Report on IOTC data collection and statistics

IOTC Secretariat

1. OVERVIEW

This document summarises the standing of a range of information received in accordance with IOTC resolutions and recommendations from its technical groups; in particular Resolution 01/05 *Mandatory statistical requirements for IOTC Members*. It covers the following major data categories (below) and briefly touches on data on bycatch and non IOTC species (Resolution 05/05 *Concerning the conservation of sharks caught in association with fisheries managed by IOTC* and Resolution 06/04 *On reducing incidental bycatch of seabirds in longline fisheries*).

The document describes the progress achieved in relation to the collection and verification of data, identifies problem areas and proposes actions that could be undertaken to improve them. The progress achieved in relation to previous recommendations for the Scientific Committee is also reported.

A list of recommendations for the improvement in the standing of the data currently available at the secretariat is made for the consideration of the Scientific Committee (next page).

The report covers the following areas:

- Overview
- Recommendations to improve the data available to IOTC
- Availability of IOTC statistics for 2006 (timeliness and completeness of data)
- Status of the IOTC nominal catches (NC), catch and effort (CE) and size frequency (SF) databases (Progress and problem areas)
- Other IOTC data holdings: biological data
- Availability of statistics for the IOTC working parties (current standing of the data used by working parties)
- Progress achieved on the recommendations made by the Scientific Committee in 2006
- Catalogues of catch effort and size frequency statistics

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 (IOTC Resolution 07/04; IOTC Resolution 05/03) or on imports of bigeye tuna from vessels under the flag concerned (IOTC Resolution 01/06).

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 and species. Information on the use of fish aggregating devices (FADs) and supply vessels is also collected.

Length frequency data: individual body lengths of IOTC species per fleet, year, gear, type of school, quarter and 5 degrees square areas.

2. RECOMMENDATIONS TO IMPROVE THE DATA AVAILABLE TO IOTC

The following list of recommendations is provided by the Secretariat for the consideration of the Scientific Committee. The recommendations include actions which the Secretariat considers would lead to a marked improvement in the standing of the data currently available at the secretariat and ultimately the provision of

scientific advice to the Commission. In general, these recommendations are made over and above the existing obligations and technical specifications relating to the reporting of data.

1. Improve the certainty of catch and effort data from artisanal fisheries, by:

- Yemen, Comoros and Madagascar implementing fisheries statistical collection and reporting systems.
- Countries having artisanal fisheries, notably Indonesia and Sri Lanka, to improving their collection and reporting of species and gear information.
- Maldives, Iran and Pakistan providing catch and effort data for their artisanal fisheries, notably gillnets, pole and lines and handlines.
- Fisheries data collection agencies in each country, notably those in India and Sri Lanka, collaboratuing to produce one consistent set of catch statistics.
- Members increasing sampling coverage to obtain acceptable levels of precision in their catch and effort statistics.

2. Improve the certainty of catch and effort data from industrial fisheries by:

- The Republic of Korea improving the consistency of its catch and effort statistics.
- Members reporting on the activities of vessels presumed to be from non-reporting fleets.
- Members reporting on total discards of IOTC species.
- Members reporting on IOTC species taken as bycatch.
- Members ensuring that log book coverage is appropriate to produce acceptable levels of precision in their catch and effort statistics.
- Members implementing or increasing coverage of existing Vessel Monitoring Systems in order to be able to validate data collected through logbooks.
- Members increasing observer coverage to produce acceptable levels of precision in their estimates of retained catches and discards.
- Indonesia and Taiwan,China collecting and reporting catch and effort data for their fresh tuna longliner fleets.
- India collecting and reporting catch and effort data for its longline fleet.
- Iran reporting catch and effort data for its industrial purse seine fleet.

3. Increase the amount of size data available to the Secretariat by:

- Members collecting and reporting size data for artisanal fisheries for yellowfin tuna taken by gillnet, handline and troll fisheries; in particular Pakistan, Comoros, Indonesia and Yemen (a non-member).
- India reporting their existing size data.
- Obtaining size frequency data from Thailand and Iran industrial purse seine fleets
- Taiwan,China collecting and providing size data from their fresh tuna longliners.
- China, Philippines and Seychelles providing size data from their longline fleets.
- Japan increasing size sampling coverage from its longline fleet.
- Members reviewing their existing sampling schemes to ascertain that the data collected are representative of their fisheries.

4. To estimate the levels of catches of non-IOTC species by:

- Members implementing appropriate sampling programmes to collect data on the catches of sharks, sea-birds, sea-turtles and sea-mammals in the first instance.

5. Reduce uncertainty in the following biological parameters important for the assessment of stock status of IOTC species by:

- Conversion relationships: Members submitting to the Secretariat the basic data that would be used to establish length-age keys, length-weight keys, processed weight-live weight keys focusing on the major tuna species, swordfish and neritic tunas and sharks.
- Sex ratio: Members undertaking research on the sex ratios of billfish species.
- Members collecting biological information on all the significant species caught in their fisheries, preferably through observer programmes, and providing this information (including the raw data) to the Secretariat.

3. AVAILABILITY OF IOTC STATISTICS FOR 2006

Tables 2i-2v (below) list the fleets for which the Secretariat received or estimated catches for the year 2006. The fleets are listed according to the size of their most recent catches. The standing of the catch, effort, size frequency and craft statistics information received is indicated using colours. Timeliness of reporting and data source are also shown. The availability and standing of statistics for tropical tunas (2i), temperate tunas (2ii), billfish (2iii), neritic tunas (2iv) and sharks, seabirds and sea turtles (2v) are presented separately. The availability of statistics on fishing crafts operating for each fleet is also presented in a separate table (2vi). Brief comments on bycatch, discards and Fishing craft statistics and active vessels are made at the end of this section.

Timeliness and completeness of data

IOTC statistics were available for 15 countries before the deadline of June 30 (cf. 21 in 2006). Partial statistics were provided in most cases. Requests were sent to over fifty countries[1] in April-May 2007. Second and third requests were needed in most cases. The amount of data available before the deadline was similar than that in 2006.

Table 1 shows the extent to which 2006 catch data was available in the IOTC Nominal Catches (NC) database by the deadline for data submission (30 June) and before the Scientific Committee Meeting (October 2007). 40% of the catch was available by 30 June and 79% of the catch was available by October. The proportion of statistics available for 2005 is shown for comparison. Levels of reporting were higher in 2007, especially for nominal catches and size data.

Late reports compromise the validation, verification and utility of data, especially when data are submitted close to or during Working Party meetings.

Table 1. Proportion of the NC, CE and SF statistics available at the IOTC Secretariat compared to the total catches estimated for 2006 (as of 15th October 2007) and proportion of catches available from the flag country (SO) *versus* total catches so far available.

Statistics available for 2005	Estim. Catch	NC		CE		SF	
		BD	SC	BD	SC	BD	SC
IOTC species 1000t	1605	680	1272	527	794	497	680
%Available for 2006		**42**	**79**	**33**	**49**	**31**	**42**
%Available for 2005		43	58	33	43	29	32
Tropical tunas 1000t	1105	594	963	486	699	471	633
Temperate tunas 1000t	34	17	33	2	18	6	12
Billfish 1000t	75	29	54	13	27	15	25
Neritic tunas 1000t	391	39	221	26	50	5	11

Estim. Catch: Total catches estimated
NC: Amount of catch available
CE: Amount of catch for which catches and effort are available
SF: Amount of catch for which size frequency data are available
SO: Amount of catch available from the flag countries
Available before the deadline for data submission (**BD**, 30th June) and at the time of the Scientific Committee Meeting (**SC**)

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

Table 2: Availability of IOTC statistics for the year 2005

Key Tables 2i - 2vi

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 (whithin 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

2i – Tropical tunas (YFT, BET, SKJ)

Gear	Fleet	Availability of statistics					TI	SO	Comments
		Catch	Sps	NC	CE	SF			
PS	EUROPEAN COMMUNITY	306.2	SY						Effort from supply vessels not available
	SEYCHELLES	79.1	SY						Effort from supply vessels not available
	THAILAND	22.6	SB						
	IRAN I R	12.3	YS						
	FRANCE-TERRITORIES	3.0	SY						
	JAPAN	2.8	SB						
	AUSTRALIA	0.4	S						CE confidential
	NEI[1]	28.1	SY						
LL	CHINA	12.6	BY						
	TAIWAN,CHINA	70.6	BY						SF only available for some fresh-tuna longliners (IOTC/OFCF)
	JAPAN	36.0	YB						
	INDONESIA	15.9	YB						SF not available per 5 degrees area
	SEYCHELLES	6.7	BY						SF not available for the industrial longline fleet
	KOREA REP	5.8	YB						
	PHILIPPINES	3.6	YB						
	OMAN	3.5	YB						
	MALAYSIA	1.6	Y						CE not available per 5 degrees area
	EUROPEAN COMMUNITY	1.5	BY						NC and CE not available for all EC flags (UK and Spain)
	THAILAND	0.3	BY						CE not available per 5 degrees area
	SOUTH AFRICA	0.2	Y						
	BELIZE	0.2	Y						CE inconsistent (size of squares)
	MAURITIUS	0.2	Y						SF not available for all species and not per 5 degrees area
	AUSTRALIA	0.1	B						CE confidential; SF not per area
	KENYA	0.0	B						
	INDIA	0.0	Y						Data only available for research vessels
	GUINEA	0.0	Y						NC/CE incomplete (only May-June available)
	SENEGAL	0.0	Y						
	NEI-FROZEN[1]	10.2	YB						
	NEI-FRESH[2]	7.0	Y						Data partially available from IOTC/OFCF sampling schemes
Artisanal	MALDIVES	161.3	SY						CE not available per 5 degrees area; SF not available per gear
	IRAN I R	131.1	SY						
	SRI LANKA	59.8	SY						Data partially available from IOTC/OFCF sampling schemes
	INDONESIA	53.3	SY						
	YEMEN AR RP	19.2	Y						
	OMAN	17.8	Y						NC not available per gear
	INDIA	12.6	SY						NC not available per gear
	COMOROS	9.1	YS						
	PAKISTAN	8.4	SY						
	FRANCE-TERRITORIES	0.8	SY						
	TANZANIA	0.7	Y						
	EUROPEAN COMMUNITY	0.3	Y						
	MAURITIUS	0.1	Y						
	KENYA	0.1	Y						
	JORDAN	0.1	S						
	UK-TERRITORIES	0.0	Y						
	SEYCHELLES	0.0	Y						
	EAST TIMOR	0.0	Y						
	AUSTRALIA	0.0	S						CE confidential
	SOUTH AFRICA	0.0	Y						

Sps Yellowfin tuna (**Y**), bigeye tuna (**B**) and skipjack tuna (**S**)

1 Vessels whose catches are not reported by their flag states

2 Non-reporting vessels from India and Indonesian vessels operating in countries other than Indonesia

2ii – Temperate tunas (ALB, SBF)

Gear	Fleet	Availability of statistics					TI	SO	Comments
		Catch	Sps	NC	CE	SF			
PS	AUSTRALIA	5.9	S						CE confidential
	EUROPEAN COMMUNITY	1.3	A						Effort from supply vessels not available
	SEYCHELLES	0.0	A						Effort from supply vessels not available
	NEI[1]	0.0	A						
LL	CHINA	0.1	A						
	TAIWAN,CHINA	10.4	A						SF only available for some fresh-tuna longliners (IOTC/OFCF)
	JAPAN	9.1	AS						Preliminary catches (not raised)
	INDONESIA	4.6	AS						SF not available per 5 degrees area
	BELIZE	0.7	A						CE inconsistent (size of squares)
	EUROPEAN COMMUNITY	0.8	A						NC and CE not available for all EC flags
	THAILAND	0.1	A						CE not available per 5 degrees area
	KOREA REP	0.2	A						
	MALAYSIA	0.0	A						CE not available per 5 degrees area
	SEYCHELLES	0.1	A						
	SOUTH AFRICA	0.0	A						
	MAURITIUS	0.0	A						SF not available per 5 degrees area
	AUSTRALIA	0.0	A						CE confidential
	KENYA	0.0	A						
	NEI-FROZEN[1]	0.6	A						
	NEI-FRESH[2]	0.2	A						Data partially available from IOTC/OFCF sampling schemes
ART	EUROPEAN COMMUNITY	0.1	A						
	AUSTRALIA	0.0	A						CE confidential
	SOUTH AFRICA	0.0	A						

Sps Southern bluefin tuna (**S**) and albacore (**A**)
1 Vessels whose catches are not reported by their flag states
2 Non-reporting vessels from India and Indonesian vessels operating in countries other than Indonesia

2iii – Billfish (SWO, MARL, sFA, ssP)

Gear	Fleet	Availability of statistics					TI	SO	Comments
		Catch	Sps	NC	CE	SF			
LL	CHINA	1.0	S						
	TAIWAN,CHINA	13.1	SM						SF only available for some fresh-tuna longliners (IOTC/OFCF)
	EUROPEAN COMMUNITY	9.0	S						NC and CE and SF not available for all EC flags
	JAPAN	3.4	SM						
	INDONESIA	3.1	SM						SF not available per 5 degrees area
	SEYCHELLES	1.0	S						SF not available for the industrial longline fleet
	GUINEA	0.8	S						NC/CE incomplete (only May-June available)
	MAURITIUS	0.7	S						SF not available for all species and not per 5 degrees area
	KOREA REP	0.6	SM						
	KENYA	0.3	S						
	AUSTRALIA	0.3	S						CE confidential; SF not per area
	MALAYSIA	0.3	SF						CE not available per 5 degrees area
	SOUTH AFRICA	0.2	S						
	PHILIPPINES	0.1	S						
	SENEGAL	0.1	S						
	BELIZE	0.0	S						CE inconsistent (size of squares)
	OMAN	0.3	MS						
	INDIA	0.0	F						Data only available for research vessels
	THAILAND	0.0	MS						CE not available per 5 degrees area
	NEI-FROZEN[1]	3.8	MS						
	NEI-FRESH[2]	0.9	S						Data partially available from IOTC/OFCF sampling schemes
Artisanal	SRI LANKA	10.9	FM						Data partially available from IOTC/OFCF sampling schemes
	IRAN I R	10.6	F						
	INDIA	7.8							
	PAKISTAN	3.5							
	INDONESIA	0.8							
	TANZANIA	0.6							
	COMOROS	0.4	F						
	OMAN	0.3	F						NC not available per gear
	MAURITIUS	0.3							
	KENYA	0.2	F						
	UN ARAB EMIRATES	0.1							
	EUROPEAN COMMUNITY	0.0	F						
	FRANCE-TERRITORIES	0.0	F						
	SAUDI ARABIA	0.0	F						
	SEYCHELLES	0.0	F						
	UK-TERRITORIES	0.0	M						

Sps Swordfish (**S**), blue marlin and/or black marlin and/or striped marlin (**M**), Indo-Pacific sailfish (**F**) and short-billed spearfish (**P**)
1 Vessels whose catches are not reported by their flag states
2 Non-reporting vessels from India and Indonesian vessels operating in countries other than Indonesia

2iv – Neritic tunas (FRZ, LOT, KAW, COM, GUT, STS, WAH)

Gear	Fleet	Availability of statistics					TI	SO	Comments
		Catch	Sps	NC	CE	SF			
PS	IRAN I R	2.3	L						Statistics incomplete for industrial purse seiners
	AUSTRALIA	1.9	K						CE confidential
	EUROPEAN COMMUNITY	0.4	F						Statistics incomplete
	SEYCHELLES	0.2	F						Statistics incomplete
LL	INDONESIA	0.1	W						
	CHINA TAIWAN,CHINA	0.0	W						
	AUSTRALIA	0.0	W						CE confidential
	EUROPEAN COMMUNITY	0.0	W						NC not available for all EC flags
	SOUTH AFRICA	0.0	W						
	THAILAND	0.0	W						CE not available per 5 degrees area
	INDIA	0.0							Data only available for research vessels
	KENYA	0.0	W						
	NEI-FROZEN[1]	0.0	W						
	NEI-FRESH[2]	0.0	W						Data partially available from IOTC/OFCF sampling schemes
Artisanal	INDONESIA	110.8	KL						
	INDIA	104.5	CK						NC not available per gear
	IRAN I R	50.7	LK						
	MALAYSIA	20.3	KL						NC and CE not fully available per species
	THAILAND	16.9	KL						NC and CE not fully available per species
	PAKISTAN	13.6	CL						
	OMAN	13.2	LC						NC not available per gear
	MADAGASCAR	12.0	C						
	YEMEN AR RP	11.9	LK						
	UN ARAB EMIRATES	8.4	CL						
	SAUDI ARABIA	7.8	C						
	MALDIVES	5.2	FK						CE not available per 5 degrees area; SF not available per gear
	SRI LANKA	4.7	CF						Data partially available from IOTC/OFCF sampling schemes
	QATAR	1.9	C						
	KENYA	1.2	C						
	EGYPT	0.9	C						
	COMOROS	0.7	K						
	TANZANIA	0.5							
	SEYCHELLES	0.4	K						CE not available per 5 degrees area
	AUSTRALIA	0.3	C						CE confidential
	KUWAIT	0.2	G						
	ERITREA	0.1	C						
	BANGLADESH	0.1							
	BAHRAIN	0.1	C						
	DJIBOUTI	0.1							
	JORDAN	0.0	K						
	EUROPEAN COMMUNITY	0.0	W						
	SUDAN	0.0	C						
	SOUTH AFRICA	0.0	G						
	UK-TERRITORIES	0.0	K						

Sps Longtail tuna (**L**), frigate tuna and/or bullet tuna (**F**), kawakawa (**K**), narrow-barred Spanish mackerel (**C**), Indo-Pacific king mackerel (**G**), streaked seerfish (**S**) and wahoo (**W**)

1 Vessels whose catches are not reported by their flag states

2 Non-reporting vessels from India and Indonesian vessels operating in countries other than Indonesia

2v – Sharks seabirds and sea turtles

Gear	Fleet	Species					Comments
		Sharks			Sea Birds	Sea Turtles	
		NC	CE	SF			
PS	EUROPEAN COMMUNITY				n/a		Preliminary results from observer programmes reported to WPEB
	SEYCHELLES				n/a		
	THAILAND				n/a		
	IRAN I R				n/a		
	AUSTRALIA				n/a		
	FRANCE-TERRITORIES				n/a		
	JAPAN				n/a		
	NEI				n/a		
LL	CHINA						NC catches might be estimated from available catches in the past
	TAIWAN,CHINA						NC not per species; NC incomplete; SF from IOTC-OFCF sampling
	JAPAN						Preliminary results from observer programmes reported to WPEB
	INDONESIA						NC not per species; NC incomplete
	EUROPEAN COMMUNITY						NC/CE not available for all fleets and/or not per species
	SEYCHELLES						NC/CE not per species; NC/CE likely to be incomplete
	KOREA REP						NC estimated by the IOTC Secretariat (incomplete and not per species)
	OMAN						NC/CE not per species; NC/CE likely to be incomplete
	PHILIPPINES						NC catches might be estimated using catches from other fleets
	MALAYSIA						NC/CE not per species; NC/CE likely to be incomplete
	BELIZE						NC not per species; NC likely to be incomplete
	MAURITIUS						NC/CE not per species; NC/CE likely to be incomplete
	GUINEA						NC/CE incomplete (only May-June available; not per species)
	THAILAND						NC catches might be estimated from available catches in the past
	SOUTH AFRICA						Preliminary results from observer programmes reported to WPEB
	AUSTRALIA						NC likely to be incomplete
	KENYA						NC estimated by the IOTC Secretariat (not per species)
	SENEGAL						NC estimated by the IOTC Secretariat (incomplete)
	INDIA						Preliminary results from observer programmes reported to WPEB
	MADAGASCAR						NC catches might be estimated using catches from other fleets
	NEI-FROZEN[1]						NC estimated by the IOTC Secretariat (incomplete and not per species)
	NEI-FRESH[2]						NC/SF estimated by the IOTC Secretariat (incomplete and not per species)
Artisanal	IRAN I R				n/a		NC catches presumed to be high
	MALDIVES				n/a		NC catches presumed to be low
	INDONESIA				n/a		NC not per species; NC likely to be incomplete
	INDIA				n/a		NC catches presumed to be high
	SRI LANKA				?		NC/CE not fully per species
	OMAN				n/a		NC estimated by the IOTC Secretariat (not per species)
	YEMEN AR RP				n/a		NC estimated by the IOTC Secretariat (incomplete and not per species)
	PAKISTAN				n/a		NC estimated by the IOTC Secretariat (incomplete and not per species)
	MALAYSIA				n/a		NC/CE not per species
	THAILAND				n/a		NC catches presumed to be low
	MADAGASCAR				n/a		NC catches presumed to be low
	COMOROS				n/a		NC catches presumed to be low
	UN ARAB EMIRATES				n/a		NC estimated by the IOTC Secretariat (not per species)
	SAUDI ARABIA				n/a		NC estimated by the IOTC Secretariat (not per species)
	QATAR				n/a		NC catches presumed to be low
	TANZANIA				n/a		NC estimated by the IOTC Secretariat (not per species)
	KENYA				n/a		NC/CE only available for sport fishery
	EGYPT				n/a		NC estimated by the IOTC Secretariat (not per species)
	FRANCE-TERRITORIES				n/a		NC not per species
	SEYCHELLES				n/a		NC catches presumed to be low
	EUROPEAN COMMUNITY				n/a		NC/CE likely to be incomplete
	MAURITIUS				?		NC catches presumed to be low
	AUSTRALIA				?		Catches likely to be incomplete
	KUWAIT				n/a		NC catches presumed to be low
	ERITREA				n/a		NC estimated by the IOTC Secretariat (not per species)
	JORDAN				n/a		NC catches presumed to be low
	BANGLADESH				n/a		NC catches presumed to be low
	BAHRAIN				n/a		NC catches presumed to be low
	DJIBOUTI				n/a		NC catches presumed to be low
	SUDAN				n/a		NC estimated by the IOTC Secretariat (not per species)
	UK-TERRITORIES				n/a		NC/CE not per species
	SOUTH AFRICA				?		NC likely to be incomplete
	EAST TIMOR				n/a		NC catches presumed to be low

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

1 Vessels whose catches are not reported by their flag states

2 Non-reporting vessels from India and Indonesian vessels operating in countries other than Indonesia

2vi – Fishing craft statistics and list of active vessels

Gear	Industrial purse seine (**PS**), industrial longline (**LL**) and artisanal gears (**ART**)	**Availability**	Fully available Partially available Not available
Catch	Recent catches amounting to (thousands of tonnes)		
Craft	Number of craft operated (2006) (blank if unknown)	**SO** Data Source	Statistics fully available from flag country Statistics partially available from flag country Statistics available from sources other than flag country
FC	Fishing craft		
AV	List of active vessels		

Gear	Fleet	Availability				SO	Comments
		Catch	Craft	FC	AV		
PS	EUROPEAN COMMUNITY	307.9	40				Names, flags and characteristics of supply vessels not available
	SEYCHELLES	79.3	10				
	THAILAND	22.6	6				
	IRAN I R	14.6	9				
	AUSTRALIA	8.2	14				Does not include vessels operating between 140 East and 150 East
	FRANCE-TERRITORIES	3.0	1				
	JAPAN	2.8	3				
	NEI	28.1	1				One vessel in operation according to IOTC IUU list
	SUPPLY VESSELS-NEI		13				Names and characteristics of supply vessels not fully available
LL	CHINA	13.7	67				41 deep-freezing longliners plus 26 fresh-tuna longliners
	TAIWAN,CHINA	94.1	685				344 deep-freezing longliners plus 341 fresh-tuna longliners
	JAPAN	49.8	141				Numbers are preliminary
	INDONESIA	21.9	1,202				Total number of fresh-tuna longliners unknown (around 1,200)
	EUROPEAN COMMUNITY	11.2	49				Vessels having LOA above 15m. Vessels from the UK not reported
	SEYCHELLES	7.8	26				
	KOREA REP	6.6	28				Active vessel list not provided (vessels available from other sources)
	OMAN	3.8	69				Fishing craft likely to include foreign vessels
	PHILIPPINES	3.7	18				
	MALAYSIA	2.1	28				
	BELIZE	0.9	8				
	MAURITIUS	0.9	8				Data from previous year repeated
	GUINEA	0.9	3				
	THAILAND	0.5	3				
	SOUTH AFRICA	0.5	14				
	AUSTRALIA	0.4	4				Does not include vessels operating between 140 East and 150 East
	KENYA	0.4	1				Data from previous year repeated
	SENEGAL	0.1	3				
	INDIA	0.0	82				
	MADAGASCAR	0.0	2				
	NEI-FROZEN[1]	11.7	41				Preliminary data
Artisanal	IRAN I R	192.4	6,722				752 oceanic gillnetters
	MALDIVES	166.5	995				
	INDONESIA	164.9					
	INDIA	124.8					
	SRI LANKA	75.5					No data for vessels operating outside the EEZ of Sri Lanka
	OMAN	31.4	13,706				
	YEMEN AR RP	31.2					
	PAKISTAN	25.5					
	MALAYSIA	20.3					
	THAILAND	16.9	990				
	MADAGASCAR	12.0					
	COMOROS	10.3					
	UN ARAB EMIRATES	8.5					
	SAUDI ARABIA	7.8					
	QATAR	1.9					
	TANZANIA	1.7					
	KENYA	1.5					
	EGYPT	0.9					
	FRANCE-TERRITORIES	0.8	350				
	SEYCHELLES	0.4	334				
	EUROPEAN COMMUNITY	0.4	238				Vessels are below 15 m
	MAURITIUS	0.4					
	AUSTRALIA	0.3	55				Does not include vessels operating between 140 East and 150 East
	KUWAIT	0.2					
	ERITREA	0.1					
	JORDAN	0.1					
	BANGLADESH	0.1					
	BAHRAIN	0.1					
	DJIBOUTI	0.1					
	SUDAN	0.0					
	UK-TERRITORIES	0.0	47				
	SOUTH AFRICA	0.0	21				
	EAST TIMOR	0.0					

1 Vessels whose activities are not reported by the flag states

- **By-catch**: Few statistics are available for sharks, seabirds, sea turtles (Table v) (and other non-IOTC species caught by fleets targeting tunas and/or tuna-like species); furthermore the quality of the available data is poor.. The statistics are seldom available by species or gear and refer only to the shark carcasses that are retained on board. Almost no statistics are available for other shark products, such as shark fins.
- **Discards**: Discards are only available for Australia, EC, France TAAF and Oman in 2006. Discard rates are believed to be high, especially from longliners, oceanic gillnets and in purse seiners setting on logs.
- **Fishing craft statistics and active vessels**: Fishing craft statistics are generally available for fleets whose catches are available. Craft statistics are not available, incomplete or inaccurate for many artisanal fleets. The number of non-reporting vessels operating in the Indian Ocean was re-estimated this year from new information collected through the IOTC Sampling Programs and new vessel records.

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

Main progress achieved during 2007

The main progress achieved in the collection and verification of the data in the IOTC Nominal catches (NC), by-catch (BY), catch and effort (CE) and size frequency (SF) databases are summarized in Table 3 below (more information is provided in Section 7, Box 1 and in the Boxes referred to in **FLAG**):

Table 3: Status of the IOTC NC, CE and SF tables: Main Progress Achieved since the last SC Meeting

DB	FLAG/S	PERIOD	SPECIES	DETAILS OF ACTIVITY	SOURCES	CHANGES IN DATA
NC	ALL	1950-2006	ALL	Disaggregation of catches recorded under gear and/or species aggregates in the IOTC database	Nominal Catches tables in the IOTC Database (WPTT-04-06)	No changes in the IOTC Database; the decomposition of the catches was conducted for the WPTT
	Indonesia's artisanal fleets	1950-2005	KAW, LOT	Indonesia reported catches fully per species for 2004-05. The Secretariat used the proportion KAW:LOT to break the catches for1950-2003, previously reported as TUX	Indonesia changed its sampling design to be able to produce catches per species for all IOTC species	Very significant decrease in the amount of catches that are not available per species Significant increase in the catches estimated for kawakawa and longtail tuna
	India's artisanal fleets	1950-2006	Neritic tunas	Disaggregation of catches per gear and species for the entire catch data series	Catches recorded per gear and species for several years	Very significant decrease in the amount of catches that are not available per gear and/or species
	Indonesia **(BOX 2A)**	2005-2006	BET, YFT, SWO	New catches available for longline fleets	DGCF/RIMF/CSIRO/IOTC OFCF Sampling in Benoa, Jakarta and Cilacap	The catches estimated for 2005-2006 are lower than those from previous years
	Taiwan,China **(BOX 2A)**	2000-2006	YFT, BET, SWO	Catches of fresh-tuna longliners available	OFDC Web site	The catches are now available from the internet
	Non-reporting fresh tuna longliners operating under several flags **(BOX 2 A)**	2005-2006	YFT, BET, SWO	Re-estimation of the catches of non-reporting fresh tuna longliners thanks to the new information available (IOTC/OFCF Program)	AFRDEC Sampling FRI Sampling NARA Sampling MFA Maldives SFA background information	Most of the catches refer now to Indonesian vessels based in countries other than Indonesia. The catches of non-reporting longliners from India were also estimated as being fresh-tuna
	Non-reporting deep-freezing longliners **(BOX 2 B)**	2000-2005	YFT, BET, ALB, SBF	New review of the series of catches from data collected recently	IOTC Vessel Records IOTC Activity Records	Change in recent year catches. Current catches are lower than those previously recorded.
	Thailand **(BOX 2 C)**	2005-06	SKJ, YFT, BET	New catches available for industrial purse seiners (ex-Soviet PS)	DOF (AFRDEC)	Catches available for the last quarter of 2005 (the time the vessels changed the flag to Thailand) and January-December 2006.
	Non-reporting industrial purse seiners	2005-06	SKJ, YFT, BET	New review of the series of catches from data collected recently	IUU vessel list	One purse seiner has been operating in recent years. Catches estimated by using average catches from previous years and catch trends for vessels from the EC.

DB	FLAG/S	PERIOD	SPECIES	DETAILS OF ACTIVITY	SOURCES	CHANGES IN DATA
	Yemen **(BOX 3)**	2003-06	YFT, KAW, COM	New review of catches	IOTC Mission to Yemen (MFW, MSRRC)	Significant drop in the catches of YFT estimated for 2005 and 2006
BY	ALL	1950-2006	All shark species	The Secretariat created draft executive summaries for main shark species for the WPEB	Background information	No changes in data
CE	Soviet & Ex-Soviet industrial Purse seiners	1985-87; 1991; 1992-94	YFT, BET, SKJ	New catches and effort series available for industrial longliners	IRD France (Dr. E. Romanov)	Catches and effort available per species
	EC Portugal	2005-2006	SWO, BET	Catches and effort data available as per IOTC standards for industrial longliners	DGPA	New Catches and effort input (previous CE data was not available per 5 degrees square grid and month)
	Taiwan,China	1967-1995	YFT, BET, SWO	Catches raised from processed to round weight	Pers.com.	Change in the proportion YFT:BET:SWO in the catches and effort
	ALL	1950-2006	BET, YFT, SKJ	Catches per month and 5 degrees square grid raised to total catches (Atlas)	IOTC Database Background information	Information prepared for the WPTT; no new data input
SF	China, Taiwan,China, Indonesia Other fresh-tuna longliners	1998-2006	YFT, BET, SWO	Validation and verification of size frequency records (fresh tuna longliners) for data input Estimation of CAS for fresh-tuna longliners	IOTC Sampling Programmes Ship operators (processing plants)	Size data input to the IOTC database
	Maldives	1997-2006	SKJ, YFT, KAW, FRI, SFA	New Size Frequency Data available	MFAR, Maldives	New data input per atoll and month
	Taiwan,China	1980-2005	YFT, BET, SWO, ALB	New data from DWF longliners from Taiwan,China	Data downloaded from the internet	Length data available per month and 10 * 20 degrees areas (same resolution as Japanese data) or IOTC area
	ALL	1950-2006	BET, YFT, SKJ	Building of Catch-At-Size and Catch-At-Age matrices	IOTC Database Background information	Information prepared for the WPTT; no new data input

Problem Areas Identified

Despite the progress achieved regarding the statistics in the IOTC NC, BY, CE and SF databases in recent years, there are still several problems regarding the completeness and quality of the data which should be addressed. The main areas of concern regarding the statistics in these databases are summarized in Table 4 below. Additional documentation about each case is provided in Section 7, Box 1 and the different Boxes referred to in **PROBLEM**, found in the pages following the Table.

Table 4: Status of the IOTC NC, CE and SF databases: Problem Areas Identified

DB	PROBLEM	SPECIES	FLAG/S	PERIOD	REASON/S	PROPOSED ACTION/S
NC	Statistics not available from the flag country **(BOX 3)**	YFT, BET, ALB, SBF, SWO, BIL	IND, PAN, HND, GNQ, BOL, KHM, NAM, TGO, UKR	1980 to Date	Fisheries not monitored by the flag countries	Identify the fleets for which important tuna catches have been unreported over the years (through retrieval of vessel and, especially, activity and port calls records)
		Mainly tropical and neritic tunas	YEM, COM MDG, SOM, MOZ, MMR, KEN, TZA	Various	Statistical system unable to produce reliable estimates of catches (as regards IOTC species)	Identify the deficiencies in data collection and processing in the countries concerned
		All	ARE, EGY, PAK	Various	Statistics probably available at the country level but not reported	Identify the reasons why the catches are not reported by the flag countries
	Species and/or gear aggregation	Neritic Tunas Billfish	IDN, IND, THA, LKA, PAK,	1950 to date	Statistical systems unable to produce detailed estimates of catches	Identify the deficiencies in data collection and processing in the countries concerned

DB	PROBLEM	SPECIES	FLAG/S	PERIOD	REASON/S	PROPOSED ACTION/S
	Poor quality	All	Non-reporting DWFNs, Industrial purse seiners from Iran, Artisanal fisheries of PAK, **LKA**, THA, IND, IDN	Various	The catches available are thought unreliable or inaccurate due to inconsistencies found during the verification processes or to the many assumptions made to produce the final catches	Continue the collection of past and recent data through the IOTC sampling programmes in ports of call of fresh-tuna longliners. Continue with the collection of activity records of non reporting fleets Identify the reasons why the catches provided by several countries are of poor quality
BY	Statistics not available from the flag country	All shark species	Most industrial fleets (LL and PS) Some artisanal fleets (IDN, YEM)	1950-2006	Same as NC above	Same as NC above
	Species and/or gear aggregation	All shark species	Most industrial fleets (LL and PS)	1952-2006	Same as NC above	Same as NC above
DI	Statistics not available from the flag country or highly aggregated	Undersized or spoiled tunas (YFT, BET, SKJ), Sharks, low-value or spoiled billfishes (SSP, SFA) and other species	All, especially industrial fleets and oceanic gillnets	1952 to date	Most of the discards are unreported and when reported they are usually incomplete and highly aggregated	Collect data on industrial fisheries through observer programs
CE & SF	Statistics not available from the flag country	All, especially Neritic tunas and Billfish	Many artisanal Oceanic gillnets from Iran and Pakistan, Longliners from IND (CE+SF), IDN (CE), BLZ (SF), PHL (SF), SYC (SF) Industrial PS from the EC, Seychelles (Effort supply vessels and FADs), Iran (CE+SF) and Thailand (SF) Non-reporting longline DWFNs	1950 to date	Catch and effort (size frequency) statistics not collected by the flag country	Assess the availability of records from other sources, especially in fleets which the retrieval of catch and effort (size frequency) records is considered important
					Statistical systems unable to produce reliable catch and effort (size frequency) estimates	Identify the deficiencies in data collection and processing in the countries concerned
					Catch and effort (size frequency) statistics collected by the flag country but no or incompletely reported to the IOTC	Identify the reasons why the catch and effort (size frequency) records are not reported by the flag countries
	Poor Quality	Tropical Tunas Billfish	KOR (CE/SF), BLZ (CE), PHL (CE), JPN (SF)	Various	Inconsistencies found during the validation and verification of catch and effort (size frequency) records or communicated by the sources reporting the data	Identify the reasons why the data are inconsistent and the ways in which these inconsistencies might be reduced (this would require a perfect knowledge about the way the catch and effort statistics are collected and processed in the country reporting the data)
					Low coverage	Identify the reasons why the fleets concerned are poorly covered and the ways in which the fleets might be better monitored Assess the availability of records from other sources, especially in fleets which the retrieval of catch and effort (size frequency) records is considered important

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

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. This data includes the numbers (fishing craft) and/or characteristics (Vessels Active Lists) of the vessels operating within their EEZ or calling to ports in their territory (Port Inspection List).

The catches for non-reporting 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 (that the non-reporting fleets were thought to operate in) and targeted the same species.

Data Availability

Data from artisanal fisheries are scarce and inconsistent in many cases. On the contrary, the statistics of industrial 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. This fleet is flagged mainly from the European Community, Seychelles, Iran, Japan and Thailand.

Longline fleets: There are many more longline fleets fishing tuna in the Indian Ocean, mainly under the flags of Australia, Belize, China, Taiwan,China, the EC, India, Indonesia, Japan, Kenya, the Republic of Korea, Madagascar, Malaysia, Mauritius, Oman, Philippines, Senegal, Seychelles, South Africa, Thailand and other longliners operating under various flags of non-reporting countries. The total number of non-reporting longliners has been estimated for 2003-05.

Main Progress Achieved during 2006

The progress achieved in the collection and verification of the data in the IOTC FC and AV databases is summarized in the Table 5 below.

Table 5: Status of the IOTC FC, VR and FTVA databases: main progress achieved

DB	FLAG/S	SOURCES	PERIOD	DETAILS	MAIN RESULTS
FC	Non reporting DWFNs	IOTC Active Vessels List	2000-05	Review to complete the craft statistics	Number of non-reporting deep-freezing longliners better known: Around 40 in recent years
	Non- reporting Fresh-tuna longliners	IOTC Sampling Programmes WASKI Indonesia DGCF Indonesia CSIRO Australia RIMF Indonesia	2000-05	Review to complete the number of fresh tuna longliners operating in the Indian Ocean	Number Indonesian fresh tuna longliners input: Around 1,200 boats in all in recent years. Current numbers are decreasing.
	Fresh-tuna longliners from Taiwan,China	Data downloaded from the internet	2006	Number of fresh-tuna longliners operating in the Indian Ocean published	341 vessels input for 2006
	Commercial Longline fleet	FSI India MAF Oman	2005-06	India reported 82 longliners operating under its flag Oman reported 69 longliners operating under its flag	Vessels input to fishing craft statistics
AV	All Industrial	AVA Singapore NARA Sri Lanka MAF Oman AFDEC Thailand (IOTC) CSP Madagascar DGCF Indonesia FRC Albion Mauritius SFA Seychelles Fisheries Administration Mozambique Fisheries Department Kenya DPMA France TAAF MRAG BIOT Japan (list of IUU vessels)	2000-06	Reporting of foreign tuna fleets putting in to ports or licensed to operating within the EEZ of these countries	New vessel and activity records input
	Belize, Senegal, Thailand, Oman	INMARBE Belize CRODT Senegal DOF Thailand	2003-06	Submission of names and characteristics of ships fishing for tunas in the Indian Ocean	Number of vessels operating better known

Problem Areas Identified

The main area problems identified in the IOTC database concerning the tuna fleets operating in the Indian Ocean are summarised in the Table 6 below. Several alternative actions to undertake to reduce these uncertainties are proposed in the right column.

Table 6: Status of the IOTC FC, VR and FTVA databases: problem areas identified

DB	PROBLEM	FLAG/S	PERIOD	REASON/S	PROPOSED ACTION/S
FC	Series incomplete for important longline fleets	TWN (fresh-tuna), IDN, BLZ, PAN, HND, GNQ, BOL, VCT	1980 to date	Lack of information, especially regarding the first years of operation	Continue collecting data through the IOTC sampling schemes (fresh-tuna longliners) Identify the fleets for which important tuna catches have been unreported over the years (through retrieval of vessel and, especially, activity records)
	No data or data inconsistent regarding many artisanal fleets	Many artisanal	1950 to date	Statistics not available	Identify the reasons why the statistics are not provided
				Statistical systems unable to produce reliable fishing craft statistics	Identify the deficiencies in data collection and processing in the countries concerned
	Lack of detailed information	All	1950 to date	Incomplete data (vessel size, mechanization, etc. not available)	Identify the reasons why the statistics are not complete
AV	Data not available	ZAF (foreign fleets) IND (commercial longliners), HND, EQG	1998-06	Fleets not monitored by the flag countries Statistics available but not provided	Continue the collection of information through the IOTC sampling programmes Continue collecting information on foreign fleets from third sources
	Information incomplete or inconsistent	All industrial, especially non-reporting flags	1995-06	Ship names, identification or characteristics mistakenly recorded Ship characteristics inconsistent between reports Lack of information about ship activity in the Indian Ocean (vessels bearing licenses to operate but not actually operating)	

6. OTHER IOTC DATA HOLDINGS: BIOLOGICAL DATA

Table 7 shows other datasets available at the IOTC Secretariat:

Table 7: Biological data available at IOTC

TYPE OF DATA	RAW DATA	PERIOD	SOURCE
Length-length-weight data of tuna and billfish caught by fresh tuna longliners in the Indian Ocean	Available	2000-06	AFDEC Thailand (IOTC Sampling Programmes) NARA Sri Lanka (IOTC Sampling Programs) RIMF Indonesia (IOTC Sampling Programs) FRI Malaysia (IOTC Sampling Programs) IFREMER Reunion-France (PPR Programme) BRS (Pelagic Observer Program)
Length-length-weight-sex-maturity of tuna and tuna-like species caught by longliners and purse seiners within the EEZ of Chagos	Available	1996-06	MRAG United Kingdom (observer data)
Length-weight-sex data of tuna species caught by longliners from the republic of Korea	Available	2001-03	MOMAF Korea
Length-length-weight-sex of sharks caught as a by-catch by Spanish longline vessels	Available	2006-07	IEO Spain
Compilation of biological data collected during several years at the IOT canning factory (Seychelles)	Not available	1984-2006	IRD and SFA
Biological data available from Atlantic: -Length-length-weight data of tuna and billfish -Relationships between straight and curved body measurements -Length-length-weight data of sharks Biological data available from Pacific: -Length-length-weight data of billfish	 Not available Available Available Not available Not available	 1992-04 1992-04 - 2004	 ICCAT, Literature NMFS Pelagic Observer Program NMFS Pelagic Observer Program Literature SPC, Literature

The Secretariat presented a document to the Working Party on Tropical Tunas on the status of data holdings regarding the biological information available on tuna and billfish species (IOTC-2007-WPTT-03).

7. AVAILABILITY OF STATISTICS FOR THE IOTC WORKING PARTIES

The IOTC Secretariat prepares the data that is used for stock assessment by various IOTC Working Parties. This includes, for each species:

- Total catches, usually made up of the catches retained on board plus those of fish not retained that dies due to the gear (catches discarded plus mortality of unloaded fish caused by gear)
- Nominal CPUE series and trends in average weight from various fisheries and as long in time as possible: These series are derived from the available catches and effort data (CE) and size data (SF), respectively, and might be used by the Working Parties as stock status indicators.
- Catch-at-size (CAS) and/or catch at-age (CAA) tables, i.e. the number of fish caught per length(age) class for each fleet and time-area strata. These tables are used by the Working Parties that use length or age based models to assess the status of the stocks under its responsibility. The Secretariat uses the following data to build these tables:
    - Total catches per fleet and time-area strata: These data are derived from the available catches per area (catch and effort table) and the total catches estimated for each species and fleet.
    - Length frequency data per fleet and time-area strata: These data are derived from the available size data (size frequency data table).
    - Other biological information, required for:
        - Standardizing the available size data: The Secretariat uses several types of equations to convert from non-standard size to standard length, as
            - Processed length – Standard length equations
            - (Processed) weight – Standard length equations
        - Estimating sampled weight: The Secretariat estimates the weight of the available size data (samples) to be able to convert from sampled length frequencies to total length frequencies. Several length-weight equations are used, depending on the species and the fishery.
        - Estimating age: The estimated lengths are converted into age by using the available length-age keys.
        - Estimating sex-ratio: Information on the amount of specimens caught by sex is important for some species, notably the swordfish and other billfish. The Secretariat uses information from samples where the sex, apart from the size of each specimen, is recorded to estimate CAS and CAA independently for each sex.

Uncertainty in the data

A summary of the standing of the data to the Secretariat and derived indicators is provided for each of the major tuna species and swordfish below. Summaries for other billfish species is provided in BOX 1. Summaries for the neritic species will be provided for the next meeting of the WPN (Iran, November 2007).

The uncertainty in the catch estimates has been assessed by the Secretariat and is based on the amount of processing required to account for the presence of conflicting catch reports, the level of aggregation of the catches by species and or gear, and the occurrence of non-reporting fisheries for which catches had to be estimated.

The uncertainty in the catch at size data has been assessed by the Secretariat as is based on the amount of the catch for which size data are not available or are unrepresentative and need to be estimated.

YELLOWFIN TUNA (YFT)

Retained catches are generally well known; however, catches are uncertain for:

- many artisanal fisheries, notably Indonesia, Sri Lanka, Yemen and Comoros
- non-reporting industrial purse seiners and longliners (NEI, India).

Discards are believed to be low although they are unknown for most industrial fisheries, notably industrial purse seiners.

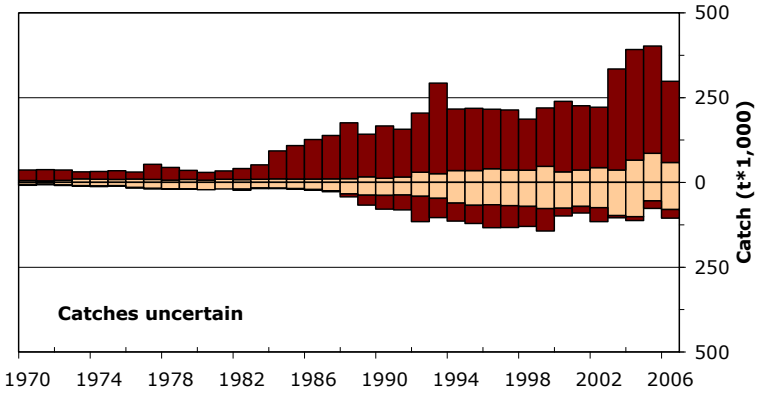


***Figure**. Uncertainty of annual catch estimates for yellowfin tuna. The amount of the catch below the zero-line has been categorised as uncertain according to the criteria given in the text. Light bars represent data for artisanal fleets and dark bars represent data for industrial fleets. Data as of October 2007*

CPUE Series: Catch and effort series are available from various industrial and artisanal fisheries. Nevertheless, catch and effort are not available for important artisanal fisheries or they are considered to be of poor quality:

- poor quality data available for the fresh-tuna longline fisheries of India, Indonesia and Taiwan,China
- poor quality effort data for the gillnet/longline fishery of Sri Lanka
- no data available for the artisanal fisheries of Yemen, Pakistan, Iran and Comoros
- no data available for the pole and line fishery of Maldives in recent years.

Trends in average weight can be assessed for several industrial fisheries but they are very incomplete or poor quality for some artisanal gears, namely hand lines, troll lines and many gillnet fisheries (Yemen, Oman, Indonesia).

Catch-at-Size(Age) table: This is available although the estimates are more uncertain in some years and fisheries due to:

- size data are not available for most artisanal fisheries, notably Yemen (lines and gillnets), Pakistan and Comoros (lines).
- a paucity of size data available from industrial longliners from the late-1960s up to the mid-1980s and in recent years (Japan, Seychelles, Philippines, India, China)
- a paucity of catches per species, type of school fished or area available for some industrial fleets (NEI).

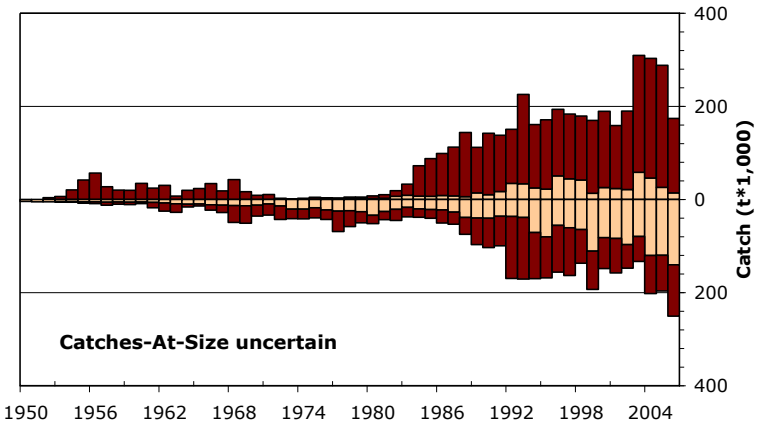


***Figure**. Uncertainty of catch at size data for yellowfin tuna. The amount below the zero-line indicates the amount of catch for which the estimated catch at size has been categorised as uncertain according to the criteria given in the text. Light bars represent data for artisanal fleets and dark bars represent data for industrial fleets. Data as of June 2007*

BIGEYE TUNA (BET)

Retained catches are generally well known; catches are uncertain for non-reporting industrial purse seiners and longliners (NEI) and for other industrial fisheries (longliners of India and Philippines).

Discards are believed to be low although they are unknown for most industrial fisheries, notably industrial purse seiners.

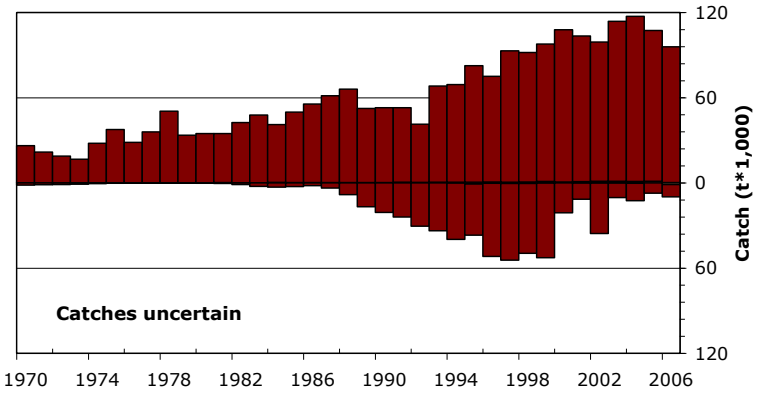


***Figure**. Uncertainty of annual catch estimates for bigeye tuna. The amount of the catch below the zero-line has been categorised as uncertain according to the criteria given in the text. Light bars represent data for artisanal fleets and dark bars represent data for industrial fleets. Data as of October 2007*

CPUE Series: Catch and effort series are available from various industrial fisheries. Nevertheless, catch and effort are not available from some fisheries or they are considered to be of poor quality, especially throughout the 1990s:

- non-reporting industrial purse seiners and longliners (NEI)
- fresh-tuna longliners of India, Indonesia and Taiwan,China
- industrial purse seiners of Iran and longliners of Philippines.

Trends in average weight can be assessed for several industrial fisheries although they are incomplete or of poor quality for most fisheries before the mid-1980s and in recent years (for the above fleets plus longliners from South Korea and Seychelles).

Catch-at-Size(Age) table: This is available but the estimates are more uncertian for some years and fisheries due to:

- a paucity of size data available from industrial longliners before the mid-60s, from the early-1970s up to the mid-1980s and in recent years (Japan, Seychelles, Philippines, China)
- a paucity of catches per area available for some industrial fleets (NEI)

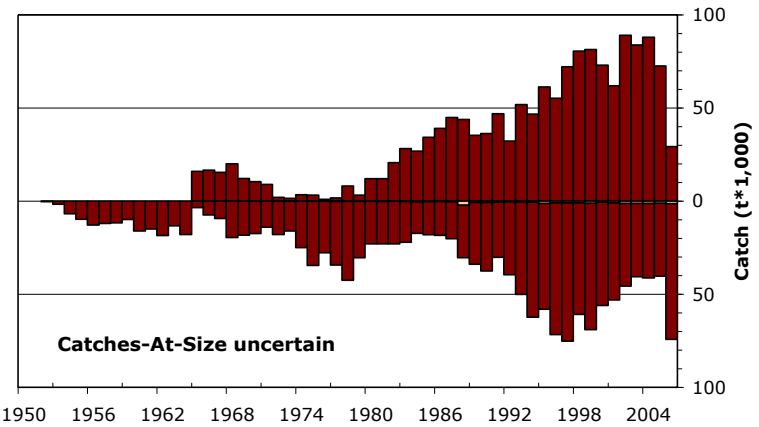


***Figure**. Uncertainty of catch at size data for bigeye tuna. The amount below the zero-line indicates the amount of catch for which the estimated catch at size has been categorised as uncertain according to the criteria given in the text. Light bars represent data for artisanal fleets and dark bars represent data for industrial fleets. Data as of June 2007*

SKIPJACK TUNA (SKJ)

Retained catches are generally well known for industrial fisheries, uncertain for some artisanal fisheries, notably because of:

- catches not being reported: No catches of skipjack tuna are reported for some fisheries, although they are believed to occur (Madagascar, industrial purse seiners of Iran and several artisanal fisheries)
- double-reporting: The statistics reported by some countries are likely to include as domestic catches both the catches of domestic and foreign fleets operating within their territory.

Discards are believed to be low although they are unknown for most industrial fisheries, notably industrial purse seiners.

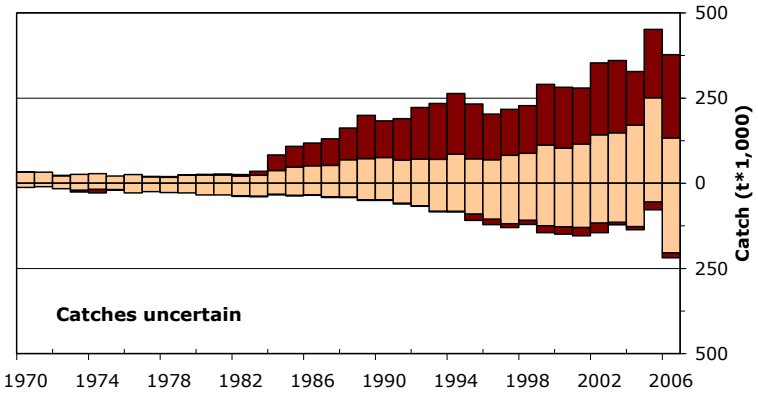


***Figure**. Uncertainty of annual catch estimates for skipjack tuna. The amount of the catch below the zero-line has been categorised as uncertain according to the criteria given in the text. Light bars represent data for artisanal fleets and dark bars represent data for industrial fleets.* *Data as of October 2007*

CPUE Series: Catch and effort series are available from various industrial and artisanal fisheries. Nevertheless, catch and effort are not available from important artisanal fisheries or they are considered to be of poor quality:

- almost no data available for the artisanal fisheries of Indonesia
- no data available for the oceanic gillnet fisheries of Iran and Pakistan
- poor quality effort data for the gillnet/longline fishery of Sri Lanka
- no data available for the pole and line fishery of Maldives in recent years.

Trends in average weight cannot be assessed before the mid-1980s and are incomplete for most artisanal fisheries thereinafter, namely hand lines, troll lines and many gillnet fisheries (Indonesia).

Catch-at-Size(Age) table: CAS are available but the estimates are thought compromised for some years and fisheries due to:

- a lack of size data before the mid-1980s
- a paucity of size data available for some artisanal fisheries, notably most hand lines and troll lines and many gillnet fisheries (Indonesia)
- a lack of some biological information such as length-age keys for the Indian Ocean.

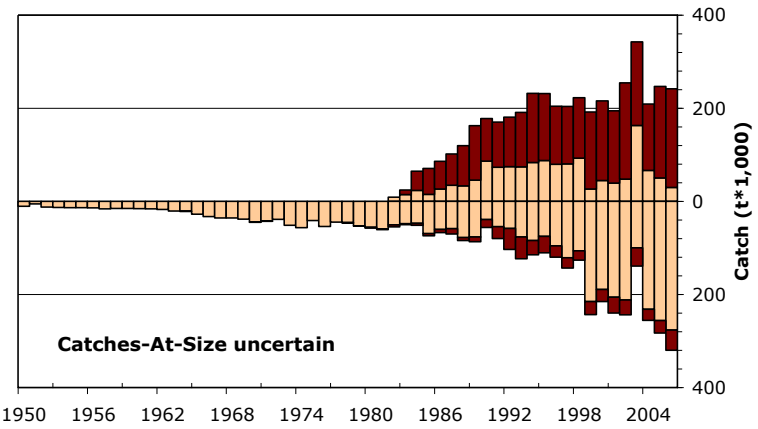


***Figure**. Uncertainty of catch at size data for skipjack tuna. The amount below the zero-line indicates the amount of catch for which the estimated catch at size has been categorised as uncertain according to the criteria given in the text. Light bars represent data for artisanal fleets and dark bars represent data for industrial fleets.* *Data as of June 2007*

ALBACORE (ALB)

Retained catches are generally well known; catches are uncertain for non-reporting industrial longliners (NEI) and for other industrial fisheries. The catches are believed incomplete for some fleets not targeting albacore (catches retained but not fully reported), mainly industrial.

Discards are believed to be low although they are unknown for most industrial fisheries

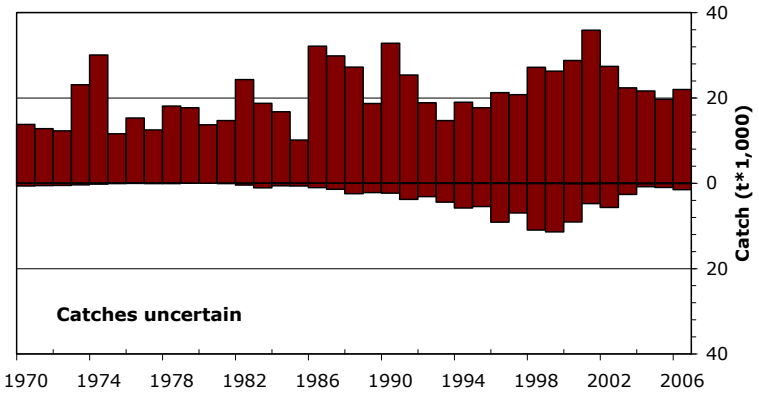


***Figure**. Uncertainty of annual catch estimates for albacore tuna. The amount of the catch below the zero-line has been categorised as uncertain according to the criteria given in the text. Light bars represent data for artisanal fleets and dark bars represent data for industrial fleets.* *Data as of October 2007*

CPUE Series: Catch and effort series are available from various industrial fisheries although the catch recorded might be incomplete when the albacore is not the target species. Nevertheless, catch and effort are not available from some fisheries or they are considered to be of poor quality, especially throughout the 1990s [Non-reporting longliners (NEI)].

Trends in average weight can be assessed for several industrial fisheries although they are incomplete or poor quality for most fisheries before the mid-1980s and in recent years (longliners from **S**outh Korea, Seychelles, Philippines and NEI).

Catch-at-Size(Age) table: The Secretariat has not built CAS or CAA tables for albacore. Nevertheless, it is thought that the amount of size data that are available for this species would make it possible to create CAS. The estimation would, however, be compromised due to:

- a paucity of size data available from industrial longliners before the mid-1960s, from the early-1970s up to the mid-1980s and in recent years (Japan, Seychelles, Philippines, India, China)
- a paucity of catches per area available for some industrial fleets (NEI)
- a lack of some biological parameters as length-age keys for the Indian Ocean

SWORDFISH (SWO)

Retained catches are generally well known; catches are uncertain because:

- non-reporting industrial longliners (NEI): The amount of non-reporting longliners targeting swordfish has been increasing in recent years due to the shift of vessels from the Atlantic Ocean to the Indian Ocean.
- conflicting catch reports: The catches for South Korean longliners reported as nominal catches and catches and effort are conflicting, with higher catches recorded in the CE table.
- double-reporting: The statistics reported by some countries are likely to include as domestic catches both the catches of domestic and foreign fleets operating within their territory.

Discards are believed to be low although they are unknown for most industrial fisheries, mainly longliners.

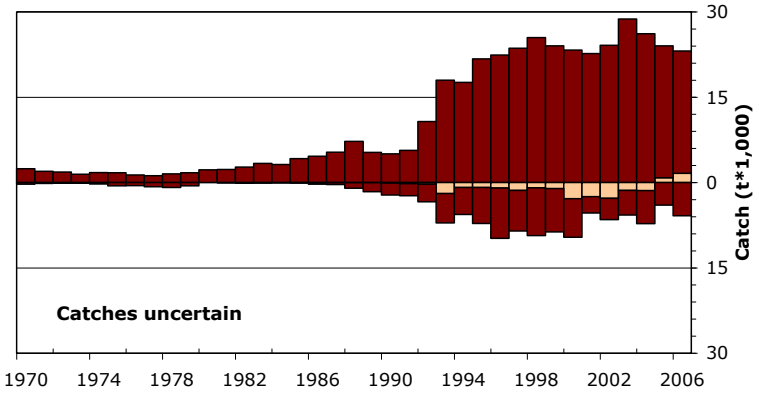


***Figure**. Uncertainty of annual catch estimates for swordfish. The amount of the catch below the zero-line has been categorised as uncertain according to the criteria given in the text. Light bars represent data for artisanal fleets and dark bars represent data for industrial fleets. Data as of October 2007*

CPUE Series: Catch and effort series are available from some industrial longline fisheries. Nevertheless, catch and effort are not available from some fisheries or they are considered poor quality, especially throughout the 90s [Non-reporting longliners (NEI)]. The catch and effort that are available from artisanal fisheries are believed inaccurate (poor quality effort data for the gillnet/longline fishery of Sri Lanka).

Trends in average weight can be assessed for several industrial fisheries although they are incomplete or poor quality for most fisheries before the early-80s and in recent years (low size of samples and time-area coverage for longliners from Japan).

Catch-at-Size(Age) table: CAS are available but the estimates are thought compromised for some years and fisheries due to:

- a lack of size data before the early-80s and from artisanal fisheries (Sri Lanka)
- a paucity of size data available from industrial longliners since the early-1990s (Japan, Seychelles, Philippines, India, China)
- a paucity of catches per area available for some industrial fleets (NEI)
- a paucity of the biological data available, notably sex-ratio and sex-length-age keys

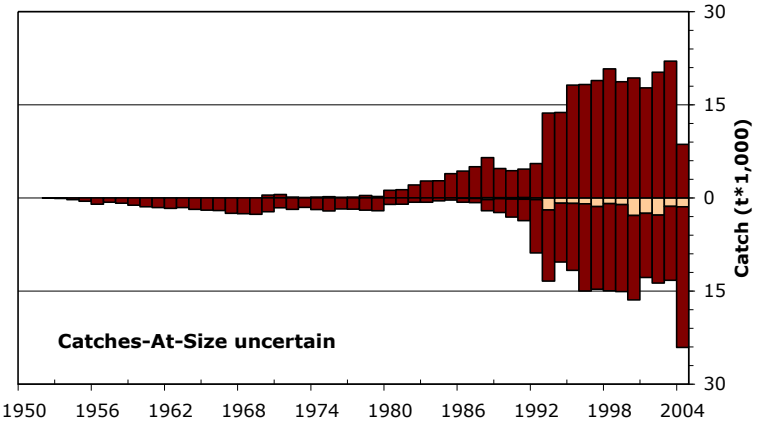


***Figure**. Uncertainty of catch at size data for swordfish. The amount below the zero-line indicates the amount of catch for which the estimated catch at size has been categorised as uncertain according to the criteria given in the text. Light bars represent data for artisanal fleets and dark bars represent data for industrial fleets. Data as of February 2006*

8. PROGRESS ACHIEVED ON THE RECOMMENDATIONS MADE BY THE SCIENTIFIC COMMITTEE IN 2006

The table below lists all recommendations relating to statistics issued during the 2006 Scientific Committee Meeting (IOTC-2006-SC-R). The progress achieved is assessed in each case[2].

Section 4.1 Status of the IOTC Databases

Para.7 Low levels of reporting

Less than 45% of the data contributing to the estimate of total nominal catch were available before the deadline for data submission (30 June). Around 30% of the data for CE and SF were available. These figures are similar than those reported in 2006. The amount of data available before the SC meeting is, however, significantly higher than the one recorded in 2006: around 80%, 50% and 40% of the data for NC, CE and SF, respectively, were available before the SC meeting.

Para.8 Support from IOTC-OFCF Project to coastal countries in the region

The IOTC-OFCF Project has initiated its second phase that may extend from one to three years. It is likely that fewer activities will be undertaken in this second phase due to a decrease in the amount of financial and human resources that will be devoted to the Project.

Para.10 Need for an increase in resources for the Secretariat to be able to provide technical advice and/or financial support to countries having artisanal fisheries that are poorly monitored, notably those where high catches of yellowfin tuna and skipjack tuna occur

There has been no increase in the resources of the Secretariat for this item of activity.

Para.11 Recommendations from the SC that represent the highest priority areas:

1. Improve the certainty of catch and effort data from artisanal fisheries, by:
    - Requesting Yemen, Comoros and Madagascar to implement fisheries statistical collection and reporting systems: *The implementation of data collection in Yemen is under way with the support of the World Bank, the EC and the FAO. The IOTC-OFCF Project is currently considering support the Marine Science Research and Resources Centre of Aden for the collection of size frequency data in several locations of the Yemen coast, notably those where high amounts of yellowfin tuna are unloaded. The Secretariat is not aware of changes in the fisheries statistical systems of Comoros and Madagascar.*
    - Requesting countries having artisanal fisheries, notably Indonesia and Sri Lanka, to improve the collection and reporting of species and gear information*: Indonesia changed the sampling design for its artisanal fisheries in 2004. These changes have allowed Indonesia to report for the first time all the catches per species for 2004 and 2005. The Secretariat used these data to break the catches of previous years per species. The amount of catches available per gear is still very low the artisanal fisheries of Indonesia and Sri Lanka (other than gillnet/longline).*
    - Requesting fisheries data collection agencies in each country, notably India and Sri Lanka, to collaborate and produce one consistent set of catch statistics: *The catches reported by India for its artisanal fisheries differ from those that are published by the CMFRI. The IOTC-OFCF estimated catches for the gillnet/longline fishery and hand line fishery of Sri Lanka for 2005-06. The new catches estimated differ greatly from those estimated for previous years, notably for billfish species. The MOFAR is to implement a new data collection system with the support of the ICEIDA. The NARA and the SU of the MOFAR are to join efforts for the implementation of this new data collection system.*
    - Requesting members to increase sampling coverage to obtain acceptable levels of precision in their catch and effort statistics: *The Secretariat does not receive estimates of precision for the statistics that are routinely reported concerning IOTC fisheries.*
2. Improve the certainty of catch and effort data from industrial fisheries by:
    - Requesting the Republic of Korea to improve the consistency of its catch-and-effort statistics: *The catch and effort statistics for the Republic of Korea remain unchanged.*
    - Reducing the amount of catches from non-reporting fleets by encouraging all members to uphold their obligations with respect to IUU vessels*: The numbers of industrial vessels that operate under the flag of non-reporting countries has been decreasing in recent years. The numbers estimated by the Secretariat are, however, thought to be incomplete due to the paucity of the data available from the coastal states that grant fishing licenses to such vessels or that allow the unloading of catches from such vessels in their ports. In addition to this, the Secretariat has being noting increases in the numbers of vessels operating under the flag of several coastal states that are members of the IOTC (Iran, India, Oman, Seychelles, Malaysia, Thailand, Madagascar and Kenya) for which the Secretariat receive no statistics (India, Kenya) or incomplete statistics (Iran, Oman, Seychelles, Malaysia, Thailand, Madagascar).*
    - Urging members to report on total discards of IOTC species*: The total amounts of IOTC species that are discarded from the fisheries in the Indian Ocean are unknown. Estimates of discards from several industrial fisheries in the IOTC region are*

[2] Note that the Secretariat might be not fully aware of actions implemented by countries concerning these recommendations

likely to be available in the future, notably from those that are sufficiently covered through observers. Estimates of discards for other fisheries will not be available unless new observer programmes are initiated or those existing strengthened.

- Urging members to report on IOTC species taken as bycatch: *The total amounts of IOTC species that are caught as a bycatch of fisheries that target other IOTC species are poorly known. The catches of Albacore, billfish and neritic tuna species are, for this reason, likely to be less precise than those of the tropical tunas. Estimates of bycatch from several industrial fisheries in the IOTC region are expected to be more precise in the future, notably from for those fisheries that are covered through port sampling and/or by observers. The estimation of bycatch for other fisheries will remain poor until the existing data collection systems are strengthened.*
- Requesting members to ensure log book coverage is appropriate to produce acceptable levels of precision in their catch and effort statistics: *The Secretariat does not receive estimates of precision for the statistics that are routinely reported concerning IOTC fisheries. Current logbook coverage rates are believed low for most fisheries.*
- Requesting Indonesia and Taiwan,China to collect and report catch and effort data for their fresh tuna longline fleets: *The Secretariat is aware of efforts being made by both Taiwan,China and Indonesia to strengthen the collection of catches and effort data on their fresh-tuna longline fleets although no data have been reported for this fishery yet.*

3. Increase the amount of size data available to the Secretariat:
   - Requesting members to collect and report size data for artisanal fisheries for yellowfin tuna taken by gillnet, handline and troll fisheries; in particular Yemen, Comoros and Indonesia: *The Secretariat did not receive any reports from these countries concerning the above issue*.
   - Requesting India to report their existing size data: *The Secretariat did not receive any reports from India concerning the above issue. The lack of reporting of size data from the artisanal fisheries in India adversely affects the quality of the statistics of neritic tuna species gathered at the IOTC Secretariat.*
   - Requesting size frequency data from Thailand purse seiners: *The Secretariat is aware of efforts being made by Thailand to strengthen the collection of length frequency data from its industrial purse seine tuna fleet although no data have been reported for this fishery to-date.*
   - Requesting Taiwan,China to collect and provide size data from their fresh tuna longliners: *The Secretariat is aware of efforts being made by Taiwan,China to strengthen the collection of length frequency data from its fresh-tuna longline fleet although no data have been reported for this fishery to-date.*
   - Requesting Philippines and Seychelles to provide size data from their longline fleets: *The Secretariat is aware of efforts being made by Seychelles to strengthen the collection of length frequency data from its deep-freezing longline fleet although no data have been reported for this fishery to-date. The Secretariat is not aware of changes in the fisheries statistical system used by Philippines.*
   - Requesting members to review their existing sampling schemes to ascertain that the data collected are representative of their fisheries: *The Secretariat does not receive estimates of precision for the statistics that are routinely reported concerning IOTC fisheries. Sample sizes and coverage rates are thought to be very low for most longline and artisanal fisheries in recent years.*

4. To estimate the levels of catches of IOTC non-target species by:
   - Urging members to implement appropriate sampling programmes to collect data on the catches of sharks, sea-birds, sea-turtles, sea-mammals in the first instance: *The total amounts of non-IOTC species that are caught as a bycatch of fisheries that target IOTC species are poorly known. Estimates of bycatch of non-IOTC species from several industrial fisheries in the IOTC region are likely to be available in the future, notably from those that are sufficiently covered through observers. Australia, the EC, India, Japan, Seychelles, South Africa and the UK have submitted estimates of bycatch of sharks by species for some fleets and periods, although it is likely that these do not represent total catches. South Africa presented preliminary estimates of bycatches of seabirds for its longline fishery. Estimates of bycatch for other fisheries will not be available unless new observer programmes are initiated or existing observer programmes strengthened.*

5. Reduce uncertainty in the following biological parameters important for the assessment of stock status of IOTC species:
   - Conversion relationships: by urging members to submit to the Secretariat the basic data that could be used to establish length-age keys, length-weight keys, processed weight-live weight keys focusing on the major tuna species, swordfish, neritics and sharks in the first instance: *The Secretariat received datasets containing biological data from the EC (shark species caught by Spanish longline vessels), the UK (data collected by observers on vessels operating within the BIOT) and the data collected on the fleets monitored with the support of the IOTC-OFCF Project (Indonesia, Thailand, Sri Lanka). The Secretariat did not receive datasets concerning other programmes*.
   - Sex ratio: by urging members to undertake research on the sex ratios of billfish species: *The Secretariat participated in 2006 to a Workshop in Reunion (EC) along with scientists from several countries that have important swordfish fisheries in the IOTC region. The main objective of this workshop was to coordinate research activities on this species and draft a project proposal for the consideration of potential funding agencies. This proposal is still under consideration. The Secretariat is not aware of activities initiated by other countries concerning this issue.*
   - Encourage all members to collect biological information on all the significant species caught in their fisheries, notably through observer programmes, and provide this information and the raw data to the Secretariat: *The activities undertaken concerning this issue were covered in paragraph 5, first bullet point. During the meeting of the WPEB in 2007 South Africa presented some results on the fin to trunk ratios for some shark species, derived from data collected through port sampling. Fin to trunk ratios are also available from Spanish longliners for several shark species.*

Para.14 Lack of detailed statistics for the Maldives pole-and-line fishery

Maldives provided length frequency data for its artisanal fisheries for 1997-2006. The catches and effort data available from the Maldives

artisanal fisheries for 1994-2006 have lower resolution than those for previous years.

Para.15 IOTC Secretariat mission to Yemen

The Secretariat undertook a mission to Yemen during April 2007. The results from this mission were presented to the meeting of the WPTT in July 2007. The IOTC-OFCF Project is currently considering support the Marine Science Research and Resources Centre of Aden for the collection of size frequency data in several locations of the Yemen coast, notably those where high amounts of yellowfin tuna are unloaded

Para.16 Availability of data from the artisanal and industrial fisheries of India

India did not report catches, effort or size data for the 78 commercial longliners that operated under its flag in 2005 and 2006, nor catches and effort or size data for its artisanal fisheries. Apparently data for the artisanal fisheries are available but they are for the exclusive use of Indian scientists (to the exclusion of the IOTC Secretariat).

Section 4.2 Review of data on species

Para.18 Recommendations made by the WPB, WPTT and WPBy (WPEB) (Appendix VIII)

Tropical Tunas (from IOTC-2006-WPTT-R)

- Collection of biological samples and data for all tuna species, especially yellowfin and bigeye: *Same as para.11, subpara.5, above.*

Bycatch (from IOTC-2006-WPBy-R)

Work plan:

- Identify major bycatch species: *The WPEB identified in 2007 fifteen species of sharks on which to work intersessionally with a goal to obtaining status indicators to enable the resources monitored to the extent possible.*
- Members to source information on non-tuna data holdings, including socio-economic data: *Same as para.11, subpara.4 and subpara.5, above.*
- Potential of the available bycatch data to develop estimates of bycatch catch rates for the wider Indian Ocean and/or specific regions: *The Secretariat presented during the meeting of the WPEB in 2007 the status of the IOTC databases concerning bycatch species, including the results of a compilation of bycatch data that a Secretariat staff undertook during 2006. The WPEB agreed that the data available is insufficient noting that precise estimates of total bycatch cannot be derived from the present data.*

Recommendations:

- Members to submit all relevant data on bycatch to IOTC Secretariat: *Same as para.11, subpara.4, above.*
- Harmonization of existing observer programmes: *The WPEB agreed in 2007 to continue its work towards the harmonization of existing observer programmes.*

Billfish (from IOTC-2006-WPB-R)

- Availability of data from Taiwanese longliners: *Nominal catches are available for both deep-freezing longliners and fresh-tuna longliners from Taiwan,China. Catches and effort and size data are available for deep-freezing longliners.*
- Catches of marlins and sailfish: *It is believed that the catches for these species are incomplete due to under-reporting and mislabelling. The amounts of billfish species that are caught in Sri Lanka are thought to be more precise for 2005-06 due to the support of the IOTC-OFCF Project to the NARA to strengthening data collection activities in Sri Lanka. Sri Lanka informed the Secretariat that a cooperative project between the ICEIDA and the Sri Lankan government is underway, one of its components being the implementation of a new fisheries information system in Sri Lanka. The IOTC-OFCF Project provided support for the compilation and computerization of catches, effort and size data from the sport fisheries operating in Kenya. Data for 1987-2006 has been collected and computerized.*
- Billfish bycatch from industrial purse seiners: *The Secretariat received preliminary information on the bycatch for industrial purse seiners of the EC, derived from data collected through observers. The EC informed that estimates of total bycatches of billfish by EC fisheries will be made available in the future.*
- Availability of data on sex-ratio by size: *Same as para.11, subpara.5, above.*
- Continued support from the IOTC-OFCF Project to improving data collection on billfish species: *same as second bullet point above.*
- Statistical reports on the catches of billfish species: *The amount of data available for billfish species was covered in section 3., Table 2iii.*
- Standardization of length measurements for billfish species: *The Secretariat presented a document to the WPTT in 2006 concerning its compilation of biological data concerning billfish and other species, including equations for converting from non-standard lengths to standard length (lower jaw-fork length). The Secretariat pointed out the paucity of the data available for billfish species, notably the paucity of the data available from the Indian Ocean.*

Section 4.3 Progress Report of the IOTC-OFCF Project

Para.23 Continuation of the IOTC-OFCF Project and Continued support to IOTC-OFCF related activities by

the Commission

Same as para.8 above. The Commission did not consider the allocation of budget to support data collection activities in the region.

Section 6.1 Report of the Working Party on Tropical Tunas and presentation of Executive Summaries

Para.35 Measures to improve data collection and reporting for artisanal fleets

Same as para.11, subpara.1 and 3. and para.23

Para.36 Statistics from Maldives and participation to IOTC meetings

Same as para.14. A scientist from the Maldives attended the WPTT and WPEB meetings in 2007

Para.39 Computer programmes and all input and output files used by WP for assessment made available to the Secretariat

Some computer programs and input and output files are available with the Secretariat

Para.40 The Secretariat to create a set of stock status indicators for the WP and provide updates of the ES before SC meetings

The Secretariat provided the stock status indicators (IOTC-2007-WPTT-INF01) and executive summaries in time

Section 6.2 Report of the Working Party on Billfish and presentation of Executive Summary on Swordfish

Para.45 Use of available observer data to estimate total bycatches of billfish species

Same as para.18 (Billfish) above.

Section 7. Status of species taken as bycatch in Indian Ocean fisheries

Para.57 Harmonization of existing observer programmes and implementation of new programmes

Same as para.11, subpara.4 and para.18 (Bycatch) above.

Para.59 The UK to provide information to the Secretariat on fin-body weight ratio

The Secretariat has not received this dataset yet.

Para.62 Interactions between tuna fisheries and seabirds

The Secretariat collaborated with Birdlife International on a study to identify areas of overlap between albatrosses and IOTC longline fisheries. Document IOTC-2007-WPEB-22 presents the results of this work.

Section 12. Other matters

12.2 Workshop on predation in longline tuna fisheries

The Secretariat received datasets from several countries and prepared data catalogues on the availability of data on predation from IOTC fisheries.

12.3 Website related activities: availability of high resolution oceanographic data

The Secretariat did not receive any datasets containing high resolution oceanographic data.

12.4 The Secretariat to maintain a regional database for observer programmes

The Secretariat did not receive detailed data from observer programmes nor additional resources to be able to devote to this task.

12.5 Tuna Atlas

The Secretariat produced maps for several tuna species and the swordfish for the WPTT and WPB.

BOX 1: AVAILABITY OF STATISTICS FOR THE IOTC WORKING PARTIES

BLUE MARLIN (BUM)

Retained catches are poorly known for most fisheries due to:

- catches per species not being available for many artisanal (gillnet/longline fishery of Sri Lanka and artisanal fisheries of India, Iran and Pakistan) and some industrial (longliners of Indonesia and Philippines) fisheries
- uncertain catches for non-reporting industrial longliners (India, NEI)
- catches being incomplete for most industrial fisheries for which the blue marlin is seldom the target species. No catches are available for industrial purse seiners although they are known to occur
- conflicting catch reports: The catches for South Korean longliners reported as nominal catches and catches and effort are conflicting, with higher catches recorded in the CE table
- a lack of catch data for several sport fisheries (Mauritius, Madagascar).

Discards are unknown for most industrial fisheries, mainly longliners.

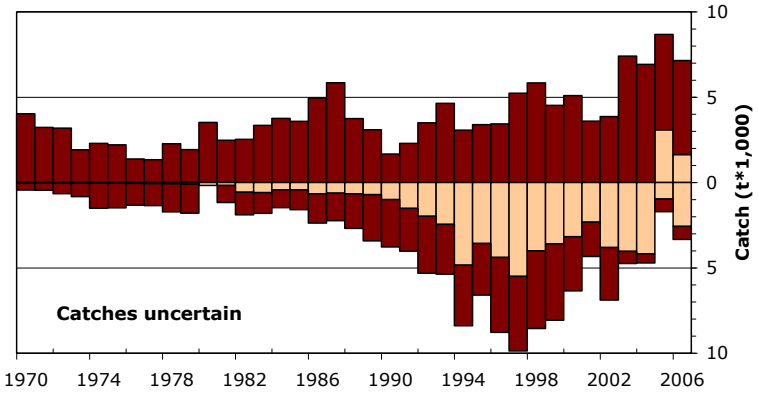


***Figure**. Uncertainty of annual catch estimates for blue marlin. The amount of the catch below the zero-line has been categorised as uncertain according to the criteria given in the text. Light bars represent data for artisanal fleets and dark bars represent data for industrial fleets.* *Data as of October 2007*

CPUE Series: Catch and effort series are available from some industrial longline fisheries although the catch might be incomplete (the catches of species other than the target are not always recorded in the logbooks). No catch and effort are available from sport fisheries, besides the sport fisheries of Kenya, or other artisanal (gillnet/longlines of Sri Lanka) or industrial fisheries (NEI longliners and all purse seiners).

Trends in average weight can only be assessed for the longline fishery of Japan since 1970. The number of specimens measured in recent years is, however, very low.

Catch-at-Size(Age) table: The Secretariat has not built CAS or CAA tables for blue marlin. The paucity of size data available for this species would make it very difficult any attempt to estimate CAS.

BLACK MARLIN (BLM)

Retained catches are poorly known for most fisheries due to:

- catches per species not being available for many artisanal (gillnet/longline fishery of Sri Lanka and artisanal fisheries of India, Iran and Pakistan) and some industrial (longliners of Indonesia and Philippines) fisheries
- uncertain catches for non-reporting industrial longliners (India, NEI)
- catches being incomplete for most industrial fisheries for which the black marlin is seldom the target species. No catches are available for industrial purse seiners although they are known to occur
- conflicting catch reports: The catches for South Korean longliners reported as nominal catches and catches and effort are conflicting, with higher catches recorded in the CE table
- a lack of catch data for several sport fisheries (Mauritius, Madagascar).

Discards are unknown for most industrial fisheries, mainly longliners.

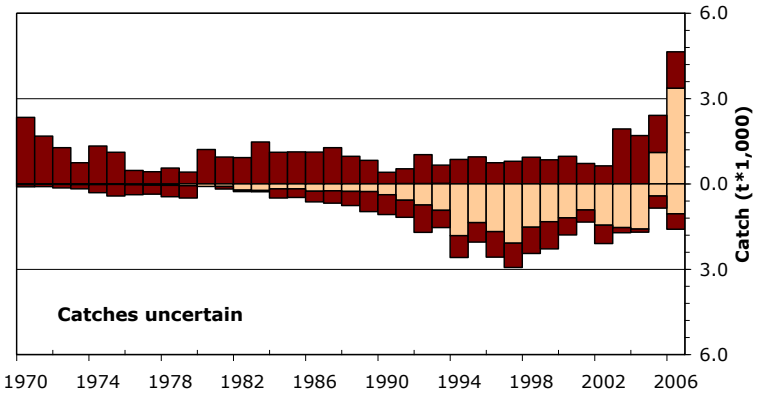


***Figure**. Uncertainty of annual catch estimates for black marlin. The amount of the catch below the zero-line has been categorised as uncertain according to the criteria given in the text. Light bars represent data for artisanal fleets and dark bars represent data for industrial fleets.* *Data as of October 2007*

CPUE Series: Catch and effort series are available from some industrial longline fisheries although the catch might be incomplete (the catches of species other than the target are not always recorded in the logbooks). No catch and effort are available from sport fisheries, besides the sport fisheries of Kenya, or other artisanal (gillnet/longlines of Sri Lanka) or industrial fisheries (NEI longliners and all purse seiners).

Trends in average weight can only be assessed for the longline fishery of Japan since 1970. The amount of specimens measured in recent years is, however, very low.

Catch-at-Size(Age) table: The Secretariat has not built CAS or CAA tables for black marlin. The paucity of size data available for this species would make it very difficult any attempt to estimate CAS.

STRIPED MARLIN (MLS)

Retained catches are reasonably well known; catches are uncertain because:

- catches per species are not available for some industrial fisheries (longliners of Indonesia and Philippines).
- uncertain catches for non-reporting industrial longliners (India, NEI)
- catches are believed to be incomplete for most industrial fisheries for which the striped marlin is seldom the target species. No catches are available for industrial purse seiners although they are known to occur
- conflicting catch reports: The catches for South Korean longliners reported as nominal catches and catches and effort are conflicting, with higher catches recorded in the CE table
- a lack of catch data from several sport fisheries (Mauritius, Madagascar) and from artisanal fisheries, although the latter are presumed to be low.

Discards are believed to be low although they are unknown for most industrial fisheries, mainly longliners.

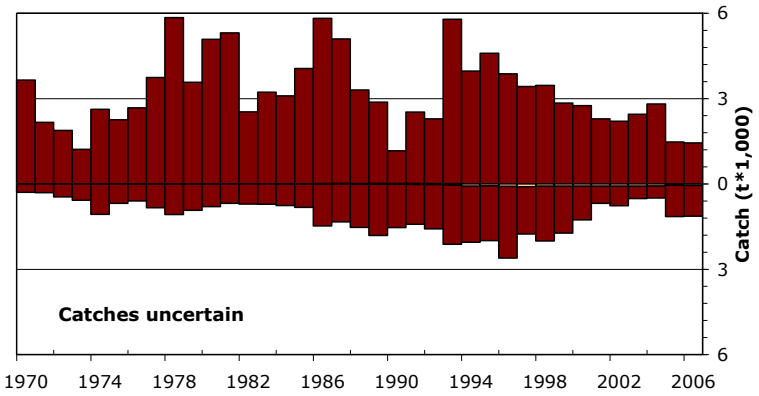


***Figure**. Uncertainty of annual catch estimates for stripped marlin. The amount of the catch below the zero-line has been categorised as uncertain according to the criteria given in the text. Light bars represent data for artisanal fleets and dark bars represent data for industrial fleets.* *Data as of October 2007*

CPUE Series: Catch and effort series are available from some industrial longline fisheries although the catches might be incomplete (the catches of species other than the target are not always recorded in the logbooks). No catch and effort are available from sport fisheries, besides the sport fisheries of Kenya, or industrial fisheries (NEI longliners and all purse seiners).

Trends in average weight can only be assessed for the longline fishery of Japan since 1970. The amount of specimens measured in recent years is, however, very low.

Catch-at-Size(Age) table: The Secretariat has not built CAS or CAA tables for striped marlin. The paucity of size data available for this species would make it very difficult any attempt to estimate CAS.

INDO-PACIFIC SAILFISH (SFA)

Retained catches are poorly known for most fisheries due to:

- catches per species not being available for many artisanal fisheries (mainly India and Indonesia)
- catches being very incomplete for most industrial fisheries for which this species is a by-catch. No catches are available for industrial purse seiners although they are known to occur
- catches being incomplete for many artisanal fisheries (gillnets of Pakistan, pole and lines of Maldives) due to under-reporting.
- a lack of catch data for several sport fisheries (Mauritius, Madagascar).

Discards are unknown for most industrial fisheries, mainly longliners (for which they are presumed to be high).

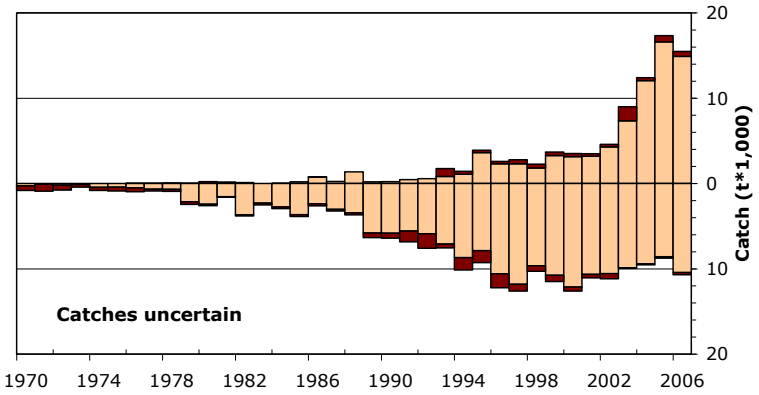


***Figure**. Uncertainty of annual catch estimates for Indo-Pacific sailfish. The amount of the catch below the zero-line has been categorised as uncertain according to the criteria given in the text. Light bars represent data for artisanal fleets and dark bars represent data for industrial fleets.* *Data as of October 2007*

CPUE Series: Catch and effort series are available from some industrial longline fisheries but they are believed to be poor quality (catches of billfish are incomplete). No catch and effort are available from sport fisheries besides the sport fisheries of Kenya. The catch and effort that are available from artisanal fisheries are believed inaccurate (poor quality effort data for the gillnet/longline fishery of Sri Lanka).

Trends in average weight can only be assessed for the longline fishery of Japan since 1970 and the gillnet/longline fishery of Sri Lanka since the late 80s. The amount of specimens measured is, however, very low. Furthermore, the specimens discarded might be not accounted for in industrial fisheries, where they are presumed to be of lower size (possible bias of existing samples).

Catch-at-Size(Age) table: The Secretariat has not built CAS or CAA tables for Indo-Pacific sailfish. The paucity of size data available for this species would make it very difficult any attempt to estimate CAS.

SHORT-BILLED SPEARFISH (SSP)

Retained catches are unknown as almost no catches are available for this species due to:

- the catches being very incomplete for most industrial fisheries for which this species is a by-catch. No catches are available for industrial purse seiners although they are presumed to occur
- the catches being incomplete for most artisanal fisheries due to miss-labelling (specimens recorded as other billfish or not recorded per species) and under-reporting
- a lack of catch data for several sport fisheries (Mauritius, Madagascar).

The overall lack of information makes it very difficult for the Secretariat to attempt to estimate total catches for this species.

Discards are unknown for most industrial fisheries, mainly longliners, where they are presumed high.

CPUE Series: Catch and effort are seldom available from industrial longline fisheries and the catches are believed incomplete. No catch and effort are available from other fisheries.

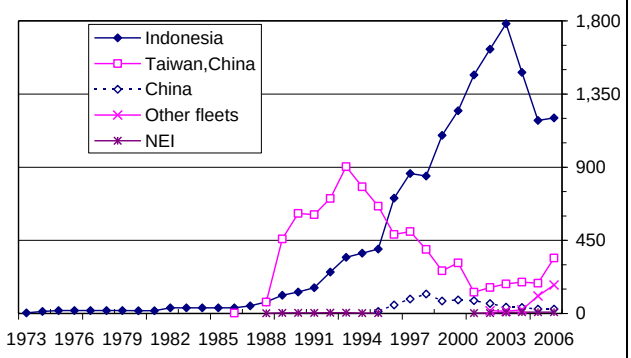
Trends in average weight can only be assessed for the longline fishery of Japan since 1970. The amount of specimens measured is, however, very low. Furthermore, the specimens discarded might be not accounted for, where they are presumed to be of lower size (possible bias of existing samples).

Catch-at-Size(Age) table: The Secretariat has not built CAS or CAA tables for short-billed spearfish. The paucity of catch and size data available for this species would make it very difficult any attempt to estimate CAS for this species.

BOX 2: ESTIMATION OF CATCHES OF NON-REPORTING FLEETS

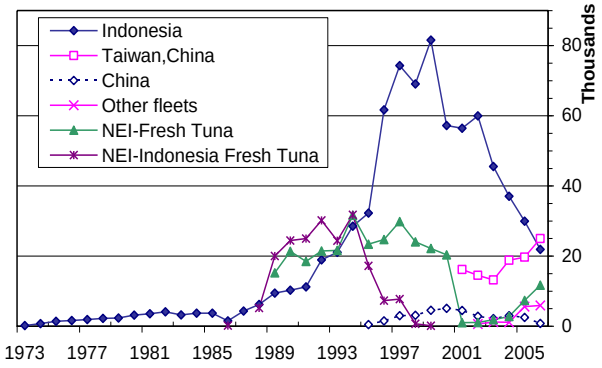
A/ FRESH TUNA LONGLINE FLEETS

Figure 5: Number of fresh-tuna longliners operating in the Indian Ocean from 1973-2006



2005-06 numbers are preliminary
'Other fleets' includes Belize, India, Malaysia, Maldives and Oman
'NEI' includes Bolivia, Equatorial Guinea and Honduras

Figure 6: Estimated catches in the Indian Ocean of fresh tuna longliners per flag country



2005-06 catches are preliminary
'NEI-' includes catches estimated for non reporting fleets from based in Indonesia ('NEI-Indonesia Fresh tuna') or elsewhere ('NEI-Fresh Tuna')
'Other fleets' includes Belize, India, Malaysia, Maldives and Oman

The estimated numbers of fresh tuna longliners operating in the Indian Ocean sharply increased after the mid-1980's, reaching around 2,000 vessels in 2003 (Figure 5). Prior to 2004 few of fresh tuna longliners reported their fisheries statistics. In recent years, the majority of these longliners have apparently been operating under the Indonesian and Taiwan,China flag. The drop in the number of Taiwanese vessels and catches observed between 1993 and 2000 is due to re-flagging of many vessels to Indonesia. The Secretariat received reports indicating that several Indonesian vessels changed its flag back to Taiwan,China and are currently based in ports other than Indonesia's. Taiwan,China is currently estimating catches for its fresh-tuna longline fleet. The catches estimated for 2001-05 are close to those that the Secretariat was estimating before for Taiwanese vessels (Figure 7). China, Malaysia and Oman submit catches for its fresh-tuna longline fleets routinely. India has not reported catches for its 78 commercial longliners, that have been operating in the Indian Ocean since 2004. The Secretariat has estimated catches for these vessels on the assumption that they all are fresh-tuna longliners even though it is likely that some of them are deep-freezing.

The estimation of number of vessels and catches has been improving over time, mainly due to the information collected through the Sampling Programs implemented by the IOTC-OFCF in key ports of landing of these vessels in the Indian Ocean. The amount of historical and current information so far collected through these cooperation schemes has helped to improve the estimates in Thailand, Malaysia, Sri Lanka and Indonesia. The collection of past information should continue to allow better estimates of historical catches in countries like Indonesia. China, Taiwan,China, Indonesia, Malaysia and Oman have provided catches for their fresh-tuna longline fleets in recent years. Catches and effort are only available for China, Malaysia and Oman. Size data are available for Indonesia and Taiwan,China (IOTC-OFCF sampling).

Current catches have been estimated at about 60,000 tonnes (12,000 t are estimated for non-reporting fresh-tuna vessels), mostly yellowfin tuna (YFT) and bigeye tuna (BET).

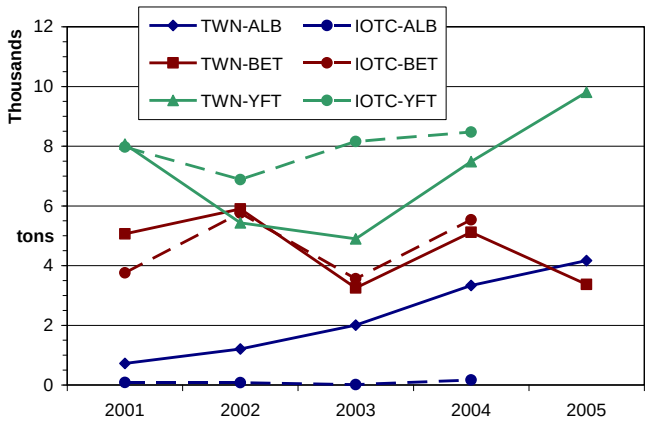


Figure 7: Catches available for Taiwanese fresh-tuna longliners for 2001-05 *versus* the catches previously estimated by the Secretariat

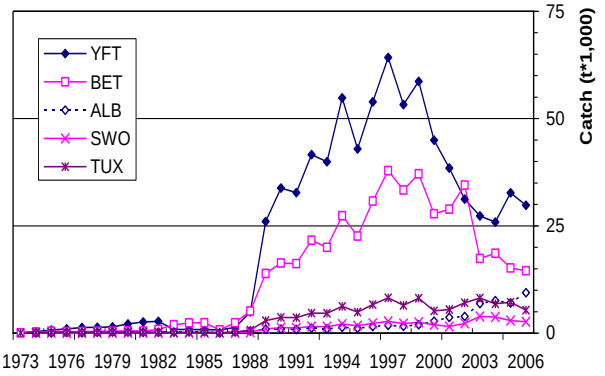
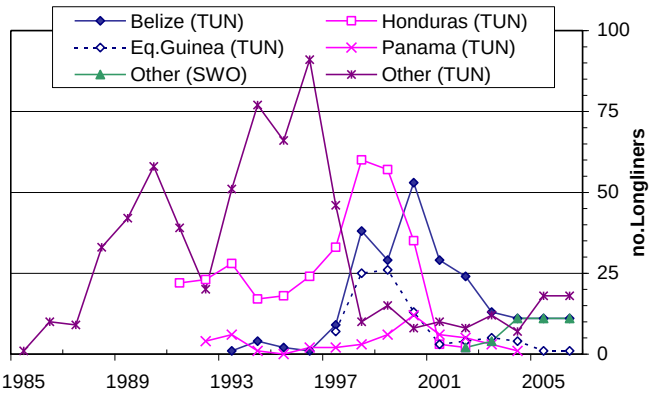


Figure 8: Total catches per species in the Indian Ocean estimated for fresh tuna longline fleets

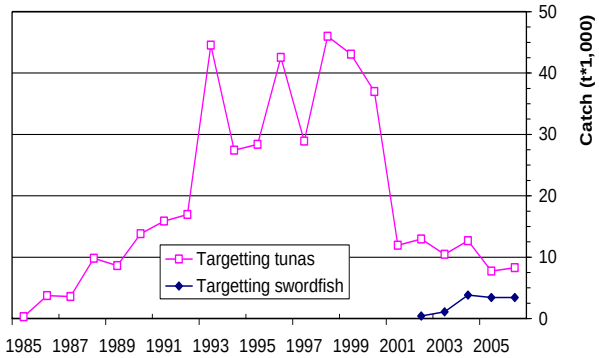
B/ NON REPORTING DEEP-FREEZING LONGLINE FLEETS

Figure 9: Number of non-reporting deep-freezing longliners estimated to operate in the Indian Ocean (per flag country)



Note: Belize is an IOTC Member since 2007 and has reported catches for its longline fleet in recent years

Figure 10: Estimated catches of non-reporting deep-freezing longliners according to the type of operation



The numbers of non-reporting deep-freezing longliners by flag are estimated by using data collected from various sources. The main sources for these data are the fishing craft statistics and the IOTC lists of active vessels. No catches have been estimated for 2006 yet. The main reason is that the Secretariat is waiting to complete the lists of active vessels with information reported from parties regarding the vessels calling to its ports and the catches unloaded.

Around 30 non-reporting longliners are believed to be operating in the Indian Ocean in recent years, with total catches estimated at 10,000 tonnes. Honduras, Equatorial Guinea and Panama were the flags most used by non-reporting longliners over the last decade with an increasing number of vessels operating under other flags as Togo, Mongolia, Namibia, Cambodia, Bolivia and Georgia in recent years. The catch series was estimated according to average catches per vessel and species composition for the Taiwanese or Spanish fleet during that period, assuming that most of the vessels operating under flags of non-reporting countries operate in a similar manner to vessels from Taiwan,China or Spain, respectively. Although there are many indications to support this, the assumption that the vessels from non-reporting countries are exploiting the same spatio-temporal strata than the Taiwanese or Spanish over time could be wrong for some flags and periods.

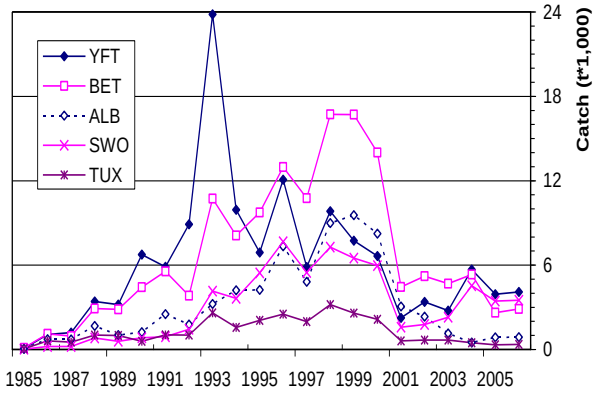


Figure 11: Total catches per species in the Indian Ocean estimated for non-reporting deep-freezing lonfline fleets

The lack of catch and effort and size frequency records from non-reporting vessels is of concern.

The dramatic drop in the number of non reporting longliners vessels operating and catches estimated since 2001 is not fully understood. This could be due to the re-flagging of vessels recorded before under this category to flags of reporting countries. The increase in the number of longliners operating in the Indian Ocean reported by Philippines, Seychelles and other coastal countries in recent years would support this assumption.

C/ NON REPORTING INDUSTRIAL PURSE SEINE FLEETS

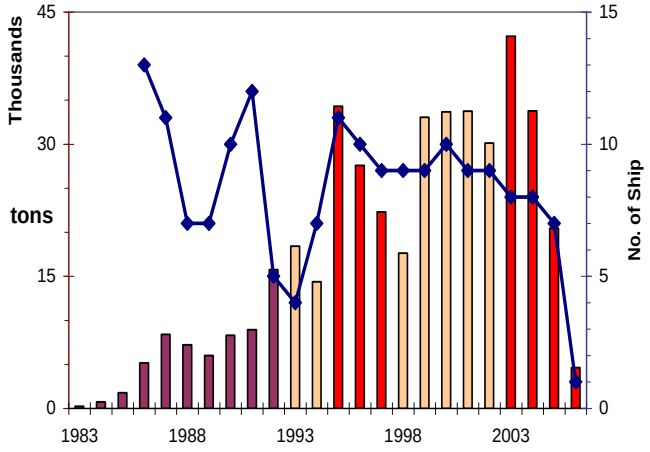
Between 6 and 11 non-reporting purse seiners have been operating in the Indian Ocean since 1995 under several flags. The catches of these vessels, mainly of skipjack, have been ranging between 30,000 and 40,000 tonnes.

The catches were estimated from two different sources:

- No catch data available (1995-97; 2003- 2006): The estimate was conducted taking into account past average catch rates for the ex Soviet Union fleet (to which most of these vessels belonged to) and species composition for the European fleet, assuming that the two fleets exploit the same areas. This assumption could be biased for periods in which the European vessels operate in the EEZs of third countries, which could not be the case with the ex-Soviet vessels. Only one vessel remained in operation in 2006, under the flag of Equatorial Guinea. The other vessels now operate under the flag of Thailand.
- Catch data available (1998-2002): The total catches and number of sets per day and area (1 degree square) were provided for the period 1998-2002[3]. The catches of EC purse seiners were used to estimate catches per species and type of set (free or log school). The catches estimated for these years are thought more accurate.

Detailed information about the fleet and catch estimates of non-reporting fleets has been provided in documents presented to the species Working Parties since 2000.

Figure 12: Number of ships and total catches per species in the Indian Ocean estimated for non-reporting industrial purse seine fleets



The catches of the ex Soviet vessels (brown pattern) are also shown for reference

The catches of NEI-PS are shown in red or light orange depending on the estimation procedure (see text on the right)

[3] Catches for 1997 and 2003 were also provided although only for several months.

BOX 3: SRI LANKA AND YEMEN

Important tuna and tuna-like fisheries have been inexistence in **Sri Lanka** since well before 1950. Catch data are available for Sri Lanka since 1950. Nevertheless. the data available at the IOTC Secretariat for this country are considered very poor quality for the following reasons:

- Catches are incomplete, especially in the early years of the fishery.
- Marked differences exist between catches reported by the National Aquatic Resources and Development Agency (NARA) and the Statistical Unit of the Ministry of Fisheries and Aquatic Resources (MOFAR), the two institutions reporting catches to the IOTC.
- Catches are highly aggregated by gears and/or species
- Species are often misidentified or mislabelled, mainly of billfish species

Although the IOTC/OFCF/NARA sampling implemented in 2005 did not cover all fisheries the catches estimated for 2005 and 2006 using this information are believed to be more precise. Furthermore, they indicate that the previous catch figures have been overestimated and are probably much higher than the actual catches, mainly due to an overestimation of vessel numbers and activity (effort).

The catch estimates for swordfish, marlins, skipjack tuna and, to a lesser extent, yellowfin tuna and other species are likely to be affected if the above is confirmed true.

An examination and possible revision of the Sri Lankan catch series from 1994-2004 is required..Figure 13 shows the new catches estimated for the gillnet and longline fishery of Sri Lanka in 2005-06 versus the catches in the IOTC database for 2004 and previous years.

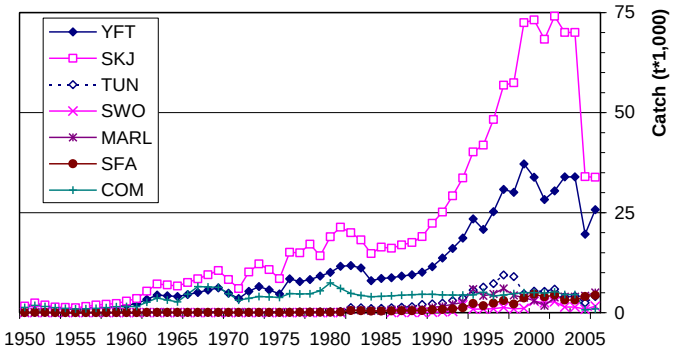


Figure 13 (right): Total catches per species in the Indian Ocean estimated for the gillnet and longline fishery operating in Sri Lanka in 2005-06 and catches in the IOTC database for previous years

Following a recommendation from the SC the IOTC Secretariat undertook a mission to **Yemen** in April 2007 and its main results were reported to the WPTT (IOTC-2007-WPTT-INF02). The data collected from some national and foreign institutions, mainly estimates of total catches (by species or aggregated) and number of operated crafts for several regions and years, is very conflicting, with some institutions publishing catches being as much as twice or even higher than those from other sources. Nevertheless, the information collected was sufficient for the Secretariat to be able to derive new estimates of catches for the artisanal fleets operating in Yemen (Figure 14).

In 2007, the Secretariat revised the catch estimates for artisanal boats operating in Yemen for 2003-2006, notably those for yellowfin tuna, longtail tuna, kawakawa and narrow-barred Spanish mackerel. The new estimates are probably more realistic than the previous although they are still uncertain due to a scarcity of information and numerous assumptions needed to complete the series. More details about the estimation were provided in a document presented to a previous Working Party on Tropical Tunas (IOTC-2005-WPTT-06). The new catches of yellowfin estimated are more than 30 times higher than those previously in the IOTC database.

The IOTC-OFCF Project is currently considering support the Marine Science Research and Resources Centre of Aden for the collection of size frequency data in several locations of the Yemen coast, notably those where high amounts of yellowfin tuna are unloaded.

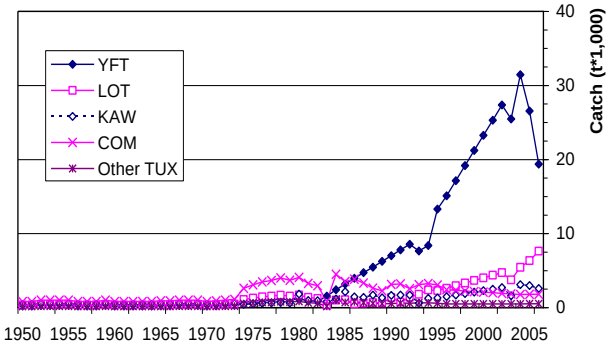


Figure 14: Total catches per species in the Indian Ocean estimated for the artisanal fishery operating in Yemen

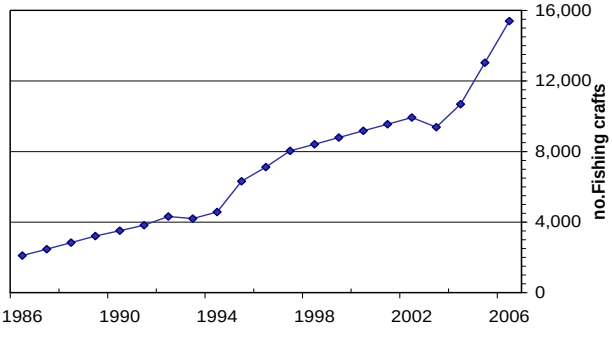


Figure 15: Total number of crafts estimated for the artisanal fishery operating in Yemen