iotc **Indian Ocean Tuna Commission**
ctoi **Commission des Thons de l'Océan Indien**

Sub-Committee on Data Collection and Statistics

First Session, Victoria, Seychelles 8 November 2004

Progress Report of the Secretariat

DATA COLLECTION: AVAILABILITY OF IOTC STATISTICS FOR 2003

The countries to which the IOTC Secretariat sent data requests in 2004 are listed in Table 2. The countries are sorted by their most recent catches and the status regarding the availability of catches, effort, size frequency and craft statistics is indicated. Timeliness of reporting and data source are also shown.

Timeliness of reporting: Data requests were sent to **58 countries** in April-May 2004. Ten countries (cf. 14 in 2003) submitted statistics to IOTC before the deadline of 30 June. Furthermore, only partial statistics were submitted ,and second and third requests were needed in most cases.

Table 1 shows the catches for 2003 available in the IOTC Nominal Catches (NC) database by the deadline for data submission and by 1st November 2004. Of concern, more than 80% of the catch was not available by the deadline and only 66% of the catch data were available before 1 November 2004.

Late reports also compromise the validation and verification 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 2003 (1 November 2004) and proportion of catches reported by official sources (SO) versus total catches so far available.

2003	NC	CE	SF	SO
Total Catch Estimated (x1000 t)	1529	1529	1529	1015
Available at 30 June 2004 (x1000 t)	317	72	77	
%Available at 30 June 2004	21	5	5	
Available at 1 November 2004 (x1000 t)	1015	625	183	1013
% Available at 1 November 2004	66	41	12	100
% Available at December 2002	61	41	39	95

Completeness of statistics: Table 1 summarises the availability of 2003 statistics as of 30 June and 1 November, 2004. The proportion of statistics available for 2002 is shown for comparison. Levels of reporting have not improved.

Complete sets of data (NC, CE, SF) for 2003 are only available for the European Community, Sri Lanka, Seychelles, Malaysia, Oman and Thailand[1]. More details about the amount of data available regarding the different types of data gathered by the IOTC Secretariat can be found below:

- **Nominal Catches**: The amount of Nominal Catch data available at the Secretariat for 2003 is slightly higher than that in 2002. Either partial or complete sets of NC are available for 22 out of the 55 fleets that operated in the Indian Ocean during 2003.

  The statistics recorded for several fleets are thought better quality than those available before. This is the case with Indonesia, Seychelles and Sri Lanka.

---

[1] This refers to fleets whose catches amounted to more than 10,000 t in 2002.

Table 2: Availability of IOTC statistics for the year 2003

FLEET	Catch	M/C	NC	CE	SF	DI	FC	FT	VR	TI	SO
EUROPEAN COMMUNITY	303	M									
INDONESIA	219	C									
MALDIVES	144										
IRAN	139	M									
CHINA	122	M						N/A			
SRI LANKA	121	M									
INDIA	106	M									
SEYCHELLES	82	M									
JAPAN	43	M						N/A			
NETHERLAND AMTILLES	40							N/A			
PAKISTAN	25	M									
MALAYSIA	17	M									
OMAN	16	M									
THAILAND	15	M									
MADAGASCAR	12	M									
PANAMA	9							N/A			
BELIZE	9							N/A			
SAUDI ARABIA	8										
YEMEN	8										
COMOROS	8	M									
AUSTRALIA	8	M									
UNITED ARAB EMIRATES	7										
KOREA	4	M						N/A			
PHILIPPINES	3	M						N/A			
FRANCE OT	3	M									
BOLIVIA	2							N/A			
TANZANIA	2										
MAURITIUS	2	M									
SOUTH AFRICA	2	C									
KENYA	2	M									
EQUATORIAL GUINEA	1							N/A			
QATAR	1										
EGYPT	1										
HONDURAS	1							N/A			
URUGUAY	1							N/A			
GUINEA	1							N/A			
CAMBODIA	<1							N/A			
SAINT VINCENT AND GRENADINES	<1							N/A			
KUWAIT	<1										
ERITREA	<1	M									
BAHRAIN	<1										
JORDAN	<1										
BANGLADESH	<1										
DJIBOUTI	<1										
SENEGAL	<1							N/A			
SUDAN	<1	M									
UNITED KINGDOM	<1	M									
EAST TIMOR	<1										
SINGAPORE	0										
VANUATU	Unk	M						N/A			
MOZAMBIQUE	Unk										
MYANMAR	Unk										
NAMIBIA	Unk							N/A			
PAPUA NEW GUINEA	Unk							N/A			
SOMALIA	Unk										

Key Table 2

| Catch | Recent catches amounting to (thousands of tonnes) |
| M/C | Is Member (**M**) or Cooperating Non Member Party (**C**) |

NC	Nominal Catch		
DI	Discards	■	Fully available
CE	Catch and Effort	■	Partially available
SF	Size Frequency	■	Not available
FC	Fishing Craft	□	Catches (data) negligible
FT	Foreign Tuna Vessels Activity	N/A	Not Applicable
VR	Vessel Record		

TI	Timeliness	■	Good (before 1st July)
		■	Fair (whithin July)
		■	Poor (after 1st August)

SO	Data Source	■	Statistics available from flag country
		■	Statistics from both flag and country/ies other than flag country
		■	All statistics from countries other than flag country
		□	No statistics available at all

To date, no data or only partial nominal catch statistics have been received from several member or cooperating non member parties, namely China, India, Madagascar, Comoros, Kenya, Eritrea, Sudan, United Kingdom and Vanuatu. Furthermore, 2002 nominal catches needed to be estimated for Madagascar, Comoros, Kenya, Sudan, Vanuatu and Eritrea.

Other important fishing parties with NC statistics not or only partially available are Maldives, Netherlands Antilles, Panama, Belize, United Arab Emirates, Saudi Arabia and Yemen. The catches of non-reporting longline fleets operating under several flags (Honduras, Belize, Panama, Equatorial Guinea, Taiwan,China etc.) usually recorded under NEI are mostly unreported for 2003.

- **Catch and effort and size-frequency statistics**: Catch and effort statistics are available for 16 fleets (13 from IOTC members or CNMP) and size-frequency data from 13 fleets (12 from IOTC members or CNMP). The statistics available for Korea, China (Taiwan,China), Seychelles (deep-freezing longliners), and the European Community (EC) (longline fleets and supply vessels) are either incomplete or poor quality.

- **Discards**: Discards are only available for Australia, Sri Lanka, Oman and the EC in 2003, despite the fact that discard rates are presumed high, especially from longliners and in purse seiners setting on logs.

- **Fishing craft statistics**: Fishing craft statistics are usually 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 for the period 1973-2002 was re-estimated this year from new information collected through the IOTC Sampling Programs and new vessel records.

- **Vessel Record and Foreign Tuna Vessel Activity**: Many new data were received at the Secretariat during the year 2004, regarding both domestic and foreign fleets. Belize, Guinea and Senegal submitted lists of ships operating in the Indian Ocean for the year 2003. Nevertheless, the number of ships operating under several flags, including Taiwan,China, Honduras, Equatorial Guinea, Panama, and Cambodia, is still uncertain.

- **Data source**: The statistics available come usually from the flag country. However, the statistics of some purse seine fleets operating under some non-EC flags are usually reported by the scientists covering the EC fleet.

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

Main Progress Achieved during 2004

The main progress achieved in the collection and verification of the data in the IOTC NC, CE and SF databases are summarised in Table 3. Additional information about each case (relating to the 'BOX' referred to in the **FLAG**, column) is provided under the numbered Boxes located in the pages following the table:

Table 3: Status of the IOTC NC, CE and SF tables: Main Progress Achieved during 2004

DB	FLAG/S	PERIOD	SPECIES	DETAILS OF ACTIVITY	SOURCES	CHANGES IN DATA
NC	ALL (BOX 1)	1950-2003	ALL	Disaggregation of catches recorded under gear and/or species aggregates in the IOTC database	Nominal Catches tables in the IOTC Database (IOTC-2004-WPTT-06)	No changes in the IOTC Database; the decomposition of the catches was conducted for the WPTT , WPTE and WPB
	Indonesia (BOX 4)	2002-2003	BET, YFT, SWO	New catches available for longline fleets	DGCF/RIMF/CSIRO/IOTC OFCF Sampling in Benoa, Jakarta and Cilacap	New estimates of catches of longline vessels unloaded in Benoa (Jakarta and Cilacap catches currently under estimation)
	Non-reporting fresh tuna longliners operating under several flags (BOX 2 A)	1985-2002	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	Decrease in current catch levels
	Non-reporting deep-freezing longliners (BOX 2 B)	1985-2002	YFT, BET, ALB, SBF	New review of the series of catches from data collected recently	IOTC Vessel Records IOTC Activity Records	Decrease in recent year catches
	Non-reporting industrial purse seiners (BOX 2 C)	1998-2002	SKJ, YFT, BET	New review of catches	Logbook data available from a non-official source Catches and effort of CE vessels	Slight changes in total catches and species composition
	Sri Lanka (BOX 3)	1950-2002	YFT, SKJ, SWO, MARL	New review of catches	Statistical Bulletin from NARA and Statistical Unit of Ministry of Fisheries	Decrease in total catches recorded in recent years
CE	Sri Lanka	2002-2003	YFT, BET, ALB, SBF, SWO	Detailed Catch and effort data extracted from NARA Database	NARA Pelagos Database	New catch and effort data input for 2002-03 (data need further verification)
	Non-reporting industrial purse seiners (BOX 2 C)	1998-2002	SKJ, YFT, BET	New catches and effort data available	Logbook data available from a non-official source Catches and effort of CE vessels	New Catches and effort estimates input
SF	China, Taiwan,China, Indonesia Sri Lanka, Thailand (BOX 4)	1998-2003	YFT, BET, SWO	Validation and verification of size frequency records (fresh tuna longliners) for data input	IOTC Sampling Programmes Ship operators (processing plants)	More than 1,000,000 fish sampled, mostly YFT, BET and SWO
	Sri Lanka	2003	YFT, SKJ, SWO, MARL, SKH	New Size Frequency Data available	NARA Pelagos Database	New data input (need further verification)
	Oman Maldives (BOX 4)	2003	YFT, SKJ	Strengthening of the collection of size data	Local Research institutions (through IOTC-OFCF financing)	New data input for Oman (YFT) Activity under way in Maldives

DB	FLAG/S	PERIOD	SPECIES	DETAILS OF ACTIVITY	SOURCES	CHANGES IN DATA
	ALL	1950-2003	YFT, SKJ, BET	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, 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 summarised in Table 4. Additional documentation about each case (relating to a 'BOX' referred to in the **PROBLEM,** column) is provided under the numbered Boxes located 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 5)	YFT, BET, ALB, SBF, SWO, BIL	TWN, BLZ, PAN, HND, GNQ, BOL, KHM, VCT, VUT	1980 to Date	Fisheries not monitored by the flag countries	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)
		Mainly tropical and neritic tunas	YEM, MDG, SOM, MMR,BGD	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	IND, ARE, COM, KEN, TZA, MOZ	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 (BOX 6)	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
	Poor quality (BOX 7)	All	Non-reporting DWFNs, 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
DI	Statistics not available from the flag country or highly aggregated (BOX 8)	Undersized or spoiled tunas (YFT, BET, SKJ), Sharks, low-value or spoiled billfishes (SSP, SFA) and other species	All, especially industrial fleets	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 (BOX 9)	All, especially Neritic tunas and Billfish	Many artisanal and non-reporting 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

DB	PROBLEM	SPECIES	FLAG/S	PERIOD	REASON/S	PROPOSED ACTION/S
					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, TWN, PHL, JPN	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

STATUS OF THE IOTC FISHING CRAFT STATISTICS (FC), FOREIGN TUNA VESSEL ACTIVITY (FTVA) AND VESSEL RECORD (VR) DATABASES

Data Availability

Data from artisanal fisheries are scarce and inconsistent in many cases. By contrast, the statistics for industrial fleets are relatively 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, Panama, Iran, Japan and Thailand. The Soviet fleet has probably reflagged into Panama.

Longline fleets: There are many more longline fleets fishing tuna in the Indian Ocean, mainly under the flags of China, Taiwan,China, Indonesia, Japan, the Republic of Korea, Philippines, the EC, Seychelles, Equatorial Guinea, Honduras, South Africa, Australia, Vanuatu, Belize, Cambodia, Namibia, Senegal, Bolivia, Uruguay and Panama. The total number of non-reporting longliners has not so far been estimated for 2003.

Main Progress Achieved during 2004

The progress achieved in the collection and verification of the data in the IOTC FC, FTVA and VR databases is summarised in the Table 5.

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 Vessel Record IOTC Activity Record	1985-02	Historic review to complete the craft statistics	Number of non-reporting deep-freezing longliners better known: Around 50 in recent years
	Non- reporting Fresh-tuna longliners	IOTC Sampling Programmes WASKI Indonesia DGCF Indonesia CSIRO Australia RIMF Indonesia	1973-02	Historic review to complete the number of fresh tuna longliners operating in the Indian Ocean	Number of Taiwanese and Indonesian fresh tuna longliners input: More than 1,000 boats in all in recent years.
VR & FTVA	All Industrial	AVA Singapore SFA Seychelles Albion Mauritius MAF Oman AFDEC Thailand (IOTC) FRI Penang (IOTC) USTA & CSP Madagascar DGCF Indonesia IEO Spain / IRD France	1992-02	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

DB	FLAG/S	SOURCES	PERIOD	DETAILS	MAIN RESULTS
	Belize, Senegal, Guinea	INMARBE Belize	2002-03	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. 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, 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 reported	Identify the reasons why the statistics are not reported by the flag countries
				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	1950-03	Incomplete reporting (vessels not reported according to their size, mechanization, etc.)	Identify the reasons why the statistics reported are not complete
FTVA & VR	Data not reported	ZAF, TWN, HND, EQG	1998-03	Fleets not monitored by the flag countries Statistics not reported by the flag countries	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	1995-03	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)	

OTHER IOTC DATA HOLDINGS: BIOLOGICAL DATA

Table 7 describes other datasets available at the IOTC Secretariat:

Table 7: Biological data available at IOTC

TYPE OF DATA	NUMBER RECORDS	PERIOD	SOURCE
Length-length-weight data of tuna and billfish caught by fresh tuna longliners in the Indian Ocean (**BOX 2**)	200,000	2000-04	AFDEC Thailand (IOTC Sampling Programmes) NARA Sri Lanka (IOTC Sampling Programs) RIMF Indonesia (IOTC Sampling Programs) FRI Malaysia (IOTC Sampling Programs)
Length-length-weight-sex-maturity of tuna and tuna-like species caught by longliners and purse seiners within the EEZ of Chagos	7,000	1996-02	MRAG United Kingdom (observer data)

BOX 1: DISAGGREGATION OF CATCHES RECORDED UNDER GEAR/SPECIES AGGREGATES

Figure 1: Catches of tropical tuna species and albacore recorded in the IOTC database (NC) and obtained through disaggregation (DIS)
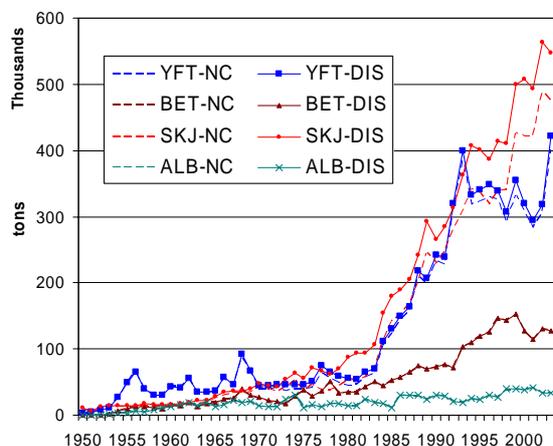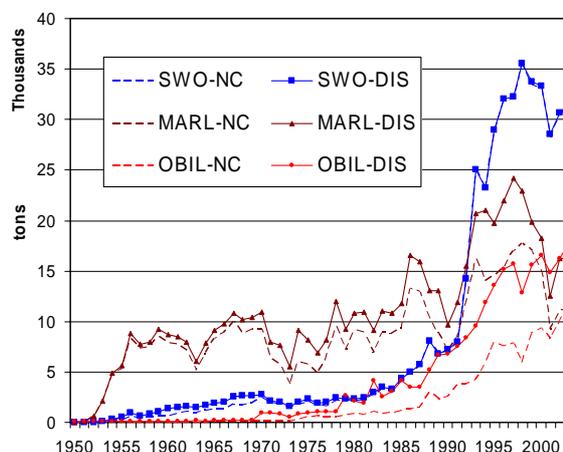
Figure 2: Catches of billfish species recorded in the IOTC database (NC) and obtained through disaggregation (DIS)

Nominal catches data are not always recorded under individual gears or species. This is due to catches not always being reported per species and/or gear by the responsible institution/s in each country.

The decomposition of catches recorded under species and/or gear aggregates is in some cases possible, especially when the Secretariat has access to alternate sources of information as publications and fishery bulletins..

Species and gear aggregates are kept when no alternative sources are found or the information available is not enough to allow the decomposition of these catches. Data recorded in the IOTC Nominal Catches database follows the above rule.

In 2002, the Working Parties recommended that the Secretariat make every possible effort to provide nominal catches broken down by gear and species for stock assessments. During 2004, the Secretariat created a database to allow the decomposition of catches, and provided the WP's with nominal catch data in the format requested.

Figures 1 to 4 show the differences between the catches in the IOTC database and those obtained after assigning catch aggregates to individual gears and species. The disaggregation exercise led to marked increases in the catches for some gears and/or species. The reliability of these new catch estimates is difficult to assess however, because in many cases there was little extra information available to inform the desegregation of the data.

Figure 3: Catches of neritic tuna species recorded in the IOTC database (NC) and obtained through disaggregation (DIS)
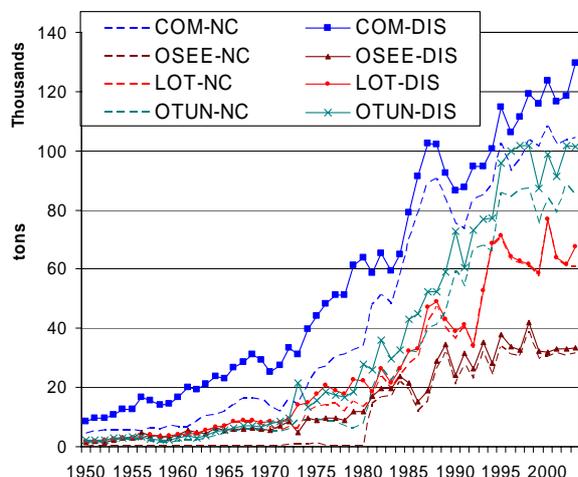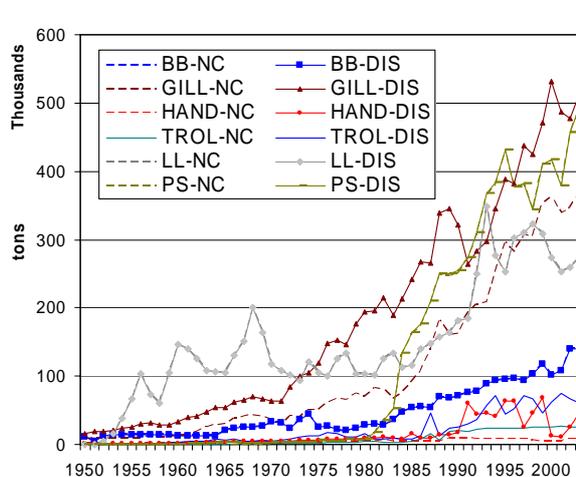
Figure 4: Catches of tuna and tuna-like species per gear type recorded in the IOTC database (NC) and obtained through disaggregation (DIS)

BOX 2: ESTIMATION OF CATCHES OF NON-REPORTING FLEETS

A/ NON REPORTING FRESH TUNA LONGLINE FLEETS (OPERATING UNDER FLAGS OTHER THAN INDONESIA)

Figure 5: Number of non-reporting fresh-tuna longliners operating in the Indian Ocean from 1973-2002
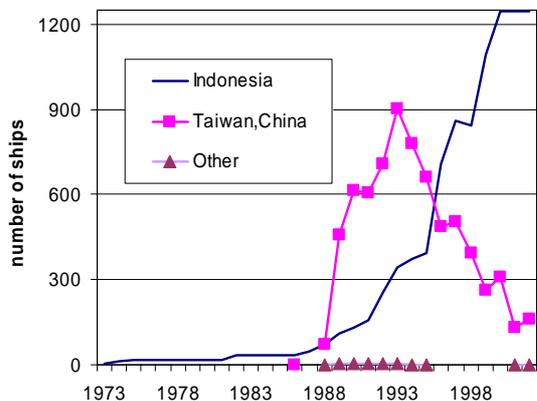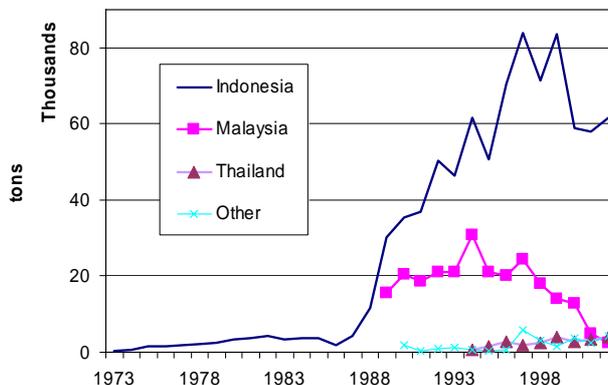
Figure 6: Catches of non-reporting fresh-tuna longliners per country of landing

The number of non-reporting fresh tuna longliners operating in the Indian Ocean sharply increased since the mid-1980's, peaking at about 1,500 vessels in 2000. Almost all longliners now operate under the Indonesian flag, although some still operate under the flag of Taiwan,China. Catches for the Taiwan,China have never been made available to the IOTC, as opposed to the deep-freezing fleet. The drop in the number of Taiwanese vessels and catches observed since 1993 is due to re-flagging of many vessels to Indonesia.

Estimates of the numbers of vessels and catches have been improving over time, due mainly to the information collected through the Sampling Programs implemented by the IOTC in key ports. 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.

Current catches have been estimated at about 70,000 t, mostly yellowfin tuna (YFT) and bigeye tuna (BET).
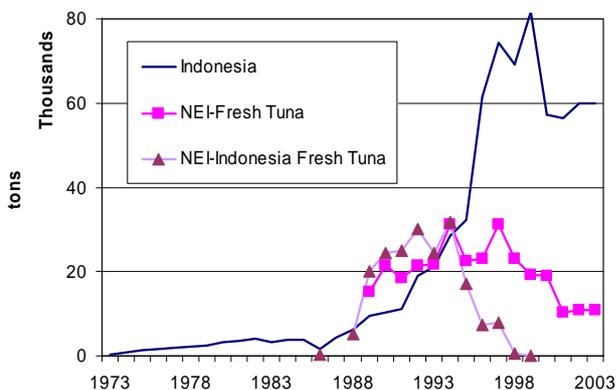
Figure 7: Estimated catches in the Indian Ocean of non-reporting fresh tuna longliners per flag country
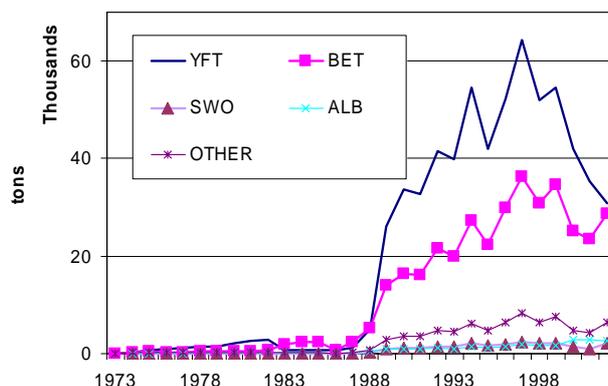
Figure 8: Total catches per species in the Indian Ocean estimated for non-reporting fresh tuna lonfline fleets

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)
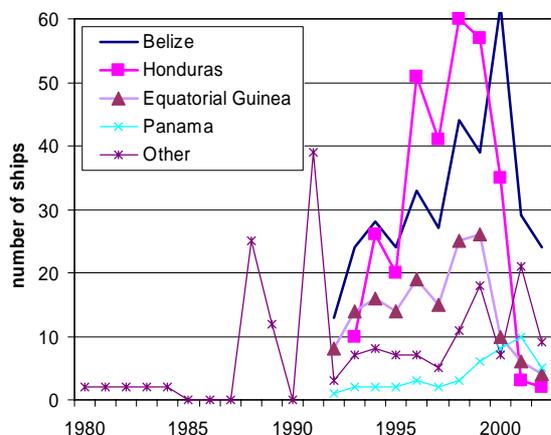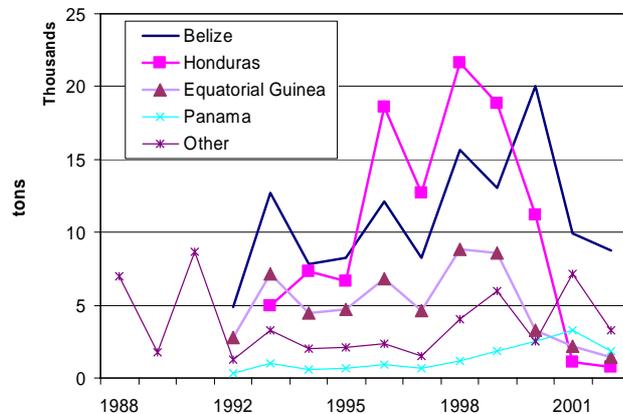

Figure 10: Estimated catches of non-reporting deep-freezing longliners according to the flag of operation

The reporting of new information regarding the activities of vessels fishing for tropical tunas in the IOTC Area of Competence during 2004 allowed the production of new estimates of numbers of non-reporting deep-freezing longliners by flag. The main sources for these data are the IOTC Vessel Record and Foreign Tuna Vessels Activity Record to which many new records where input during 2004.

An estimated 50 non-reporting deep-freezing longliners are operating in the Indian Ocean, , taking a total catch of around 15,000 t. Honduras, Belize, Equatorial Guinea and Panama have been the flags most used by non-reporting longliners over the last years. The catch series was estimated according to average catches per vessel and species composition for the Taiwanese fleet during that period, assuming that most of the vessels operating under flags of non-reporting countries were originally from Taiwan,China, still having skippers from Taiwan,China on board. Although there are many indications to support this, the assumption that the vessels from Taiwan,China and non-reporting countries are exploiting the same spatio-temporal strata over time could be wrong for some flags or periods. The lack of catch and effort and size frequency records regarding non-reporting vessels is of concern.
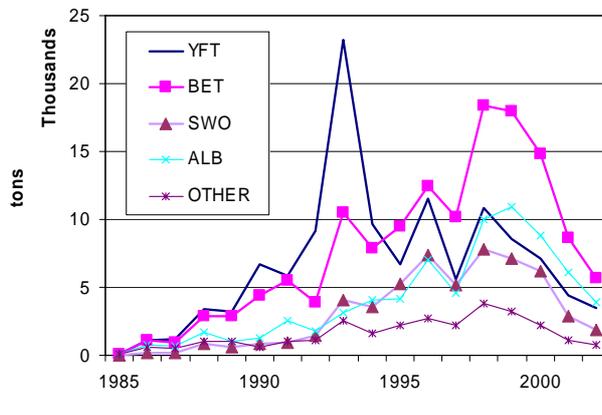

Figure 11: Total catches per species in the Indian Ocean estimated for non-reporting deep-freezing lonfline fleets

The marked drop in the numbers of non reporting longliners vessels operating and catches estimated for 2001 and 2002 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 Seychelles and Philippines in recent years would support this assumption. The low catches reported by both countries, however, are thought not to account for this dramatic increase in the number of vessels operating. It is, therefore, likely that the catches recorded since 2000 for these two countries have to be updated once that more information become available.

C/ NON REPORTING INDUSTRIAL PURSE SEINE FLEETS

Between 9 and 11 non-reporting purse seiners have been operating in the Indian Ocean since 1995 under the flags of Panama and Belize. The catches of these vessels, mainly of skipjack, have been estimated at about 30,000 t. The Secretariat received during 2003 new information regarding the activities of non-reporting purse seiners, namely daily catches and effort for each purse seiner from 1997 to 2003. The information was processed to:

- Fit with IOTC standards: catches and effort per year, month and one degree square area.

- Estimating catches and effort not available per area: the catches and effort of a purse seiner had to be estimated for a trip for which only total catches were available (no logbook information available).

- Estimating catches per species: The dataset available did not include catches per species but total catches per day per vessel.

Figure 12: Location of the 40 transhipments of non-reporting purse seiners as recorded in the logbooks collected for 1997-2003
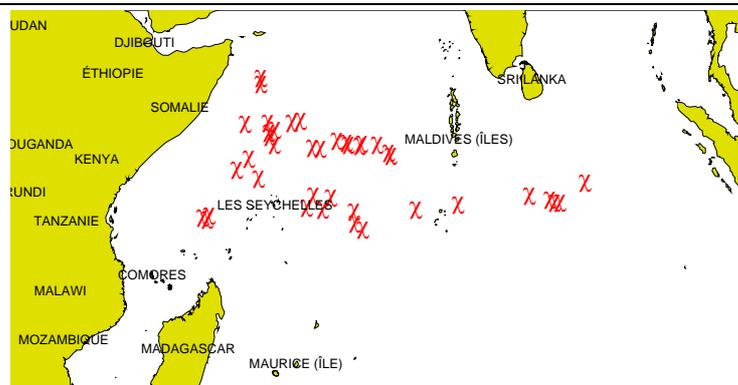
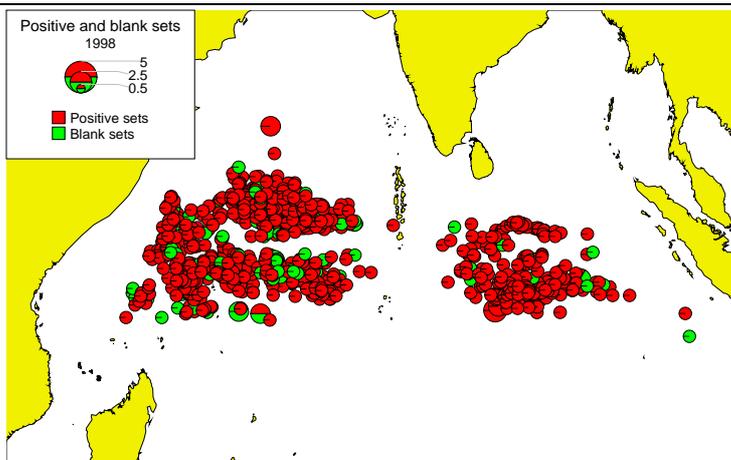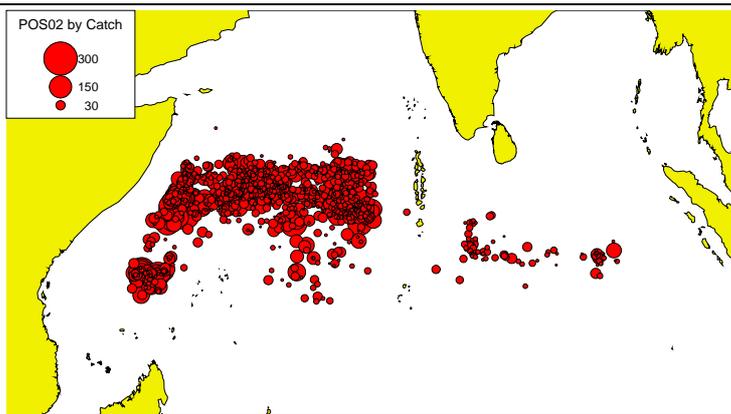More details about the estimation procedure are given below:

1. Aggregation of data according to IOTC standards: all data were put together and aggregated according to IOTC standards.

2. The total catches of a vessel during a trip were assigned to one degree square areas according to the data available for other ships operating in that period. Catches, number of sets and effort were estimated proportionally to catches and effort in each one degree square area aggregated for all other purse seiners.

3. The catches recorded within each one degree square area and month were broken per type of school and species according to the catches available for other purse seine fleets fishing in the same one degree square area and month, mostly EC vessels. The disaggregation of the catches was possible in most cases with catches per species and type of school available for other fleets for the same month and area. The catches of strata for which no information was found for other fleets were assigned according to the following substitution criteria:


Figure 13-16 (above): Catches of non-reporting purse seiners in the Indian Ocean from 1998 to 2001

1. Catches of other industrial purse seine fleets during the same month and 5 degrees square area

2. Catches of other industrial purse seine fleets during the same month and area of 5 degrees latitude by 10 degrees longitude

3. Catches of other industrial purse seine fleets during the same month and area of 10 degrees latitude by 10 degrees longitude

4. Catches of other industrial purse seine fleets during the same month and area of 10 degrees latitude by 20 degrees longitude

5. Catches of other industrial purse seine fleets during the same quarter and one degree square area

6. Catches of other industrial purse seine fleets during the same quarter and 5 degrees square area

7. Catches of other industrial purse seine fleets during the same quarter and area of 5 degrees latitude by 10 degrees longitude

8. Catches of other industrial purse seine fleets during the same quarter and area of 10 degrees latitude by 10 degrees longitude

9. Catches of other industrial purse seine fleets during the same quarter and area of 10 degrees latitude by 20 degrees longitude

Figures 18-22 (right and below): Number of positive and blank sets of non-reporting purse seiners in the Indian ocean from 1998 to 2002

Figure 17: Catches of non-reporting purse seiners in the Indian Ocean during 2002
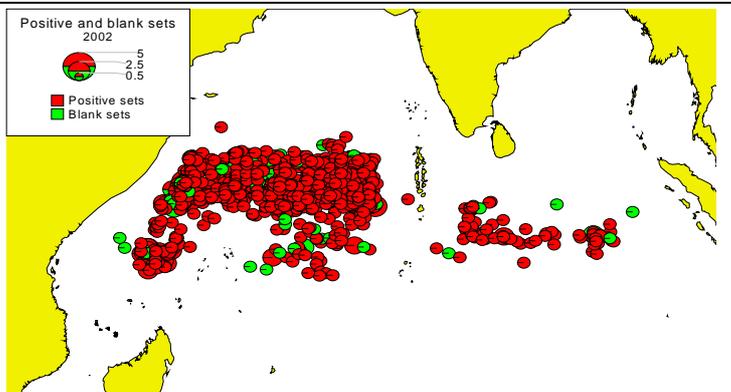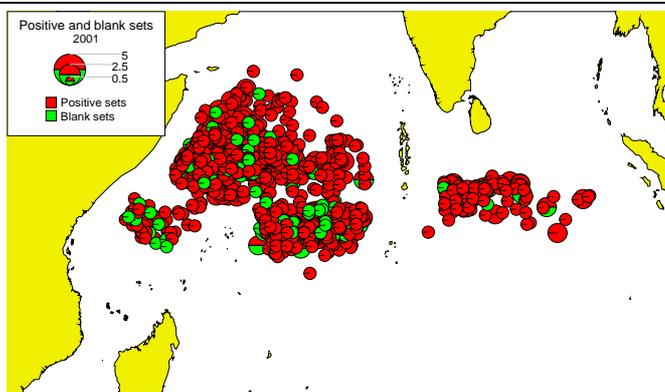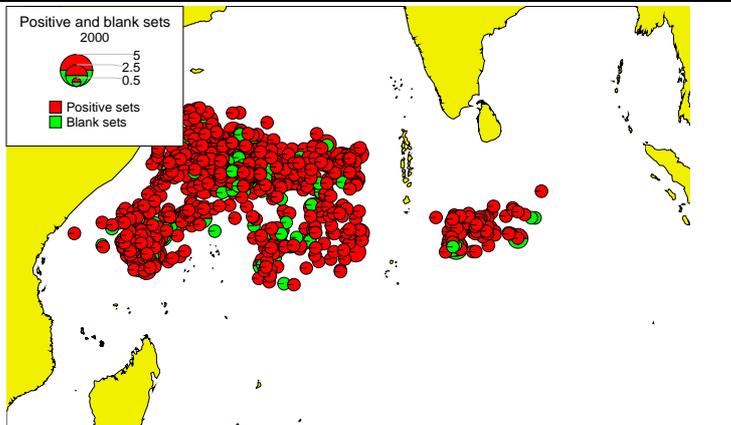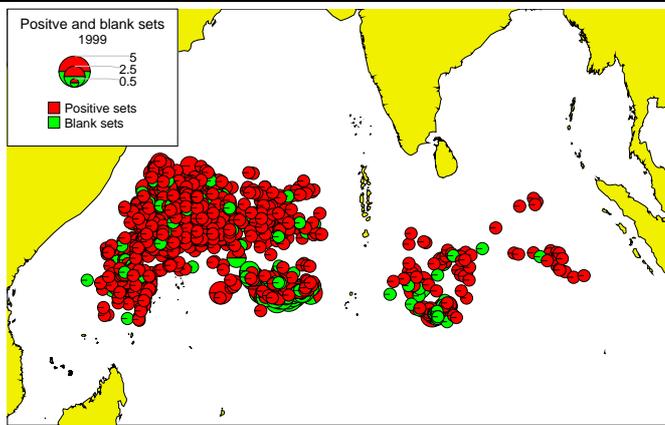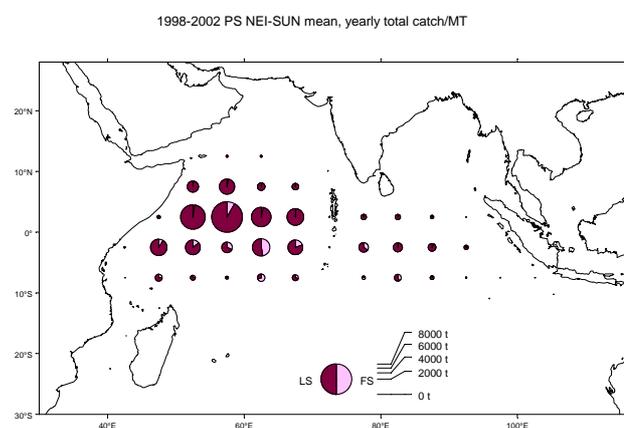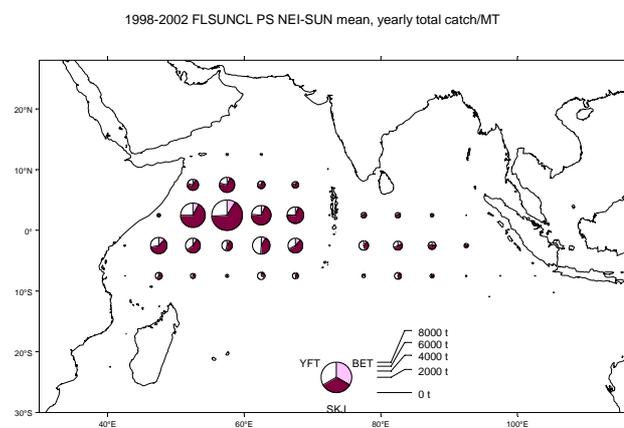
10. Catches of other industrial purse seine fleets during the same semester and 5 degrees square area

11. Catches of other industrial purse seine fleets during the same semester and area of 5 degrees latitude by 10 degrees longitude

12. Catches of other industrial purse seine fleets during the same semester and area of 10 degrees latitude by 10 degrees longitude

13. Catches of other industrial purse seine fleets during the same semester and area of 10 degrees latitude by 20 degrees longitude

14. Catches of other industrial purse seine fleets during the same year and 5 degrees square area

15. Catches of other industrial purse seine fleets during the same year and area of 5 degrees latitude by 10 degrees longitude

16. Catches of other industrial purse seine fleets during the same year and area of 10 degrees latitude by 10 degrees longitude

17. Catches of other industrial purse seine fleets during the same year and area of 10 degrees latitude by 20 degrees longitude

18. Catches of other industrial purse seine fleets during the same quarter and one degree square area of the previous year

19. Catches of other industrial purse seine fleets during the same quarter and one degree square area of the previous year

20. Catches of other industrial purse seine fleets during the same quarter and area of 5 degrees latitude by 10 degrees longitude of the previous year

21. Catches of other industrial purse seine fleets during the same quarter and area of 10 degrees latitude by 10 degrees longitude of the previous year

Figure 23: Catches of non-reporting purse seiners in the Indian Ocean:

Top: Average catches 1998-2002 per species

Below: Average catches 1998-2002 per type of school

1998-2002 FLSUNCL PS NEI-SUN mean, yearly total catch/MT

1998-2002 PS NEI-SUN mean, yearly total catch/MT

22. Catches of other industrial purse seine fleets during the same quarter and area of 10 degrees latitude by 20 degrees longitude of the previous year

23. Catches of other industrial purse seine fleets during the same quarter and one degree square area of the previous year

24. Catches of other industrial purse seine fleets during the same quarter and one degree square area of the same triennium (as 1995-97, 1998-2000 and 2001-03)

25. Catches of other industrial purse seine fleets during the same quarter and area of 5 degrees latitude by 10 degrees longitude of the same triennium

26. Catches of other industrial purse seine fleets during the same quarter and area of 10 degrees latitude by 10 degrees longitude of the same triennium

27. Catches of other industrial purse seine fleets during the same quarter and area of 10 degrees latitude by 20 degrees longitude of the same triennium

28. Catches of other industrial purse seine fleets during the same quarter and one degree square area of the same six years period (as 1992-97, and 1998-2003)

29. Catches of other industrial purse seine fleets during the same quarter and area of 5 degrees latitude by 10 degrees longitude of the same six years period

30. Catches of other industrial purse seine fleets during the same quarter and area of 10 degrees latitude by 10 degrees longitude of the same six years period

31. Catches of other industrial purse seine fleets during the same quarter and area of 10 degrees latitude by 20 degrees longitude of the same six years period

The new catches estimated for this fleet are very close to catches previously estimated by the Secretariat.

BOX 3: SRI LANKA

Tuna and tuna-like fisheries in Sri Lanka initiated well before 1950. Catches are available for Sri Lanka since 1950. Nevertheless. the catches gathered at the IOTC Secretariat for this country were considered very poor quality due to the following reasons:

- Catches incomplete, especially in the early years of the fishery.

- Dramatic discrepancies 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 highly aggregated per gears and/or species

- Mislabelling, mainly of billfish species

The new information collected through several missions of IOTC/OFCF staff to this country, especially that collected for the completion of a Country Report (IOTC/OFCF Project) has allowed the Secretariat to review the catches series for this country. The new catches estimated, although preliminary, are considered better quality than the previous.

A new Memorandum of Understanding signed recently by NARA and the IOTC/OFCF Project will allow strengthening sampling in three important landing places. The information collected will help to obtain better estimates of catches and effort as well as increase the amount of fish measured in this country.
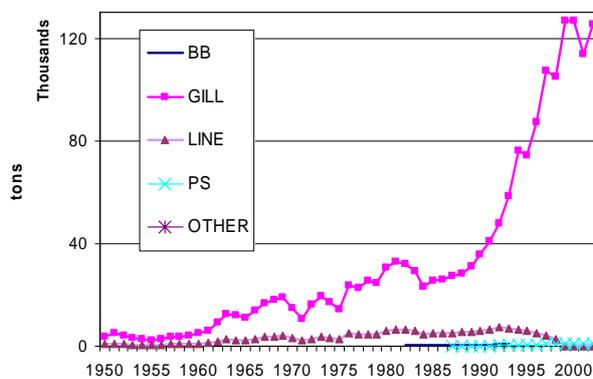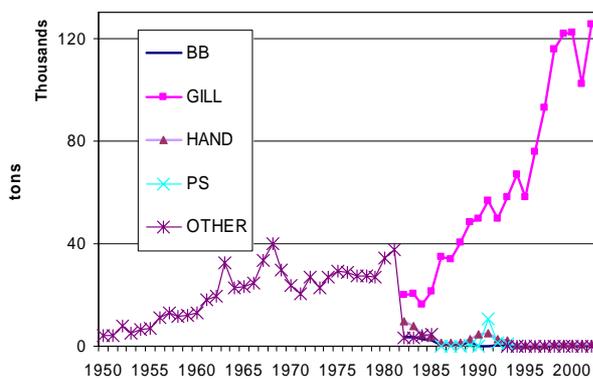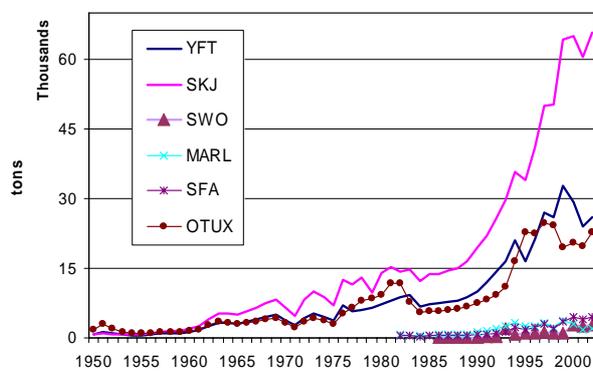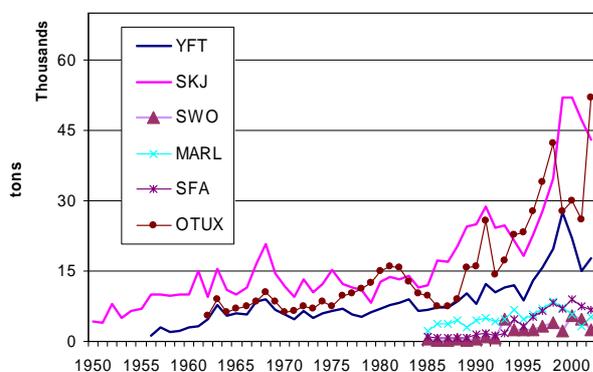
Figures 24-25: Previous catches available for Sri Lanka in the IOTC database (1950-2002)

Top: Total catches per species

Above: Total catches per Gear

Figures 26-27: New catches estimates for Sri Lanka (1950-2002)

Top: Total catches per species

Above: Total catches per Gear

BOX 4: IOTC/OFCF SAMPLING PROGRAMS

Table 8: Total number of fish sampled and total number of length measurements taken by enumerators in processing plants of ports covered through IOTC/OFCF Sampling

Country	Port	Year	From-To	YFT noS	YFT noL	BET noS	BET noL	SWO noS	SWO noL	OTH noS	OTH noL	TOTAL noS	TOTAL noL
Thailand	Phuket	2000	January-Decembre	16,982	1,630	6,853	376	1,459	187	3,993	224	29,287	2,417
		2001	January-December	12,824	2,388	12,212	1,794	1,133	214	3,994	541	30,163	4,937
		2002	January-December	17,294	1,958	20,284	2,646	741	64	2,291	221	40,610	4,889
		2003	January-December	37,739	2,301	17,270	1,003	1,424	121	2,492	171	58,925	3,596
		2004	January-April	14,471	601	7,377	333	433	15	408	10	22,689	959
Malaysia	Penang	2001	January-December		670		366					25,524	1,036
		2002	January-December		1,626		1,766					14,673	3,392
		2003	January-December		1,100		301					7,267	1401
Sri Lanka	Mutwal (Colombo)	2000	January-Decembre	10,972		7,028		84		460		18,544	
		2001	January-December	20,934		14,980		43		1,149		37,106	
		2002	January-December	25,062	2,200	16,136	1,397	334	56	1,416	233	42,948	3,886
		2003	January-December	21,725	288	11,988	176	129	8	669	24	34,511	496
Indonesia	Muara Baru (Jakarta)	2002	August-December	14,577	6,769	12,682	6,231	175		123		27,557	13,000
		2003	January-December	103,899	36,265	52,237	19,768	5870	162	9,569	339	171,575	56,534
		2004	January-July	50,601	10,378	27,137	5,262	3319		6,353		87,410	15,640
	Cilacap	2002	August-December	1,810	1,810	3,005	3,005	352	352	3,936	3,931	9,103	9,098
		2003	January-December	17,570	17,533	8,429	8,413	1120	1102	1,931	933	29,050	27,981
		2004	January-June	10,645	10,623	5,308	5,306	545	531	893	187	17,391	16,647
	Benoa (Bali)	2002	June-December	34,718	4,013	36,047	4,443	4,158	364	9,360	795	84,283	9,615
		2003	January-December	77,201	8,952	61,200	6,555	5,862	196	24,344	947	168,607	16,650
		2004	January-July	31,767	3,220	24,419	2,401	2,739	5	9,574	220	68,499	5,846
Total		2000	January-Decembre	27,954	1,630	13,881	376	1,543	187	4,453	224	47,831	2,417
		2001	January-Decembre	33,758	3,058	27,192	2,160	1,176	214	5,143	541	67,269	5,973
		2002	January-Decembre	93,461	18,376	88,154	19,488	5,760	836	17,126	5,180	204,501	43,880
		2003	January-Decembre	258,134	66,439	151,124	36,216	14,405	1,589	39,005	2,414	462,668	106,658
		2004	January-July	107,484	24,822	64,241	13,302	7,036	551	17,228	417	195,989	39,092
		TOTAL		520,791	114,325	344,592	71,542	29,920	3,377	82,955	8,776	978,258	198,020

Table 9: Total number of fish recorded in landing sheets collected from shipping agents in Phuket and Penang

Country	Port	Year	From-To	YFT noS	BET noS	SWO noS	OTH noS	TOTAL noS
Thailand, Malaysia	Phuket, Penang	1998	January-December	6,543	13,034	1,062	1,742	22,381
		1999	January-December	10,543	21,498	1,488	979	34,508
		2000	January-December	6,948	7,744	869	1,545	17,106
		TOTAL		24,034	42,276	3,419	4,266	73,995

The Secretariat has been implementing Sampling Programs to monitor the activities of non-reporting fleets since 2000. Sampling programs have been conducted in ports in Indonesia, Phuket, Penang and Sri Lanka, where most of the catches of non-reporting fresh tuna longliners operating in the Indian Ocean are unloaded.

Sampling in Maldives and Oman has allowed increasing the amount of size data available from artisanal fisheries, mainly pole and line and gillnet.

Scientists and samplers of research institutions in the three countries, AFDEC[2], FRI[3], NARA[4] and DGCF[5]/RIMF[6] are collecting the information in close cooperation with IOTC/OFCF Project staff.

[2] Andaman Sea Fisheries Development Centre, Phuket

[3] Fisheries Research Institute, Penang

[4] National Aquatic Resources and Development Agency, Colombo

[5] Directorate General of Capture Fisheries, Jakarta

The main objectives of these programmes are to:

- Collect current and historic information regarding the activities of non-reporting vessels in the Indian Ocean in order to be able to estimate their catches as accurately as possible.
- Collect size frequency statistics through sampling and the retrieval of current and historical data from tuna operators or buyers.
- Collect other relevant biological information concerning the main species landed.

The information collected to date has allowed the Secretariat to conduct preliminary estimates of catches for the period of activity of these fleets, being mostly longliners operating under the flags of Taiwan,China and Indonesia. The estimates will probably change as more information about the activities of this fleet is obtained through the schemes currently operating or by implementation of new schemes in other important landing ports.

The estimation of catch-at-size tables for fresh tuna longline fleets is being conducted currently by the Secretariat. Complete estimates of catches and number of vessels operating will also be available soon for fleets operating in Indonesia.

BOX 5: DATA AVAILABILITY

The number of **coastal countries** for which tuna statistics are available in the IOTC nominal catches database ranges from 11 in 1950 to 32 in 2003 (out of the 36 coastal countries lying within the IOTC Area of Competence). The low number of countries for which statistics are available in the early years of the fishery, especially between 1950 and 1970, could be because tunas were not targeted, non-reporting or to poor monitoring of fisheries in some countries. Although the catches of most artisanal fisheries are not believed high, the existence of historical records in each country might be investigated.

The catches of **DWFNs** have, on the contrary, usually been high. The following fleets are not monitored by the flag countries:

> **Fresh tuna longliners (IDN, NEI-ICE, NEI-IDN)**: A large number of fresh tuna longliners, mainly from Indonesia and Taiwan,China, has been operating in the Indian Ocean since the early 1970's, but their catches were never or poorly monitored by the responsible countries. These fleets are currently monitored through the IOTC/OFCF Sampling Schemes in Indonesia, Thailand, Malaysia and Sri Lanka. Recent estimates are close to 70,000 t.

> **Deep-freezing longliners (NEI-DFRZ)**: Between 40 and 150 longliners have been operating in the Indian Ocean in recent years under flags of countries not reporting to the IOTC. The catches have been estimated since the mid-eighties, mainly using information from the IOTC vessel record. Current estimates amount to some 20,000 t.

> The number of NEI-DFRZ longliners operating in the Indian Ocean during the last two years has dramatically decreased.
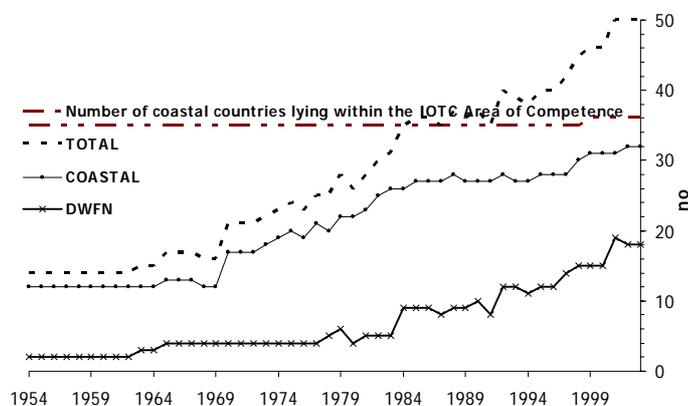
Figure 28: Number of flags for which catches are available in the IOTC NC database:

This is probably because of the re-flagging of many longliners to flags of reporting countries, especially Seychelles and Philippines. Nevertheless, the catches reported by these countries are considered very low, probably due to statistical systems still unable to monitor the new fisheries.

Ex-Soviet purse seiners (NEI-SUN) operating under Belize and Panama flags: No catches were reported for the 9 to 11 ex-Soviet ships operating in the Indian Ocean from 1994 to 1997. Total catches amounting to around 30,000 tons were reported for 1998-2002 but catches per species and type of school had to be estimated (see **Box 2 C**).

---

[6] Research Institute for Marine Fisheries, Jakarta

BOX 6: GEAR AND SPECIES AGGREGATION

Catches reported under Species Aggregates:
Average 1999-2003

Catches reported under Gear Aggregates:
Average 1999-2003

Figure 29: Proportion of the total catches recorded under species (above left) or gear (above right) aggregates in the IOTC Nominal Catches Database per country during 1999-2003 (average catches in tonnes are shown in each case)

The number of countries not reporting detailed statistics to the IOTC has been always high. Many countries have been submitting highly aggregated statistics (80% or more of the catches reported under aggregates containing two or more species or catches not reported by gear) in recent times.
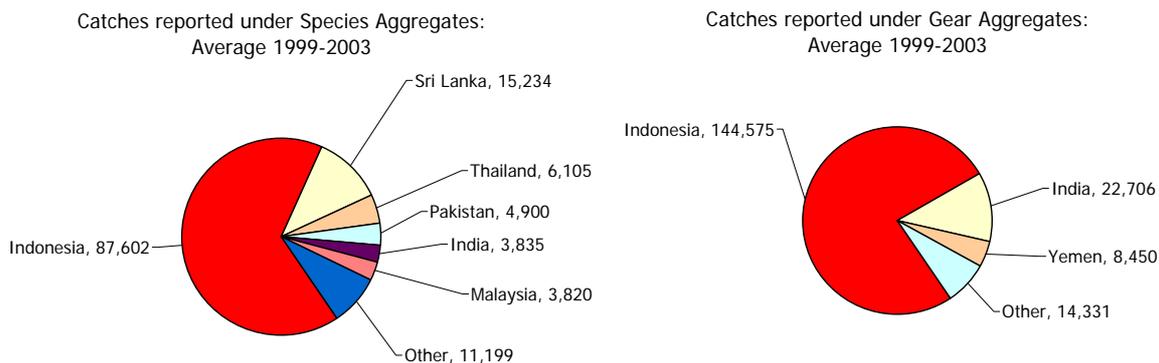
Indonesia: The catches of Indonesian vessels in the Indian Ocean were not reported to IOTC between 1993 and 2000. Catches reported after 2000 are considered poor quality due to:

- Highly aggregated catches: the statistical system is unable to produce detailed catches for most tuna and tuna-like species;

- The Indonesian catch statistics are not thought to fully account for the sharp increases in the number of longliners operating under its flag in recent years (especially since 1995)

New estimates conducted by the Secretariat resulted in catches above 150,000 t since 1995. More than 60% of the catches reported aggregated to the IOTC in recent times thus come from Indonesia. Furthermore, high proportions of tropical tunas and billfish, under IOTC mandate are caught in Indonesia.

India: India has reported the artisanal catches aggregated at the gear level until 2000 and significant catches aggregated at the species level (mainly of neritic tuna species).

Yemen: Either reported by the flag country or estimated from the FAO databases, the catches available were all recorded under unclassified gears. The catches for this country are, indeed, thought highly underestimated.

Sri Lanka, **Thailand**, **Pakistan and Malaysia**: The amount of catches recorded aggregated in the IOTC Nominal Catches Database for these countries has been high in recent years. These aggregates mostly refer to neritic tuna species, although considerable amounts of billfish species have also been reported by Sri Lanka in recent years.
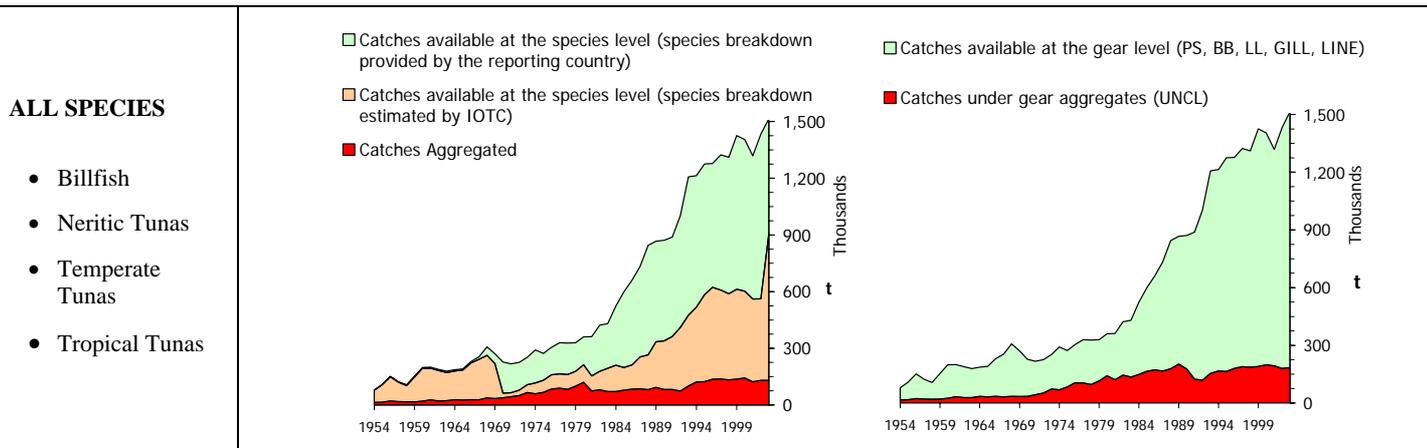
ALL SPECIES

- Billfish
- Neritic Tunas
- Temperate Tunas
- Tropical Tunas

Figure 30: Amount of catch reported at the species level and aggregated

Figure 31: Amount of catch reported at the gear level and aggregated

Almost all catch statistics in the IOTC databases between 1950 and 1969 come from the FAO and are thus considered as being originally aggregated (no gear information is provided in the FAO databases). Nevertheless, the Secretariat was able to assign the catches partially to the corresponding species or gears, especially in well known fisheries with more or less stable composition in species of the catches and a single gear (e.g. Japanese longliners). The amount of catch recorded under unclassified gears remained very high until the mid-eighties.

The amount of catches reported under species aggregates has been increasing since 1970, more rapidly since the early eighties. The main reason for this increase is the growing number of non-reporting fleets operating in the Indian Ocean, using mainly longlines. The Secretariat has been using different sources to estimate the catches of these vessels (sampling programmes, foreign tuna vessels activity, vessel record), although the series are still considered incomplete.

Around 15% of the catches in the IOTC NC database have been recorded under unclassified gears in recent years. This uncertainty is mostly attributable to artisanal fleets operating in coastal countries unable to produce detailed statistics or not reporting the information to IOTC. Indonesia (75% of the total catches reported under unclassified gears come from Indonesia), India (12%) and Yemen (5%) are the major contributors in this respect.

The levels of aggregation are very different between and within the different species groups:
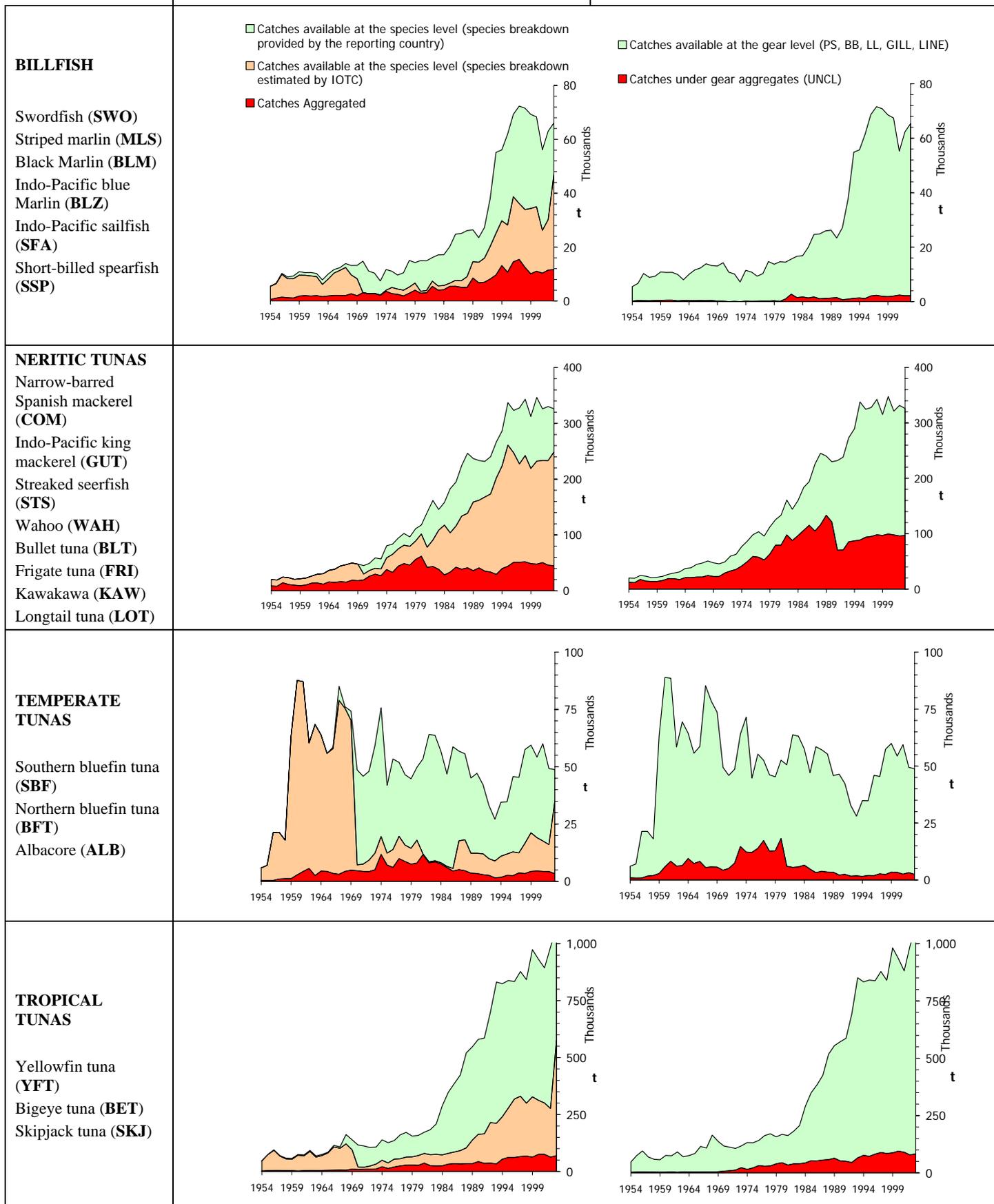
Billfish: The species within this group are mostly caught by longlines and, to a lesser extent, gillnets. While aggregation does not represent a problem as regards the gears used it does at the species level. About half the catches of these species have been reported aggregated. Sri Lanka, India and Pakistan have been reporting high catches of billfish under species aggregates in recent years. The aggregation concerns mainly species other than the swordfish which is easily identified, mostly caught by industrial fleets and has a high market value. Catches, besides those from non-reporting fleets, are thus well known for this species.

Neritic tunas: Species and gear aggregation are widespread within this group. Current levels of aggregation have been close to 60% and 30% as regards species and gears, respectively. Indonesia, India and Thailand are the major contributors in this respect. The high levels of aggregation are thought to be mainly due to no or incomplete reporting from the countries, since several among them are known to have been routinely collecting the statistics.

Temperate **and Tropical tunas**: Most of the catches of the six species under these groups come from industrial fleets and, therefore, gear and species aggregation are quite low. Nevertheless, the rising number of non-reporting fleets operating in the Indian Ocean in recent years is increasing the amount of catches that have to be estimated by the Secretariat. Indonesia is the mayor contributor to this uncertainty, especially regarding the tropical tuna species (80% of the total catches of tropical tuna species reported under gear or species aggregates come from this country). The multilateral longline catch monitoring program implemented in Indonesia since June 2002 will allow that catches are estimated per species for 2003 and following years.

Figures 32-35: Amount of catch reported at the species level and aggregated	*Figure 36-39: Amount of catch reported at the gear level and aggregated*

BILLFISH

Swordfish (**SWO**)

Striped marlin (**MLS**)

Black Marlin (**BLM**)

Indo-Pacific blue Marlin (**BLZ**)

Indo-Pacific sailfish (**SFA**)

Short-billed spearfish (**SSP**)

☐ Catches available at the species level (species breakdown provided by the reporting country)

☐ Catches available at the species level (species breakdown estimated by IOTC)

■ Catches Aggregated

☐ Catches available at the gear level (PS, BB, LL, GILL, LINE)

■ Catches under gear aggregates (UNCL)

NERITIC TUNAS

Narrow-barred Spanish mackerel (**COM**)

Indo-Pacific king mackerel (**GUT**)

Streaked seerfish (**STS**)

Wahoo (**WAH**)

Bullet tuna (**BLT**)

Frigate tuna (**FRI**)

Kawakawa (**KAW**)

Longtail tuna (**LOT**)

TEMPERATE TUNAS

Southern bluefin tuna (**SBF**)

Northern bluefin tuna (**BFT**)

Albacore (**ALB**)

TROPICAL TUNAS

Yellowfin tuna (**YFT**)

Bigeye tuna (**BET**)

Skipjack tuna (**SKJ**)

19

BOX 7: DATA QUALITY

ALL SPECIES	

Catches recorded poor or unknown Quality in the IOTC Database: Average 1999-2003

- Taiwan,China, 45,216
- India, 81,044
- Sri Lanka, 123,746
- Indonesia, 202,140
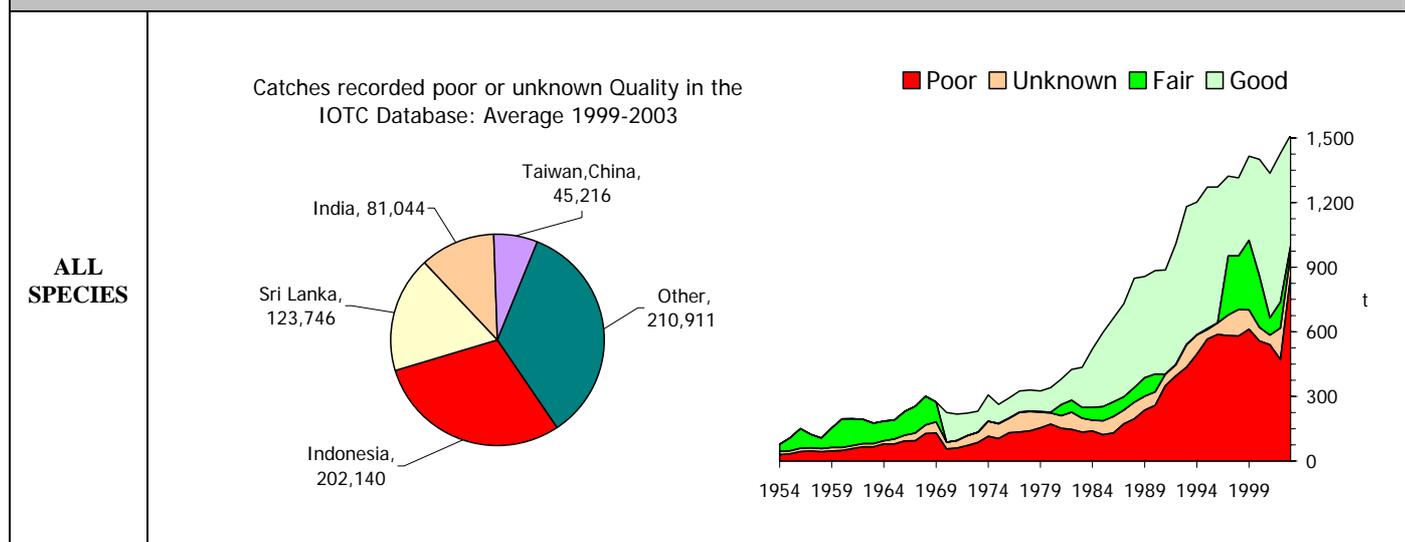- Other, 210,911

Legend: Poor, Unknown, Fair, Good

Figure 40: Presumed quality of the data in the IOTC nominal catches database and main fleets for which catches are thought inaccurate or uncertain in recent years.

The following quality codes were assigned to the records in the IOTC databases:

- **4 (Good)**: The catches recorded in a given stratum are presumed to represent the actual catches occurred in that stratum. This refers to all data available from countries having data collection and processing systems with known ability to produce good catch estimates and to the data estimated by the Secretariat from sources thought to be reliable. No inconsistencies in the data were found during the verification and validation processes run at the Secretariat or communicated from the reporting source.

- **3 (Fair)**: This refers to data coming from the same sources as above but for which minor inconsistencies were found during validation and verification or communicated from the reporting source. These inconsistencies referred were not thought to affect the catches recorded in the strata concerned substantially.

- **2 (Unknown)**: It is not known whether the catches recorded in a given stratum represent the actual catches occurred in that stratum as insufficient or no information was provided by the reporting source about how the estimates were obtained.

- **1 (Poor)**: The catches recorded in a given stratum are thought inaccurate as major inconsistencies were found during validation and verification or many assumptions had to be made in the estimates.

Sharp increases in the catches recorded as poor quality have been noted since the mid-eighties. This uncertainty comes mostly from:

Indonesia (IDN): Although the current estimates are possibly more accurate regarding the total catches, the catches at the species level are still thought uncertain.
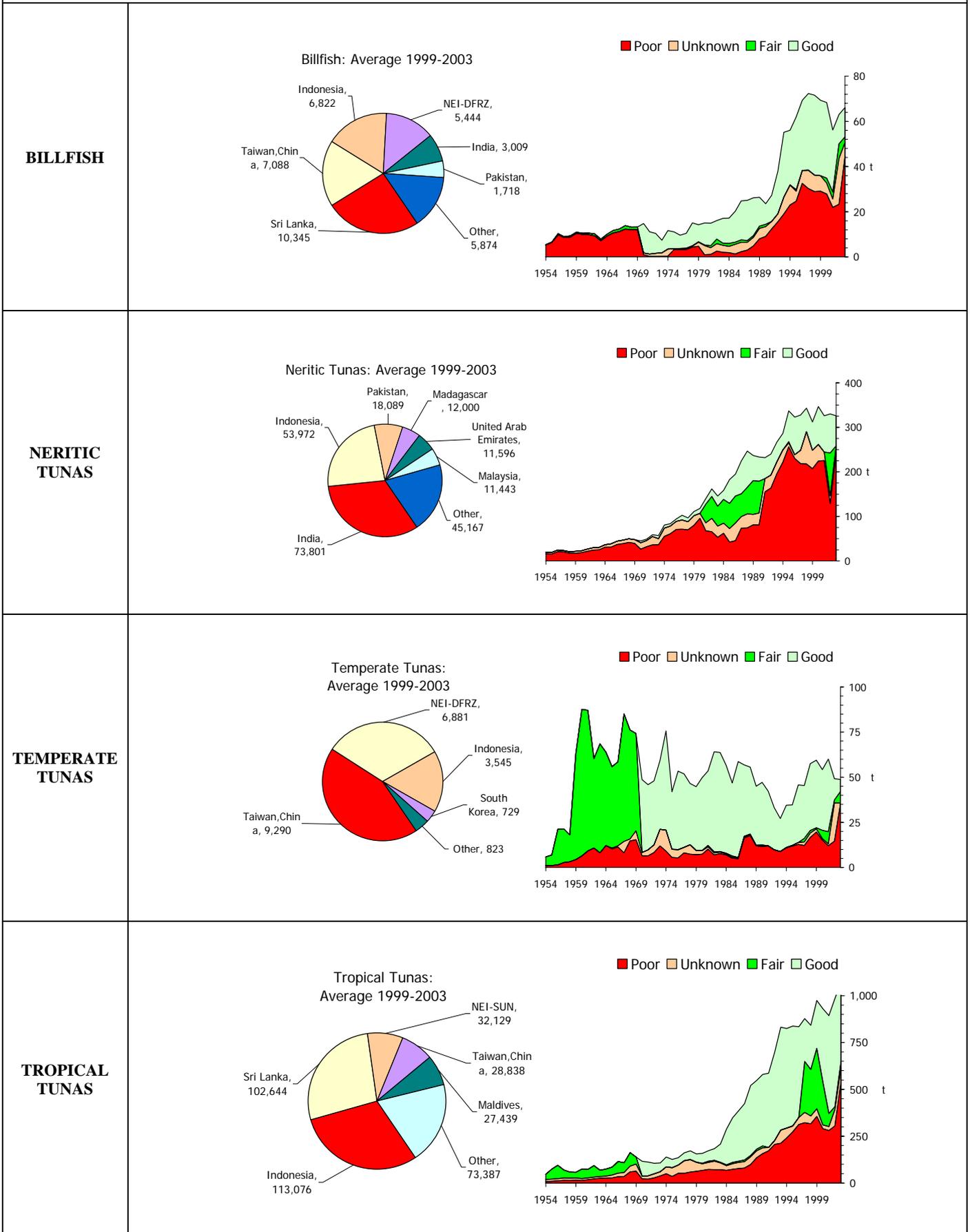
Non-reporting DWFNs (Taiwan,China, NEI-DFRZ, NEI-ICE and NEI-SUN): The catches of NEI vessels are estimated by the Secretariat using the reported numbers per year and mean catches and species breakdowns from fleets thought to operate in a similar way. The IOTC sampling programmes are proving helpful to reduce the uncertainty of catches estimated for fresh-tuna longline fleets (NEI-ICE). The amount of information available for non-reporting deep-freezing longliners (NEI-DFRZ) and purse seiners (NEI-SUN) is still very low.

Sri Lanka (LKA) **and India** (IND): The either unreliable or highly aggregated data available from these countries needed to be re-estimated by the Secretariat, sometimes using information for years far from those which the catches had to be estimated. Thus, gear and/or species breakdowns were estimated assuming fisheries were not changing over time. The risk from these assumptions increases with the gap in time between the new catches and the year when catches were used as basis for the estimate.

The amount of catches with a poor quality code is of concern, especially for **billfish** and **neritic tunas**. Poor quality catches amount to more than half the total catches in recent years for these categories. The fleets that contributed mostly to this uncertainty are from **India**, **Indonesia** and **Thailand**, for the neritic tunas, and **NEI-DFRZ, Indonesia** and **Sri Lanka**, for billfish.

Although less affected than the others, the quality of the catches of **tropical** and **temperate tuna** species have been worsening in recent years. The increasing trend in the number of longline vessels from **Indonesia** and longline and purse seine vessels from non-reporting DWFNs is again the reason for these uncertain catches.

Figures 41-44: Presumed quality of the data in the IOTC nominal catches database and main fleets which catches are thought inaccurate or uncertain in recent years.

BILLFISH

Billfish: Average 1999-2003

NERITIC TUNAS

Neritic Tunas: Average 1999-2003

TEMPERATE TUNAS

Temperate Tunas: Average 1999-2003

TROPICAL TUNAS

Tropical Tunas: Average 1999-2003

21

BOX 8: DATA COMPLETENESS

BILLFISH	NERITIC TUNAS

TEMPERATE TUNAS	TROPICAL TUNAS

■ NC
■ CE
□ SF

Figures 45-48: Proportion of the total catches (NC) for which the catch and effort (CE) and size frequency (SF) records in the IOTC databases are available for the species groups managed by IOTC

The Charts above and in the next page are optimistic views about the proportion of the total catches for which records in the IOTC catch and effort and size frequency databases are available. Catch and Effort (CE) and/or size frequency (SF) records were presumed fully representative of the total catches (NC) per species, country and year whenever one or more records were found in the Catch and Effort and/or Size Frequency databases for that species, gear, year and country.

In spite of this approach, the situation is of concern for some species groups and fisheries:

BILLFISH: Recent coverage rates amount to about 40% and 15% of catch and effort and size frequency data, respectively. The low rates are due to:

- Non-reporting of statistics for important **longline fisheries** operating in the Indian Ocean: Fresh tuna longliners from **Taiwan,China** and **Indonesia** and deep-freezing longliners (DWFNs) operating under several flags (mainly **Belize**, **Honduras**, **Equatorial Guinea** and **Panama**)

- Lack of size frequency statistics for deep-freezing longliners from **Taiwan,China**, the Republic of **Korea** and **Philippines**.

The lack of the data above concerns swordfish mostly and, to a lesser extent, all marlin species.

- Lack of catch and effort and size frequency data from **artisanal fisheries**, especially **gillnets** and **troll lines**. The Indo-Pacific sailfish and, to a lesser extent, the black and blue marlins are the species most affected.

The lack of Catch and Effort data for longliners of **Taiwan,China** in 2003 is the reason for the drop in coverage during this year. This is of great concern considering that most of the catches of the species come from this fleet and other vessels belonging to owners of Taiwan,China that operate under flags of non-reporting countries.

NERITIC TUNAS: These species, caught mostly by artisanal gears, have been either badly monitored or not reported in detail. Recent coverage rates are around the 10% for both catch and effort and size frequency statistics. No or scarce catch and effort and size frequency statistics are available at IOTC from **India**, **Iran**, **Indonesia, United Arab Emirates** and, up to recent years, **Oman** and **Thailand**. Catch and effort records and size samples are, however, collected in all these countries.

TEMPERATE TUNAS: Current levels of coverage are around the 15% regarding size data. Catch and effort data are however quite complete until 2000. The lack of size frequency statistics since 1989 from **Taiwan,China** is of high concern.

TROPICAL TUNAS: The coverage rates for both the catch and effort and size frequency data have been worsening since the mid-eighties.

This is due to the increase in the number non-reporting fleets operating in the Indian Ocean, mainly fresh tuna longliners from **Indonesia**, longliners (both fresh and deep-freezing) from DWFNs and, recently, **Taiwan,China**.

Figures 49-54: Proportion of the total catches (NC) which the catch and effort (CE) and size frequency (SF) records in the IOTC databases are available according to the gears under which the statistics were reported.

PURSE SEINE	POLE AND LINE

LONGLINE	LINE (HAND AND TROLL LINES)

GILLNET	UNCLASSIFIED GEARS
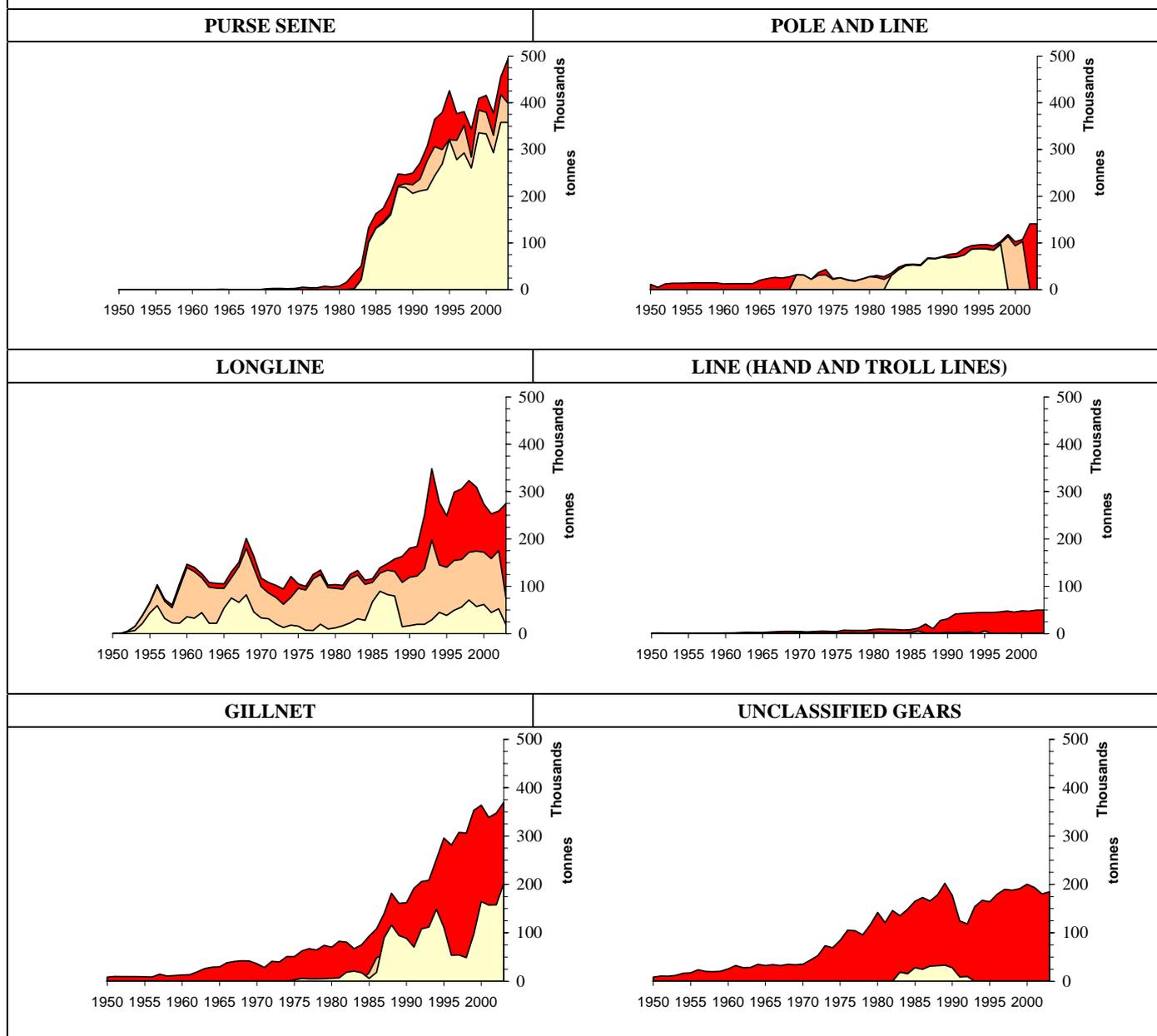
NOTE: Catch and Effort (CE) and/or size frequency (SF) records were presumed fully representative of the total catches (NC) per species, country and year whenever one or more records were found in the Catch and Effort and/or Size Frequency databases for that species, gear, year and country.

The completeness of catch and effort and size frequency data is also changing depending on the gear: while **pole and line** and **purse seines** are well covered from the mid-eighties to the late-nineties[7], this is not the case with all other gears, especially **gillnets** and **lines**, both having very low coverage rates. The statistics for **longliners** have been worsening since the mid-eighties, with coverage rates of 50% (catch and effort) and 25% (size frequency) up to 2002 and much lower in 2003, due to the lack of data from **Taiwan,China**.

Finally, the amount of catches reported under **unclassified gears**, around 200,000 t in recent years, is of concern. The catches come usually

---

[7] Catch and effort and size frequency have not been available for the pole and line fishery of Maldives since 1994 (detailed data) and 1998, respectively.

from artisanal fisheries, mainly gillnets and lines.

BOX 9: AVAILABILITY OF CATCHES OF SPECIES OTHER THAN IOTC TUNA AND TUNA-LIKE SPECIES AND DISCARDS FROM INDUSTRIAL FLEETS OPERATING IN THE IOTC AREA OF COMPETENCE

Gear	Fleet	Av99/03	NTAD	SKH	TUX	DISCARDS
Longline	Taiwan,China	105,931	311	1,511	104,110	NO
	Indonesia	64,685	0	1,660	63,025	NO
	Japan	38,074	0	0	38,074	NO
	NEI-Deep-freezing	28,712	109	317	28,286	NO
	NEI-Fresh Tuna	14,182	47	103	14,031	NO
	Spain	12,827	0	9,827	3,000	NO
	China	6,237	0	57	6,180	YES
	Seychelles	3,863	64	99	3,701	NO
	Korea, Republic of	3,365	0	17	3,348	NO
	Australia	2,814	0	61	2,752	YES
	France-Reunion	2,405	70	56	2,278	NO
	Philippines	2,397	4	25	2,368	NO
	Other	5,285	99	2,148	3,038	NO
	TOTAL LL	290,777	704	15,882	274,191	
Purse seine	Spain	148,030	0	0	148,030	NO
	France	88,163	0	0	88,163	YES
	NEI-Other	59,375	0	0	59,375	NO
	Seychelles	44,173	0	0	44,173	NO
	NEI-Ex-Soviet Union	32,139	0	0	32,139	NO
	Indonesia	11,903	0	0	11,903	NO
	Other	46,972	23	0	46,949	NO
	TOTAL PS	430,754	23	0	430,731	
	TOTAL	721,532	727	15,882	704,923	

Table 10: Average catches of tuna and tuna-like species (TUX) for the period 1999-2003 and amounts of sharks (SKH) and other non-tuna or tuna-like species (NTAD) from the IOTC NC database

The reporting of catches of sharks and species other than those covered in the IOTC Agreement has been scarce and inconsistent over time. It is currently impossible to know to what extent the catches of these species are underestimated due to the lack of reliable data.

The reporting of discards has also been very low. Furthermore, when reported, the discards never represented the total amount and no indication on what proportion of the total catches was covered, being impossible to estimate their totals. These discards might involve considerable amounts of undersized tuna species, especially in purse seine fisheries exploiting schools associated to fish aggregating devices (FADs).

Gear	SppGroup	Total	Aggregated	Disaggregated
Longline	NTAD	3,522	3,172	349
	SKH	79,408	20,905	58,503
Purse seine	NTAD	115	115	0
	SKH			
	TOTAL	83,044	24,192	58,852

Table 11: Average catches of sharks (SKH) and other non-tuna or tuna-like species (NTAD) recorded under species aggregates (Aggregated) or at the species level (Disaggregated) in the IOTC NC database for the period 1998-2002

Underreporting concerns more industrial fisheries, mainly longline and purse seine, than artisanal fisheries, where the amount of discards is thought negligible.

Species aggregation is, besides underreporting, an important problem concerning the reporting of these data, with some 60% of the catches available reported under species aggregates.

The implementation of observer programs in industrial fleets might help to reduce the uncertainties regarding the catches of these species.

Species	ScientName	AvCatch	Longline	Purse seine	Baitboat	Gillnet	Line	Other
Sharks various nei	Selachimorpha (Pleurotremata)	46,088	4,001			37,647	225	4,215
Other non tuna-like fishes nei	Fishes non Scombroidei	19,116	95		9,961	4,009	4,552	499
Blue shark	Prionace glauca	15,575	10,690			4,885	0	
Silky shark	Carcharhinus falciformis	12,854	3			12,851		
Oceanic whitetip shark	Carcharhinus longimanus	2,811	16			2,795		
Requiem sharks nei	Carcharhinidae	2,299	152			2,146	2	
Thresher sharks nei	Alopias spp.	1,934	25			1,908		
Hammerhead sharks nei	Sphyrna spp.	1,754	2			1,752	0	
Indian mackerel	Rastrelliger kanagurta	1,731				43		1,688
Sharks mackerel, porbeagles nei	Lamnidae	1,387				1,382	5	
Shortfin mako	Isurus oxyrinchus	1,068	944			124	0	
Dogtooth tuna	Gymnosarda unicolor	732	1		423	5	302	1
Non targeted, associated and dependent species		562	539	23		0		0
Striped bonito	Sarda orientalis	275				252	3	21
Common dolphinfish	Coryphaena hippurus	184	69			115		
Mackerels Indian, nei	Rastrelliger spp.	37	0		11	0	24	2
Smooth-hound	Mustelus mustelus	19	19				0	
Longfin mako	Isurus paucus	16	16					
Tope shark	Galeorhinus galeus	8	3				4	
Unknown		4						4
Copper shark	Carcharhinus brachyurus	3	3				0	
Smooth hammerhead	Sphyrna zygaena	3	2				0	
Angular rough shark	Oxynotus centrina	2	2					
Sharks nei other than oceanic whitetip shark and blue shark		1	1					
Porbeagle	Lamma nasus	1	1					
Dusky shark	Carcharhinus obscurus	1	0				1	
Blacktip reef shark	Carcharhinus melanopterus	1					1	
Rays, stingrays, mantas nei	Rajiformes	0	0					
Dogfishes nei	Squalus spp.	0	0					
Broadnose sevengill shark	Notorhynchus cepedianus	0	0				0	

Table 12: Species other than tuna and tuna-like for which catches are available in the IOTC NC database and average catches reported for the last five years