purse seiners, Mozambique longliners, Seychelles semi-industrial longliners and purse seiners, South Africa longliners (foreign & local fleets), Sri Lanka (all gears), , the UK Overseas Territories (nil discards), China and Taiwan,China longliners

Discard rates are believed to be high for fisheries using longlines and oceanic gillnets, and moderate for purse seine sets on associated schools (mainly with FADs). However, the nets of FADs may also contribute substantially to ghost fishing.

3vii – Discards

Fleet	Gear	Units	Catch
Australia	Longline	# Fish	Albacore(264) Bigeye tuna(569);Black Marlin(10);Blue shark(3309);Crocodile shark(2378);Giant Mantas(22);Oceanic whitetip shark(36);Shortfin mako(333);Skipjack tuna(2);Smoothtail mobula(1);Southern bluefin tuna(775);Striped marlin(11);Swordfish(115);Tiger shark(4);Yellowfin tuna(281)
EU-France	Purse Seine	kg	Bigeye tuna(4);Black Marlin(10);Blue Marlin(9);Blue sea chub(2);Common dolphinfish(32);Frigate and bullet tunas(9);Frigate tuna(44);Giant Mantas(1);Great barracuda(4);Indo-Pacific sailfish(1);Kawakawa(1);Mackerel scad(14);Marine fishes nei(6);Marlins and sailfish and spearfish nei(1);Mobula nei(2);Ocean triggerfish(60);Oceanic whitetip shark(2);Rainbow runner(69);Requiem sharks nei(2);Silky shark(73);Skipjack tuna(50);Spinetail mobula(2);Tiger shark(1);Tripletail(1);Unicorn leatherjacket filefish(7);Wahoo(15);Yellowfin tuna(30)
		# Fish	Green turtle(2);Hawksbill turtle(6);Leatherback turtle(1);Loggerhead turtle(3);Marine turtles(4);Olive ridley turtle(3);Whale shark(3)
EU-France	Longline	# Fish	Albacore(164);Bigeye thresher(1);Bigeye tuna(281);Black gemfish(1);Blackfin barracuda(1);Blue shark(2072);Carcharhinus sharks nei(72);Common dolphinfish(8);Crocodile shark(2);Dogfish sharks, etc. nei(2);Dolphins nei(1);Escolar(363);False killer whale(2);Green turtle(5);Hammerhead sharks nei(173);Hawksbill turtle(3);Lancetfishes nei(418);Leatherback turtle(3);Loggerhead turtle(10);Long snouted lancetfish(213);Longfin escolar(1);Mako sharks(59);Marine fishes nei(15);Marine turtles(4);Ocean sunfish(3);Oceanic puffer(8);Oceanic whitetip shark(142);Oilfish(255);Olive ridley turtle(3);Pelagic stingray(883);Pilot whales nei(7);Risso's dolphin(6);Sharks various nei(13);Sharptail mola(3);Shortfin mako(1);Silky shark(119);Slender sunfish(2);Smooth hammerhead(3);Snake mackerel(115);Sunfish(33);Swordfish(673);Thresher sharks nei(29);Tiger shark(16);Toothed whales nei(2);True tunas nei(20);Various sharks nei(13);Yellowfin tuna(90)
EU-Spain	Longline	# Fish	C. caretta(1);D. coriacea(3)
	Purse seine	# Fish	C. caretta(3);D. coriacea(1);L. olivacea(9);Unidentified turtles(3)
UK-OT (Chagos)			nil
Korea Rep	Longline	# Fish	Marine fishes nei(3);Pelagic thresher shark(1);Sharks various nei(1);Thresher Shark(3);Various sharks nei(1);Yellowfin tuna(100);Blue shark(126);Porbeagle(58);Shortfin mako(22)
Korea Rep	Purse Seine	kg	Haffara seabream(1200);Indo-Pacific sailfish(200);Leatherback turtle(2);Marine fishes nei(28170);Oceanic whitetip shark(965);Olive ridley turtle(2);Skipjack tuna(400);Black Marlin(11380);Porbeagle(4964);Silky shark(27398)
Sri Lanka	Gillnet	# Fish	Blue whale(1);Dolphins nei(17);Oceanic whitetip shark(4);Thresher Shark(7);Whale shark(2);Green turtle(117)
	Ringnet	# Fish	Dolphins nei(1);Green turtle(92)
	Longline	# Fish	Blue whale(1);Dolphins nei(3);Green turtle(99);Oceanic whitetip shark(10);Thresher Shark(2)
South Africa	Longline(National flags)	# fish	Blue shark(2);Copper shark(3);Giant Mantas(1);Loggerhead turtle(1);Scalloped hammerhead(19);Shortfin mako(1);Swordfish(2);Thresher Shark(3);Tiger shark(7)
	Longline(Foreign flags)	# fish	Albacore(60);Atlantic Yellow-nosed Albatross(12);Bigeye tuna(155);Blue shark(1503);Bottlenose dolphin(2);Brama(519);Copper shark(5);Crocodile shark(40);Greater amberjack(1);Grey petrel(1);Loggerhead turtle(2);Marine turtles(2);Oilfish(7);Pelagic thresher shark(37);Scalloped hammerhead(2);Shortfin mako(212);Southern bluefin tuna(43);Striped marlin(6);Swordfish(28);Thresher Shark(21);White-chinned Petrel(25);Yellowfin tuna(213)
Maldives	Longline	# fish	Hammerhead sharks nei(78);Mako sharks(534);Marine turtles(424);Oceanic whitetip shark(464);Other seabirds(15);Sharks various nei(1085);Silky shark(879);Thresher Shark(374);Various sharks nei(1085)
Mozambique	Longline	# fish	Marine turtles(6)
Mauritius	Purse seine	kg	Common dolphinfish(1890);Frigate tuna(570);Non targeted, associated and dependent species(1455);Oceanic whitetip shark(135);Silky shark(1482);Triggerfishes, durgons nei(2890);Wahoo(1175);Yellowfin tuna(100)
Malaysia	Longline	# fish	Blue shark(3)
Seychelles	Longline (semi industrial)	# fish	Bigeye tuna(9);Black Marlin(5);Indo-Pacific sailfish(3);MARINE MAMMALS(1);Striped marlin(5);Swordfish(52);Yellowfin tuna(21)

	Purse seine	# fish	True tunas nei(66)
China	Longline	# Fish	Hammerhead sharks nei(555);Longfin mako(761);Oceanic whitetip shark(550);Silky shark(610);Thresher sharks nei(583); Leatherback turtle (2);Olive ridley turtle (3);Green turtle (1)
Taiwan	Longline	# fish	Black-browed Albatross(1);Grey-headed Albatross(1);Light-mantled sooty albatross(1);Loggerhead turtle(5);Olive ridley turtle(6);Shearwaters nei(8);Shy Albatross(2);Sooty albatross(4);Wandering Albatross(1);White-chinned Petrel(6);Yellow-nosed albatross(11)

- **FADs and supply vessels (**Resolutions 15/08 and 15/02**)**:

  Mauritius, Rep. of Korea and Seychelles are the only CPCs that have provided complete information on FADs and supply vessels as requested in IOTC Resolutions 15/08 and 15/02. A summary of the status of data reporting for FADs and supply vessels is provided below:

  - Five CPCs (EU,Spain, EU,France, Rep. of Korea, Seychelles, and Mauritius) provided information on the amount of Fish Aggregating Devices (FADs) for purse seine activities in 2016.
  - Rep. of Korea, Mauritius and Seychelles have provided information on the activity of supply vessels, according the reporting standards in Resolution 15/08, while EU-Spain has provided information on the number of supply vessels only.
  - EU,France have indicated that they have not had supply vessels in operation in recent years. Australia has also indicated that purse seiners under its flag do not set FADs or use other vessels in support of fishing activities.

1. No data was received for other fleets on FADs, or activities of supply vessels (including I.R. Iran, Sri Lanka, and Indonesia).

3. STATUS OF THE IOTC NOMINAL CATCHES (NC), CATCH AND EFFORT (CE) AND SIZE FREQUENCY (SF) DATABASES

Tables 4a-f show the presumed quality of the nominal catches of tropical tunas, temperate tunas, billfish and neritic tunas for the last forty years (1977-2016), by species, and year (overall, Fig.4a. and by type of fishery Figs.4b-f). Keys to the scoring system used to assess the quality of the statistics available for each species are presented below.

Figure 2 shows the proportion of nominal catches, catch and effort, and size frequency data that are presumed uncertain for the period 1977-2016, by main fleet and species group, including tropical and temperate tunas, billfish, and neritic tunas.

The importance of catches of each species group under each individual gear had over the total catches for that same group during the last decade (2007-2016), all gears combined, is presented in Figures 3a-3e. Figures 4a-4e shows the proportion of catches that are presumed uncertain for the period 1977-2016, by type of dataset, main fleet and fishery. It is important to note that the quality of the statistics for the last two years is likely to improve in the future, as more information is collected from the fisheries and reported to the Secretariat.

Key to tables 4(a-f) and scoring system used to assess the quality of statistics of IOTC species available in the IOTC databases

Key:

Species	Species code (Albacore ALB; bigeye tuna BET; black marlin BLM; bullet tuna BLT; blue marlin BUM; narrow-barred Spanish mackerel COM; frigate tuna FRI; Indo-Pacific king mackerel GUT; kawakawa KAW; longtail tuna LOT; striped marlin MLS; southern bluefin tuna SBF; Indo-Pacific sailfish SFA; skipjack tuna SKJ; swordfish SWO; yellowfin tuna YFT)
%Catch	Contribution (in %) that the catches of the species make out of the total combined catches of all IOTC species, over the entire time series of catch
Yfirst	Availability and quality of data in the IOTC database for the year, species, and gear concerned, by type of dataset
Ylast	

e.g.;

Species	%Catch	YearYY

$Species_1^n$ — % Catch, as defined above

- Availability and quality of **nominal catch** data
- Availability and quality of **catch-and-effort** data
- Availability and quality of **size frequency** data

Key to IOTC Scoring system

Nominal Catch	By species	By gear
Fully available	0	0
Partially available (part of the catch not reported by species/gear)*	2	2
Fully estimated (by the IOTC Secretariat)	4	4

*Catch assigned by species/gear by the IOTC Secretariat; or 15% or more of the catches remain under aggregates of species

Catch-and-Effort	Time-period	Area
Available according to standards	0	0
Not available according to standards	2	2
Low coverage (less than 30% of total catch covered through logbooks)	2	
Not available at all	8	

Size frequency data	Time-period	Area
Available according to standards	0	0
Not available according to standards	2	2
Low coverage (less than 1 fish measured by metric ton of catch)	2	
Not available at all	8	

Key to colour coding

- Total score is 0 (or average score is 0-1)
- Total score is 2 (or average score is 1-3)
- Total score is 4 (or average score is 3-5)
- Total score is 6 (or average score is 5-7)
- Total score is 8 (or average score is 7-8)

Table 4(a.): Overall status of IOTC catch, effort, and size frequency statistics, by year and species (1977-2016)

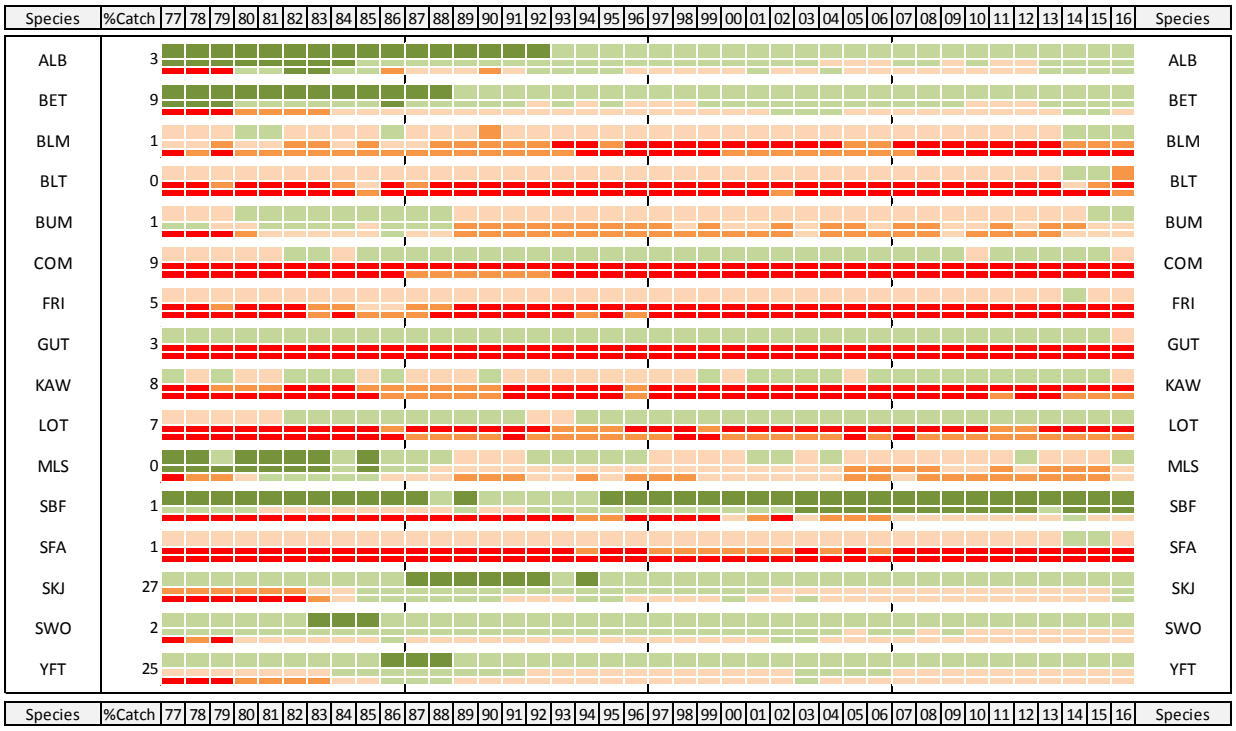
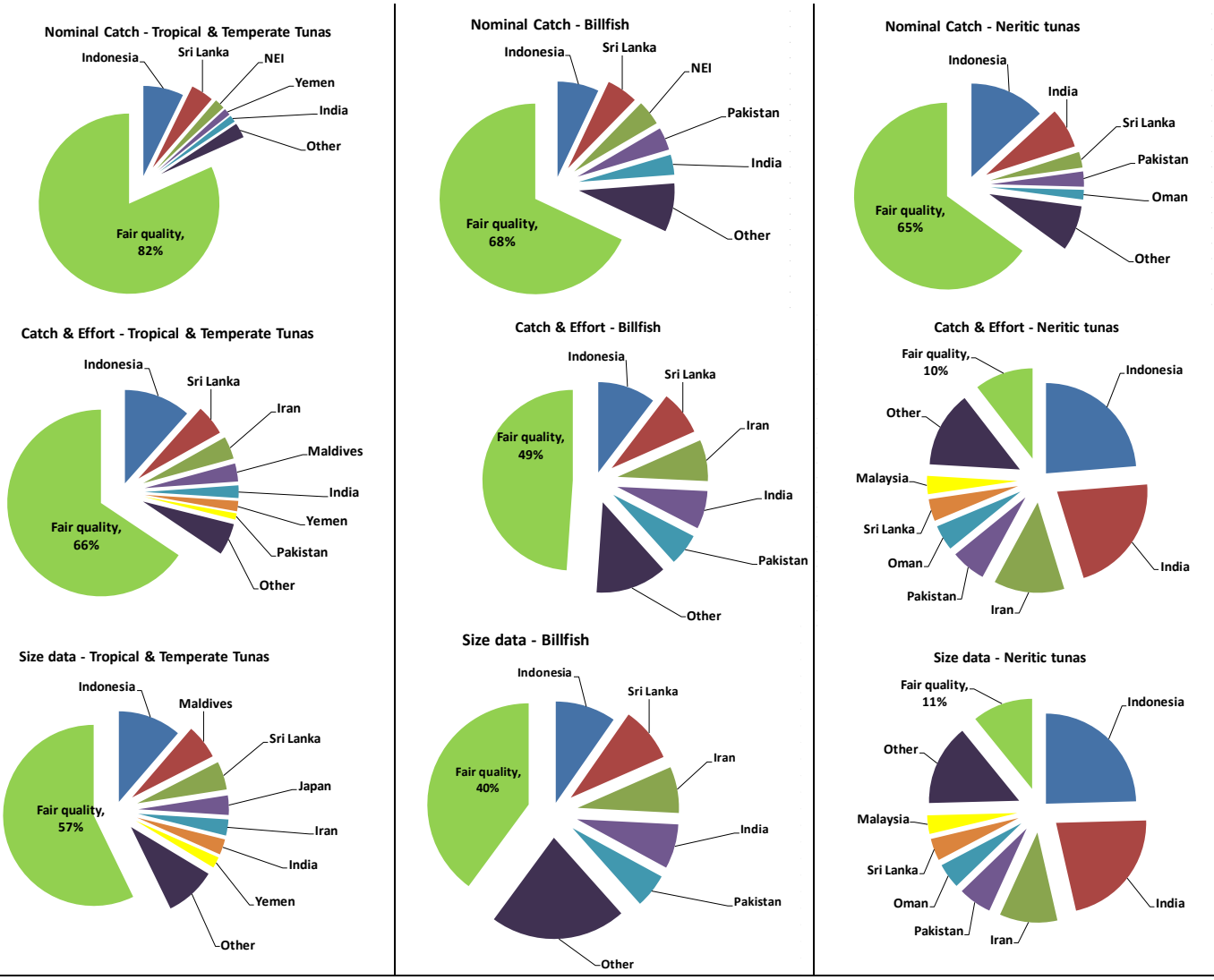


Fig. 2: Presumed uncertainty of the nominal catch (top row), catch-and-effort (middle row), and size data (bottom row) available in the IOTC databases for tropical and temperate tunas, billfish, and neritic tunas, and main fleets that contribute to that uncertainty, for the period 1977-2016 (all gears combined).



Surface fisheries: Purse seine

Table 4(b.): Status of IOTC catch statistics for purse seine fisheries, by year and species (1977-2016)

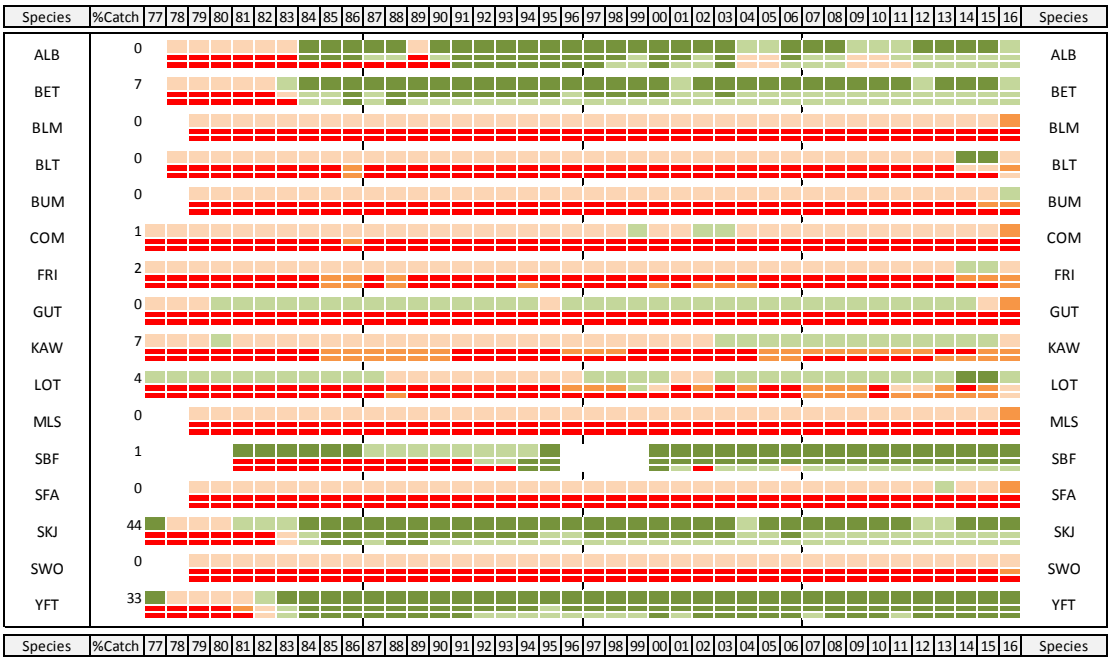


Fig. 3(a.): Contribution (in %) that the purse seine catches for each species group, and for all species combined, made out of the total catches of that same group, for all fisheries combined (2007-2016)

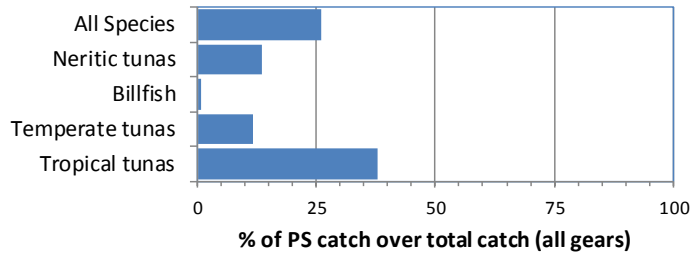
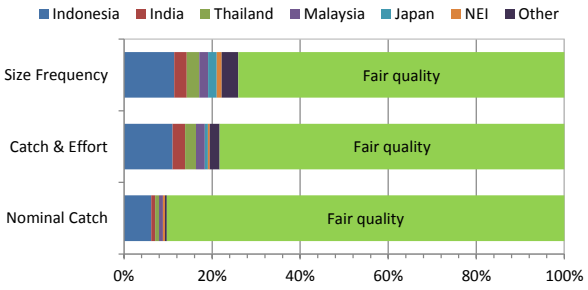


Fig. 4(a.): Amount of PS statistics (in %) presumed to be uncertain, by type of dataset and fleet, over the total PS catch (1977-2016)



Overall, nominal catches recorded for purse seine fisheries in the IOTC database are considered to be of **fair to good quality**, in particular for tropical and temperate tuna species (**Table 4(b.)**). Purse seiners target tropical tunas or neritic tunas, depending on the type of vessel, and area operated.

- During the last decade, **purse seine gears have reported over 26% of the catches of IOTC species in the Indian Ocean**, especially tropical tunas (≈36%), neritic tunas (≈13%), and temperate tunas (≈8%, the majority southern Bluefin tuna) (**Fig. 3(a)**).
- Over the last forty years (1976-2015), **over 90% of the nominal catches**, **78% of the catch-and-effort**, and **74% of the size frequency statistics** of purse seine fisheries recorded in the IOTC database are considered to be of **good quality** (**Fig. 4(a.)**).
- The statistics for the following purse seine fleets are considered to be of uncertain quality (1977-2016):
  1. **Indonesia**: The Secretariat estimated catches for the coastal purse seine fishery of Indonesia (targeting neritic tunas) from the total aggregated catches reported by Indonesia; since 2006 Indonesia has been reporting catches by gear to the Secretariat, but the completeness and quality of the datasets reported remains uncertain. To date, Indonesia has not reported catch-and-effort and size data for its purse seine fisheries.
  2. **Thailand**: The catches of large and coastal purse seine vessels reported by Thailand are not reported fully by species; this affects the quality of the nominal catches and catch-and-effort of both tropical tunas and neritic tunas. In 2015, Thailand began reporting size data for its coastal purse seine fisheries; In 2016 Thailand reported some historical size frequency data for the neritic species for year 2005 to 2012. However IOTC secretariat is expecting more size frequency data from Thailand neritic fisheries, as far back as in the early 1990s. The Thai large (offshore) PS fleet is no longer operating in the Indian Ocean, since moving to the Atlantic Ocean in July 2010.
  3. **India**: To date, India has not reported catch-and-effort and size data for its purse seine fisheries.
  4. **Japan**: Japan has only reported size data for its purse seine fisheries in recent years.
  5. **NEI**: The catches of ex-Russian vessels, recorded under the flag of Belize and other unidentified flags, were estimated by the Secretariat in the past; between 2005 and 2010 these vessels operated under the flag of Thailand for which the statistics are considered to be of better quality. However, the amount of size data available for this fleet is very low.

Surface fisheries: Pole-and-line

Table 4(c.): Status of IOTC catch statistics for pole-and-line fisheries, by year and species (1977-2016)

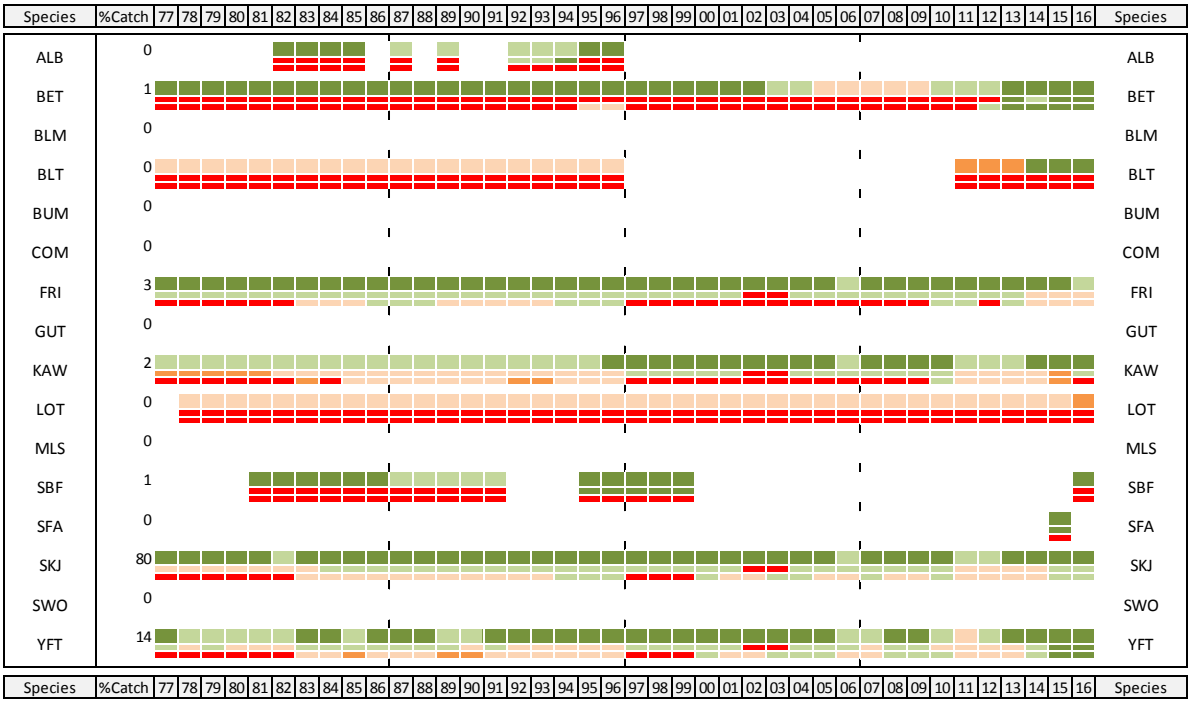


Fig. 3(b.): Contribution (in %) that the pole-and-line catches for each species group, and for all species combined, made out of the total catches of that same group, for all fisheries combined (2007-2016).

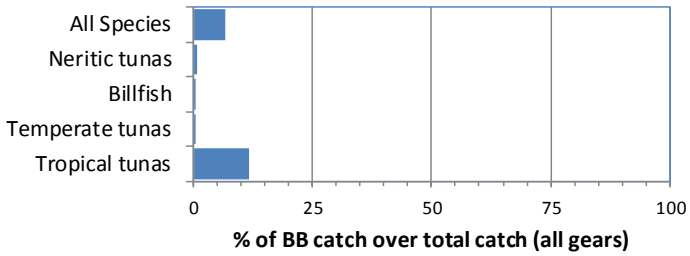
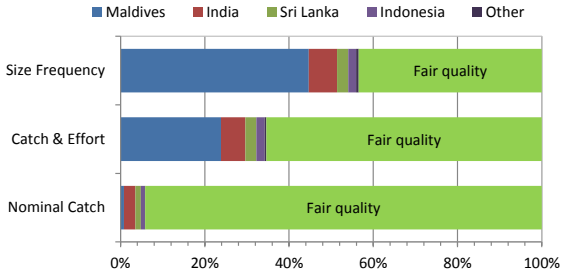


Fig. 4(b.): Amount of BB statistics (in %) presumed to be uncertain, by type of dataset and fleet, over the total BB catch (1977-2016).



Overall, the nominal catches recorded for pole-and-line fisheries in the IOTC database are considered to be of **fair to good quality** (Table 5c). Baitboats target tropical tunas in the Indian Ocean: over the last forty years (1977-2016) over 90% of baitboat catches were accounted for by tropical tunas (% Catch column, **Table 4(c.)**).

- During the last decade, **pole-and-line gears caught around 8% of the IOTC species in the Indian Ocean**, especially tropical tunas (≈13%) (**Fig. 3(b.)**).
- Over the last forty years (1977-2016), **over 94% of the nominal catches, 65% of the catch-and-effort**, and **43% of the size frequency statistics** of pole-and-line fisheries recorded in the IOTC database are considered to be of **good quality** (**Fig. 4(b.)**).
- The statistics for the following baitboat fleets are considered to be of uncertain quality, for the species and time-periods identified (1977-2016):
  1. **India** (Lakshadweep): The Secretariat estimated catches for the pole-and-line fishery of India from the total aggregated catches for years in which the catches reported by gear for India are inconsistence. With the exception of a partial report of catch-and-effort data for 2013, to date India has not reported catch-and-effort and size data for its pole-and-line fisheries.
  2. **Sri Lanka:** Since 2014 Sri Lanka is collecting and reporting logbook data from the offshore fisheries. However catches for the coastal fisheries are still consider to be uncertain.
  3. **Indonesia**: The Secretariat estimated catches for the pole-and-line fishery of Indonesia from the total aggregated catches reported by Indonesia; since 2006 Indonesia has been reporting catches by gear to the Secretariat, but the completeness and quality of the datasets reported remains uncertain. To date, Indonesia has not reported catch-and-effort and size data for its pole-and-line fisheries.

Surface fisheries: *Gillnet*

Table 4(d.): Status of IOTC catch statistics for gillnet fisheries, by year and species (1976-2015)

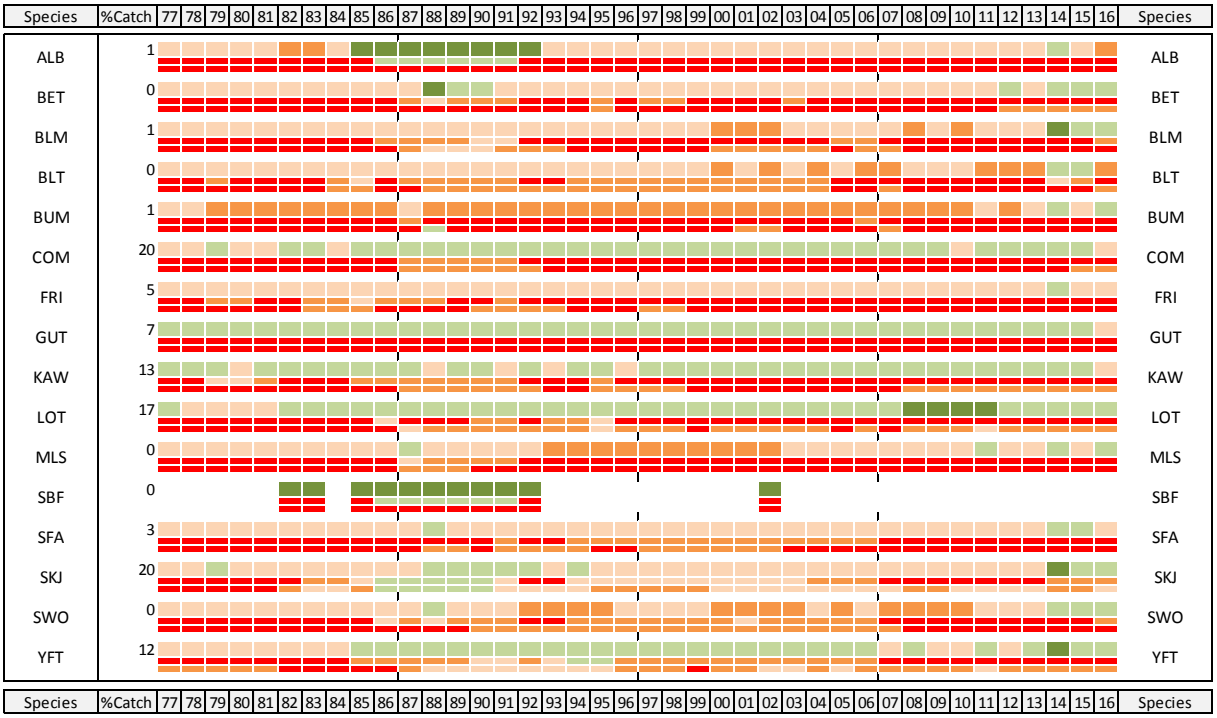


Fig. 3(c.): Contribution (in %) that the gillnet catches for each species group, and for all species combined, made out of the total catches of that same group, for all fisheries combined (2007-2016).

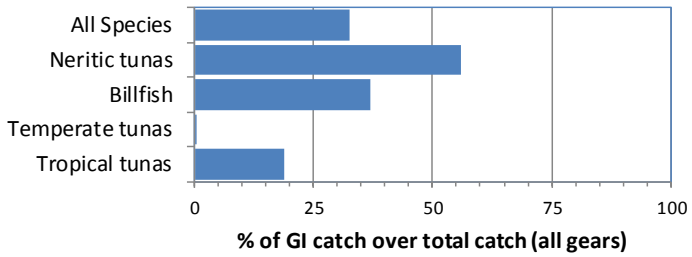
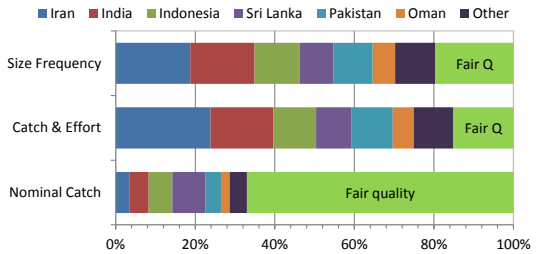


Fig. 4(c.): Amount of GI statistics (in %) presumed to be uncertain, by type of dataset and fleet, over the total GI catch (1977-2016).



Overall, the nominal catches recorded for gillnet fisheries in the IOTC database are considered to be of **poor to fair quality,** depending on the fleet and time period (**Table 4(d.)**). Over the last forty years (1976-2015) around ≈62% of the gillnet catches were composed of neritic tunas and ≈32% of tropical tunas.

- During the last decade, **gillnet gears caught around 27% of the IOTC species in the Indian Ocean**, especially neritic tunas (≈56%), billfish (≈25%) and tropical tunas (≈14%) (**Fig. 3(c.)).**
- Over the last forty years (1977-2016), **≈67% of the nominal catches, ≈15% of the catch-and-effort**, and **≈20% of the size frequency statistics** of gillnet fisheries recorded in the IOTC database are considered to be of **good quality** (**Fig. 4(c.)**).
- The statistics for the following gillnet fleets are considered to be of uncertain quality (1977-2016):
  1. **I.R. Iran**: To date I.R. Iran has not provided catch-and-effort and size data fully by the IOTC standards.
  2. **India**: The Secretariat estimated catches for the gillnet fishery of India from the total aggregated catches for years in which the catches reported by gear for India are inconsistence; this affects the quality of the catches of neritic tunas. To date, India has not reported catch-and-effort and size data for its gillnet fisheries.
  3. **Sri Lanka**: Since 2014 Sri Lanka is collecting logbook data from the offshore fisheries. Sri Lanka reported the offshore catches for individual fisheries from 2014. Catches for the coastal fisheries are still uncertain
  4. **Indonesia**: The Secretariat estimated catches for the gillnet fishery of Indonesia from the total aggregated catches reported by Indonesia; this affects the quality of the catches of both tropical tunas and neritic tunas. Since 2006 Indonesia has been reporting catches by gear and species to the Secretariat, but the completeness and quality of the datasets reported remains uncertain. To date, Indonesia has not reported catch-and-effort and size data for its gillnet fisheries.
  5. **Pakistan**: In 2017 Pakistan provided revisions to the historical time series to IOTC Secretariat, which incorporate information from WWF-Pakistan. The IOTC Secretariat is currently assisting Pakistan is the validation of the new catch series – which is significantly different from the current catch estimates in the IOTC database.
  6. **Oman**: To date, Oman has not provided size data. No catch and effort was also not reported in 2017.

Longline fisheries

Table 4(e.): Status of IOTC catch statistics for longline fisheries, by year and species (1976-2015)

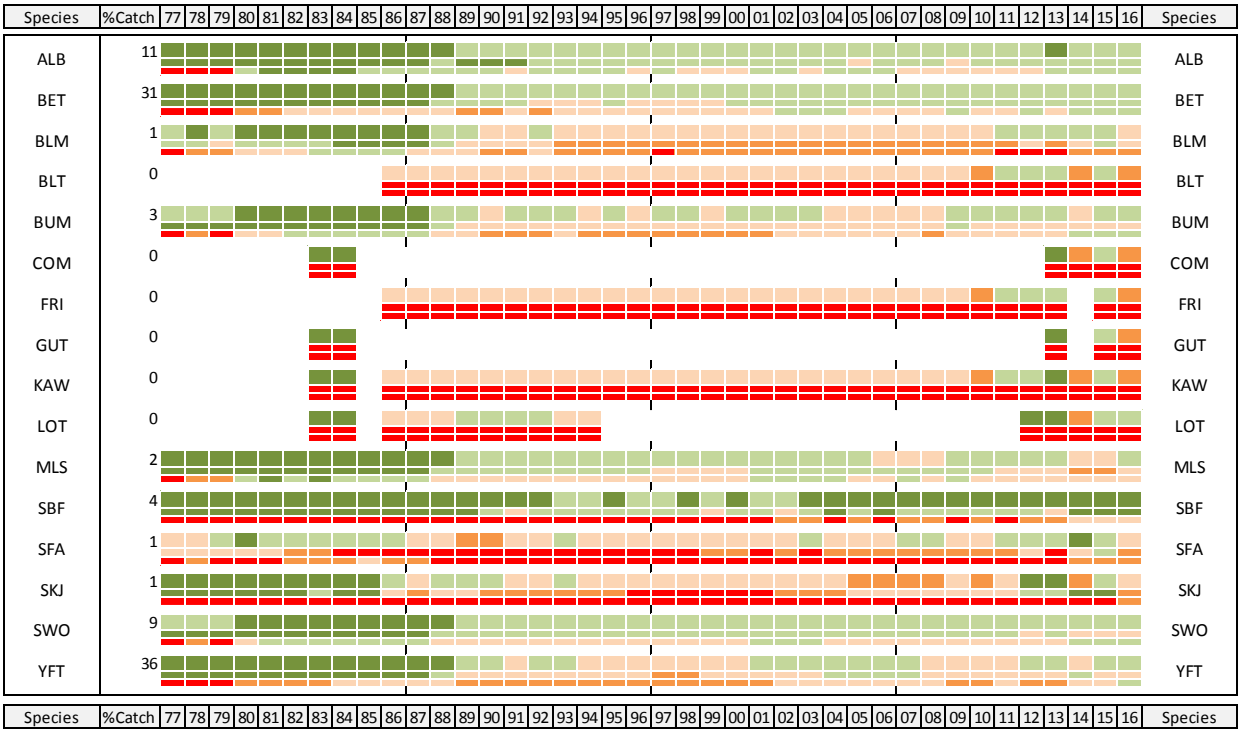


Fig. 3(d.): Contribution (in %) that the longline catches for each species group, and for all species combined, made out of the total catches of that same group, for all fisheries combined (2007-2016).

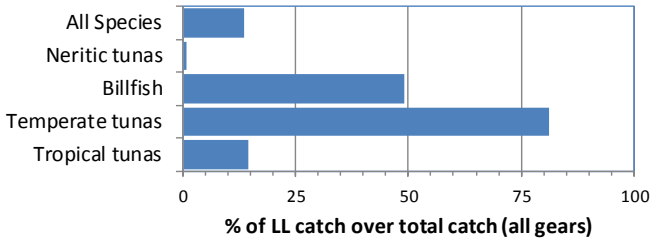
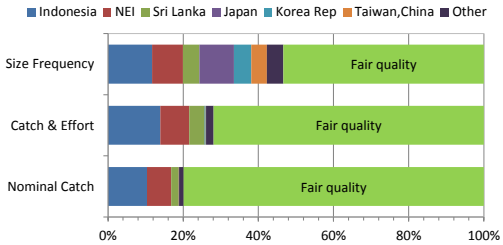


Fig. 4(d.): Amount of LL statistics (in %) presumed to be uncertain, by type of dataset and fleet, over the total LL catch (1977-2016).



Overall, the catches recorded for longline fisheries in the IOTC database are considered to be of **good quality until the late-1980's and fair quality since then,** for most species (Table 4e). Over the last forty years (1976-2015), 68% of the longline catches were made of tropical tunas, 15% of temperate tunas and 16% of billfish (**Table 4e**).

- During the last decade, **longline gears caught around 22% of the IOTC species in the Indian Ocean**, especially temperate tunas (≈81%), billfish (≈65%) and tropical tunas (≈24%) (**Fig. 3(d.)**).
- Over the last forty years (1977-2016), **around 80% of the nominal catches, 72% of the catch-and-effort**, and **53% of the size frequency statistics** of longline fisheries recorded in the IOTC database are considered to be of **good quality** (**Fig. 4(d.)**).
- However, the quality of statistics in recent years has worsened, in particular the availability of catch-and-effort and size frequency data. The statistics for the following longline fleets are considered to be of uncertain quality (1977-2016):
  1. **Indonesia**: The Secretariat estimated the catches of longline vessels in addition, a small component of the catches of fresh-tuna longliners are not reported by species; this affects the quality of the catches of tropical tunas, temperate tunas and billfish. To date, Indonesia has not reported catch-and-effort data for its longline fisheries and size data has not been reported as per the IOTC requirements.
  2. **NEI**: The Secretariat estimates the catches of deep-freezing longline vessels that operate under flags of non-reporting countries using information from both the IOTC-OFCF Project and Third Parties. This category includes also the catches estimated for fleets under the flags of IOTC CPCs that do not report complete sets of catches to the Secretariat. Catch-and-effort and size data are usually not available for this component, in particular deep-freezing longliners.
  3. **Sri Lanka**: To date, Sri Lanka has not provided catch-and-effort and size data fully according to the IOTC standards.
  4. **Japan, Republic of Korea, and Taiwan,China**: Japan, the Republic of Korea and Taiwan,China have not provided size data for their longline fisheries over the entire time series and, where size data are available, the amount of fish measured is often below the minimum number set by the Commission (one fish measurement per metric ton of catch, by species).

Hand line, trolling and other small-scale fisheries

Table 4(f.): Status of IOTC catch statistics for hand line, trolling and small-scale line fisheries, by year and species (1976-2015)

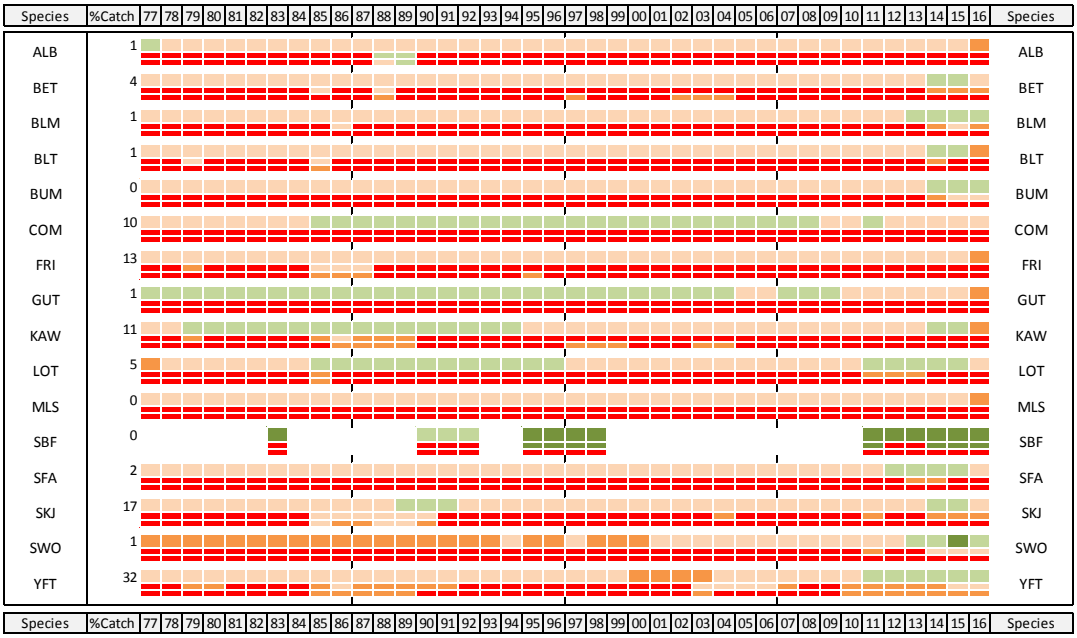


Fig. 3(e.): Contribution (in %) that the hand line, trolling and other NEI gears catches for each species group, and for all species combined, made out of the total catches of that same group, for all fisheries combined (2007-2016).

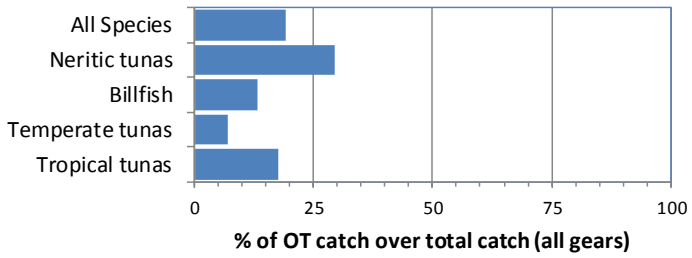
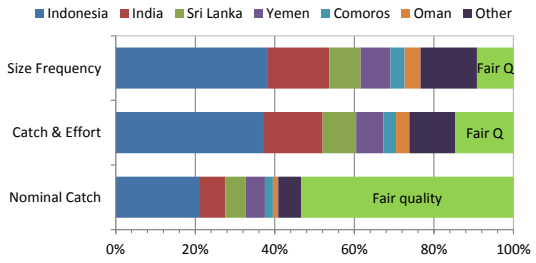


Fig. 4(e.): Amount of LI+OT statistics (in %) presumed to be uncertain, by type of dataset and fleet, over the total LI+OT catch (1977-2016).



This category includes the catches of hand and troll lines and catches of other IOTC species that are not reported by gear. The majority of the catches not reported by gear are likely to refer to coastal gillnets, hand line, trolling and other minor artisanal fisheries.

- Overall, the catches recorded for these fisheries in the IOTC database are considered to be of **poor quality** (**Table 4(f.)**). Over the last forty years (1977-2016), over 41% of catches under line fisheries were made of neritic tunas and over 53% of tropical tunas.
- **Hand line, trolling and other unidentified gears catch over 16% of the IOTC species in the Indian Ocean**, especially neritic tunas (≈27%), tropical tunas (≈12%), and billfish (≈10%) (**Fig. 3(e.)**).
- Over the last forty years (1977-2016), **53% of the nominal catches, 15% of the catch-and-effort**, and **9% of the size frequency statistics** of these fisheries recorded in the IOTC database are considered to be of **good quality** (**Fig. 4(e.)**).
- The catches for the following fleets are considered to be of uncertain quality (1977-2016):
  1. **Indonesia**: The Secretariat estimated catches for the handline and trolling fishery of Indonesia from the total aggregated catches reported by Indonesia; this affects the quality of the catches of both tropical tunas and neritic tunas. Since 2006 Indonesia has been reporting catches by gear and species to the Secretariat. To date, Indonesia has not reported catch-and-effort and size data for line and other NEI fisheries.
  2. **India**: The Secretariat estimated catches for the hand line and trolling fisheries of India from the catch by species and split gears as catches for years in which the catches reported by gear for India are inconsistence; this affects the quality of the catches of neritic tunas. To date, India has not reported catch-and-effort and size data for line and other NEI fisheries.
  3. **Sri Lanka**: Since 2014 Sri Lanka is collecting logbook data from the offshore fisheries. However catches for coastal fisheries are still uncertain.
  4. **Yemen**: No data reported by Yemen. Catches have been estimated based on data published by FAO.
  5. **Comoros**: No data reported for the historical time series, up to 2012. Improvements in data collection and reporting occurred have been noted since assistance provided by the IOTC-OFCF Project in 2012; notably improvements in the catch estimation and reporting of size frequency data.
  6. **Oman**: Oman does not report catches by gear and, to date, has not provided size data as per the IOTC requirements.

4. STATUS OF THE IOTC FISHING CRAFT STATISTICS (FC) AND ACTIVE VESSELS (AV) DATABASES

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

- Derive input-fishing capacity in the Indian Ocean.
- Estimate the catches of fleets that operate under the flags of countries that do not report data to the IOTC.
- Assess the completeness of the catches reported by IOTC CPCs completing those catches when the fleets concerned are not fully monitored by their flag countries.

During 2009, the Secretariat participated in a study to estimate **input-fishing capacity** for the fleets fishing for IOTC species in the Indian Ocean during 2006-08; the results of this study were presented to the IOTC Scientific Committee in 2009.

In 2013 the IOTC Secretariat worked with an independent consultant to update previous estimates of input fishing capacity in the Indian Ocean and complete information for 2009 and following years. The study included a full review of the IOTC numbers of industrial vessels, as defined by the Commission[5], over the entire time-series; and an attempt to estimate numbers of small-scale fishing craft fishing that fished for tunas in the Indian Ocean during the same period. The Report prepared by the Secretariat is available[6] and was presented at the 16th Meeting of the IOTC Scientific Committee (Busan, December 2013). In 2014/15 the IOTC Secretariat updated the fishing craft statistics series to incorporate estimates up to 2014 and update past estimates, where necessary.

NEI category: numbers of vessels

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

- IOTC IUU list (IOTC Resolution 11/03);
- Identification, dimensions and other vessels attributes, by vessel, for those foreign vessels that owed fishing licenses to operate within the Economic Exclusive Zone (EEZ) of the reporting country (as specified in IOTC Resolution 14/05);
- Identification and total catches unloaded, by species and vessel, for those foreign vessels using ports in the territory of the reporting country (as specified in IOTC Resolution 10/11 & 05/03);
- Identification and total catches transhipped, by species and vessel, for vessels participating in the IOTC Transhipment Programme(as specified in IOTC Resolution 14/06);
- Data provided by other parties, including data on the imports of tuna for canning, by species and vessel, from processors cooperating with the International Seafood Sustainability Foundation (ISSF) or other initiatives.

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

Partially reported fleets

In addition, the Secretariat estimates catches for countries that report only partial statistics for their fleets. This refers to the **catches of fleets of IOTC CPCs** that are not fully monitored by their flag states. The catches reported by these

[5] The term industrial vessel includes all large-scale vessels (vessel length overall is 24 m or greater) that fished for IOTC species within the IOTC Area of Competence during the year concerned; and all small-scale vessels that fished for IOTC species within the IOTC Area of Competence, and where fishing occurred partially or fully beyond the Economic Exclusive Zones of their flag countries during the year concerned.

[6] IOTC Secretariat, 2013. Estimation of fishing capacity by tuna fishing fleets in the Indian Ocean. Report presented at the 16th Meeting of the Scientific Committee of the Indian Ocean Tuna Commission, Busan, Rep. of Korea, 2-6 December 2013. *IOTC–2013–SC16–INF04: 88 pp.*

countries are assumed incomplete because the average catches estimated by vessel by year are significantly lower than those estimated for similar fleets of other countries, on the assumption that the same levels of activity apply to both fleets. This applies to the following fleets:

- Longline fleet of **India**: Up to 100 longliners have been operating in India in recent years, including fresh-tuna longliners and deep-freezing longliners.
- Longline fleets of **Indonesia**: Indonesia do not monitor the catches of vessels under its flag that are unloaded in ports outside its territory.
- Longline fleet of **Philippines**: The catches of bigeye tuna reported by Philippines for its longline fleet in the Indian Ocean have been consistently lower than the amounts of Indian Ocean bigeye tuna imported by Japan from this fleet. Philippines did not have any vessels in operating in India Ocean since 2015

The additional catches estimated for these countries are also included into the NEI category.

Fishing craft statistics: data availability

- Data from **artisanal** (small-scale) fisheries are scarce and inconsistent in many cases. On the contrary, the statistics of large-scale and medium-scale fleets are thought fairly complete:
- **Purse seine fleets**: The number of purse seiners fishing for tropical tunas on the high seas (usually referred to as "industrial") is well known. At present, this fleet is flagged mainly in countries of the European Union, Seychelles, I.R. Iran, Mauritius, Japan and the Republic of Korea.
- **Longline fleets**: There are many longline fleets fishing tuna in the Indian Ocean, mainly under the flags of Australia, , China, Taiwan,China, the EU, India, Indonesia, Japan, the Republic of Korea, Madagascar, Malaysia, Mauritius, Mozambique, Oman, Philippines, Sri Lanka, Seychelles, South Africa, Tanzania, Thailand and other longliners operating under various flags of non-reporting countries. The total number of non-reporting longliners is estimated whenever the Secretariat receives new data from third parties (NEI category).
- **Oceanic gillnet fisheries of I.R. Iran and Pakistan**: The number of oceanic gillnet vessels operating in the Indian Ocean is well known for I.R. Iran and poorly know for Pakistan.
- **Offshore gillnet/longline fishery of Sri Lanka**: The number of offshore gillnet/longline vessels that operate under the flag of Sri Lanka is well known.
- **Pole-and-line fishery of Maldives**: The number of pole-and-line vessels that operate under the flag of Maldives is well known.

5. OTHER IOTC DATA HOLDINGS

a. Biological data

The IOTC Secretariat compiles datasets and information relating to IOTC species and main species of sharks, as identified by the Commission, including the data used to derive standard measurements for IOTC species and other biological information of interest to the IOTC. The information available was presented to the WPDCS in 2013[7], and separate reports were presented for the consideration of each species Working Party in 2014[8], as requested by the IOTC Scientific Committee. The IOTC Secretariat will update the equations available as it receives updates from the Working Parties.

b. Observer data

[7] Geehan, J. & Pierre, L. (IOTC Secretariat), 2013. Biological data on tuna and tuna-like species gathered at the IOTC Secretariat: Status Report. Document presented at the 9th Meeting of the Working Party on Data Collection and Statistics of the Indian Ocean Tuna Commission, Busan, Republic of Korea, 29-30 November 2013. *IOTC–2013–WPDCS09–13.*

[8] Herrera, M, Geehan, J. & Pierre, L. (IOTC Secretariat), 2014. Review of the statistical data and fishery trends for billfish. Document presented at the 12th Meeting of the Working Party on Billfish of the Indian Ocean Tuna Commission, Yokohama, Japan, 21-25 October 2014. *IOTC–2014–WPB12–07.*

The Secretariat has received limited information concerning the past and current sub-regional and national observer programmes in the Indian Ocean, the latest falling under the IOTC Regional Observer Scheme (cf. Resolution 11/04 *on a Regional Observer Scheme*). The information available is summarized in a document that will be presented at the 20th meeting of the IOTC Scientific Committee.

c. Field sampling

IOTC Resolution 11/04 contains also provisions covering the monitoring of artisanal fisheries:

> *"The number of the artisanal fishing vessels landings shall also be monitored at the landing place by field samplers*[9]*. The indicative level of the coverage of the artisanal fishing vessels should progressively increase towards 5% of the total levels of vessel activity (i.e. total number of vessel trips or total number of vessels active)."*

In order to assess the level of coverage of artisanal fleets by coastal countries in the IOTC Region, in 2011 the IOTC Secretariat initiated a Pilot Project. To this purpose, the Secretariat hired the services of a Consultant, who prepared a report covering the fisheries in nine coastal countries in the Region, having important catches of tropical tunas (70% of the total catches estimated for coastal countries) . The report of the Consultant is available at the Secretariat, and was summarized in a document presented to the IOTC Scientific Committee in 2011 (IOTC-2011-SC14-38).

Since the last IOTC WPDCS Meeting the IOTC Secretariat has coordinated capacity building activities in some of the countries covered in the above report. These actions followed requests from local institutions, as well as priorities identified by the IOTC Working Parties and Scientific Committee, and were possible thanks to financial support from the IOTC and its partners, including: the Overseas Fisheries Cooperation Foundation of Japan, WWF, and the European Union. Capacity building activities were implemented in Indonesia, Tanzania, and Mauritius. More details about these activities are provided in a separate document[10].

d. Tagging data

Since 2002, the Secretariat has been coordinating and supervising the Indian Ocean Tuna Tagging Programme (IOTTP). This programme was a combination of a main tagging project, the Regional Tuna Tagging Project in the Indian Ocean (RTTP-IO), funded by the EU (9th EDF, DG-Dev), and several pilot and small-scale tuna tagging projects, funded by the DG-Fish (ex DG-Mare) and the government of Japan.

The specific objective of this programme was to reinforce the scientific knowledge of tropical tuna stocks and the rate of exploitation in the Indian Ocean by obtaining the crucial model parameters for stock assessment.

All the tagging and recapture data is hosted at IOTC and is in the public domain and is available upon request to the Executive Secretary of the IOTC. At the moment, all the data from the RTTP-IO is stored in a stand-alone database developed for the project. In 2012, data from past tagging projects implemented in Maldives in the 1990s were added to the tagging database at the Secretariat, and as of September 2016, this database contains 219,121 releases and 34,340 recoveries.

[9] Field sampler: a person that collects information on land during the unloading of fishing vessels. Field sampling programmes can be used for quantifying catch, retained bycatch, collecting tag returns, *etc.*

[10] Geehan, J (IOTC Secretariat), 2016. IOTC Capacity Building Activities in Support of developing coastal IOTC CPCs: 2016 Activities. Document presented at the 12th Meeting of the Working Party on Data Collection and Statistics of the Indian Ocean Tuna Commission, Seychelles, 28-30 November 2016. *IOTC–2016–WPDCS12–09.*

Tagging data contains the following information:

- Tag series and tag number
- Species
- Fork length
- Data and position of tagging
- Type of tag
- Tagger
- Gear
- Information on the school
- Quality codes

Recovery data contains the following information:

- Species
- Fork length and/or weight at recovery
- If found during fishing: date and position of recovery
- If found during processing: estimated date and position of recovery
- Date of reporting
- Country of reporting
- Gear of recapture
- Place and process where found
- Name of the vessel (*confidential*)
- Name and details of recoverer (*confidential*)
- Reward given (*confidential*)
- Name of staff collecting data and checking data

Every year the IOTC Secretariat prepares and makes available the files including the tagging data to be used for the assessments of tropical tuna species, as required by the WPTT. The tagging data generated by the RTTP-IO, and the broader IOTTP, have been used in the assessments of tropical tuna species since 2008.

Growth curves for the three species and natural mortality rates have also been derived from the tagging data and were updated for some species (i.e., growth rates for yellowfin tuna and skipjack tuna, exploitation rate and natural mortality for skipjack tuna).

APPENDIX I

Resolutions containing requirements for the collection and/or reporting of data to the IOTC

- IOTC Resolution 15/02: ***Mandatory statistical requirements*** *for IOTC Members and Cooperating Non-Contracting Parties (CPC's): Defines IOTC's data reporting procedures for* ***IOTC SPECIES,*** *main* ***shark species*** *caught by IOTC fisheries****,*** *and* ***non-target, associated and dependent species****.*

- IOTC Resolution 15/08: *Procedures on a* ***fish aggregating devices (FADs)*** *management plan, including 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: Applies to IOTC CPCs that have purse seine or baitboat vessels under their flag that catch tuna schools associated to Fish Aggregating Devices. This resolution establishes minimum data requirements for fishing on FADs through a FAD logbook and reporting of aggregated data to the IOTC.*

- IOTC Resolution 15/01: *On the recording of* ***catch and effort data*** *by fishing vessels in the IOTC area of competence: Establishes minima data requirements for the collection of operational catch and effort data on authorized vessels, including the species for which those requirements apply. Data requirements are set for industrial purse seine, longline, drifting gillnet, pole-and-line, trolling, and handline. This Resolutions calls also port states that license foreign fishing vessels to collect logbooks on fishing by those vessels within their EEZs and report this information in aggregated form to the IOTC Secretariat.*

- IOTC Resolution 05/05 *Concerning the conservation of* ***SHARKS*** *caught in association with fisheries managed by IOTC*
    - *Paragraph 1: Contracting Parties, Cooperating non-Contracting Parties (CPCs) shall annually* ***report data for catches of sharks, in accordance with IOTC data reporting procedures, including available historical data****.*
    - *Paragraph 2: The* ***ratio of fin-to-body weight of sharks*** *shall be reviewed by the Scientific Committee and reported back to the Commission in 2006 for revision, if necessary.*

- IOTC Resolution 13/06[11]: *On A Scientific And Management Framework On The Conservation Of Shark Species Caught In Association With IOTC Managed Fisheries*
    - *Paragraph 5: CPCs shall encourage their fishers to record incidental catches as well as live releases of* ***OCEANIC WHITETIP SHARKS****. These data shall be kept at the IOTC Secretariat.*

- IOTC Resolution 12/09 *On the conservation of* ***THRESHER SHARKS*** *(family Alopiidae) caught in association with fisheries in the IOTC area of competence*
    - *Paragraph 4: CPCs shall encourage their fishers to record and report incidental catches as well as live releases. These data will be then kept at the IOTC Secretariat.*
    - *Paragraph 8: The Contracting Parties, Cooperating Non-Contracting Parties, especially those directing fishing activities for sharks, shall submit data for sharks, as required by IOTC data reporting procedures.*

- IOTC Resolution 13/05 *On the conservation of* ***WHALE SHARKS*** *(Rhincodon typus)*
    - *Paragraph 3: CPCs shall require that, in the event that a whale shark is unintentionally encircled in the purse seine net, the master of the vessel shall:*
        b. report the incident to the relevant authority of the flag State, with the following information…
    - *Paragraph 4: CPCs using other gear types fishing for tuna and tuna-like species associated with a whale shark shall report all interactions with whale sharks to the relevant authority of the flag State and include all the information outlined in paragraph 3b(i–v).*
    - *Paragraph 7: CPCs shall report the information and data collected under paragraph 3(b) and paragraph 4 through logbooks, or when an observer is onboard through observer programs, and*

[11] This Resolution was objected to by India and therefore is non-binding to India.

provide to the IOTC Secretariat by 30 June of the following year and according to the timelines specified in Resolution 10/02 (or any subsequent revision).

- IOTC Resolution 12/06 *On reducing the incidental bycatch of **SEABIRDS** in **longline fisheries***
  - *Paragraph 1: CPCs shall record data on seabird incidental bycatch by species, notably through scientific observers in accordance with Resolution 11/04 and report these annually.*

- IOTC Resolution 12/04 *On **MARINE TURTLES***
  - *Paragraph 3: CPCs shall collect (including through logbooks and observer programs) and provide to the IOTC Secretariat no later than 30 June of the following year in accordance with Resolution 10/02 (or any subsequent revision), all data on their vessels' interactions with marine turtles. The data shall include the level of logbook or observer coverage and an estimation of total mortality of marine turtles incidentally caught in their fisheries.*

- IOTC Resolution 13/04 *On the conservation of **CETACEANS***
  - *Paragraph 3: CPCs shall require that, in the event that a Cetacean is unintentionally encircled in the purse seine net, the master of the vessel shall:*
    b. report the incident to the relevant authority of the flag State, with the following information…
  - *Paragraph 4: CPCs using other gear types fishing for tuna and tuna-like species associated with cetaceans shall report all interactions with cetaceans to the relevant authority of the flag State and include all the information outlined in paragraph 3b(i–v).*
  - *Paragraph 7: CPCs shall report the information and data collected under paragraph 3(b) and paragraph 4 through logbooks, or when an observer is onboard through observer programs, and provide to the IOTC Secretariat by 30 June of the following year and according to the timelines specified in Resolution 10/02 (or any subsequent revision).*

- IOTC Resolution 11/04 *On a Regional **OBSERVER SCHEME***
  - *Paragraph 9: CPCs shall provide to the Executive Secretary and the Scientific Committee annually a report of the number of vessels monitored and the coverage achieved by gear type in accordance with the provisions of this Resolution.*
  - *Paragraph 11: …The CPCs shall send within 150 days at the latest each report, as far as continuous flow of report from observer placed on the longline fleet is ensured, which is recommended to be provided with 1°x1° format to the Executive Secretary, who shall make the report available to the Scientific Committee upon request…*