REVIEW OF THE STATISTICAL DATA AND FISHERY TRENDS FOR TROPICAL TUNAS

PREPARED BY: IOTC SECRETARIAT[1], 30 OCTOBER 2014

PURPOSE

To provide the Working Party on Tropical Tunas (WPTT) with a review of the status of the information available on tropical tuna species in the databases at the IOTC Secretariat as of September 2014, as well as a range of fishery indicators, including catch and effort trends, for fisheries catching tropical tunas in the IOTC area of competence. It covers data on nominal catches, catch-and-effort, size-frequency and other data, in particular release and recapture (tagging).

BACKGROUND

Prior to each WPTT meeting the Secretariat develops a series of maps, figures and tables that highlight historical and emerging trends in the fisheries data held by the Secretariat. This information is used during each WPTT meeting to inform discussions around stock assessment and in developing advice to the Scientific Committee.

This document summarises the standing of a range of information received for tropical tuna species, in accordance with IOTC Resolution 10/02 *Mandatory statistical requirements for IOTC Members and Cooperating non-Contracting Parties (CPC's)*[2].

Section 2 identifies problem areas relating to the statistics of tropical tuna species. Section 3 looks into the main fisheries, catch trends and tag release and recovery data available for each species; and main issues identified concerning the statistics available at the IOTC Secretariat for each species.

The report covers the following areas:

- Overview
- Main issues relating to the data available on tropical tunas
- Overview of tropical tuna fisheries in the Indian Ocean:
  - Catch trends
  - Status of fisheries statistics for tropical tuna species
  - Status of tagging data

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 parties on the activity of vessels under their flag (IOTC Resolution 10/08; IOTC Resolution 12/05) or other flags (IOTC Resolution 12/07; IOTC Resolution 05/03); data on imports of bigeye tuna from vessels under the flag concerned (IOTC Resolution 01/06); and data on imports of tropical tunas from canning factories collaborating with the International Seafood Sustainability Foundation[3].

Catch and effort data which refer to the fine-scale data – usually from logbooks –, reported in aggregated format: per fleet, year, gear, type of school, month, grid and species. Information on the use of fish aggregating devices (FADs) and activity of vessels that assist industrial purse seiners to locate tuna schools (supply vessels) is also collected.

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[1] James Geehan (jg@iotc.org), Miguel Herrera (mh@iotc.org), & Lucia Pierre (lp@iotc.org).

[2] This Resolution superseded IOTC Resolutions 98/01, 05/01 and 08/01.

[3] With catch imports by vessel, trip, species and commercial category forwarded to the IOTC Secretariat on each quarter.

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

Tagging data: release and recovery data gathered in the framework of the Indian Ocean Tuna Tagging Programme (IOTTP), which encompass data gathered during the Regional Tuna Tagging Project – Indian Ocean (RTTP-IO) and data gathered during a series of Small-scale tuna tagging projects in Maldives, India, Mayotte, Indonesia and by other institutions, e.g. SEAFDEC, NRIFSF, with the support of IOTC. In 2012, the data from past projects implemented in Maldives in the 1990s was added to the tagging database at the Secretariat, and as of September 2014 this database contains 219,121 releases and 34,319 recoveries.

Tropical tuna species and main fisheries in the Indian Ocean

Table 1 below shows the three species of tropical tunas under IOTC management.

Table 1. Neritic tuna species under the IOTC mandate

IOTC code	English name	Scientific name
BET	Bigeye tuna	*Thunnus obesus*
SKJ	Skipjack tuna	*Katsuwonus pelamis*
YFT	Yellowfin tuna	*Thunnus albacares*

DISCUSSION

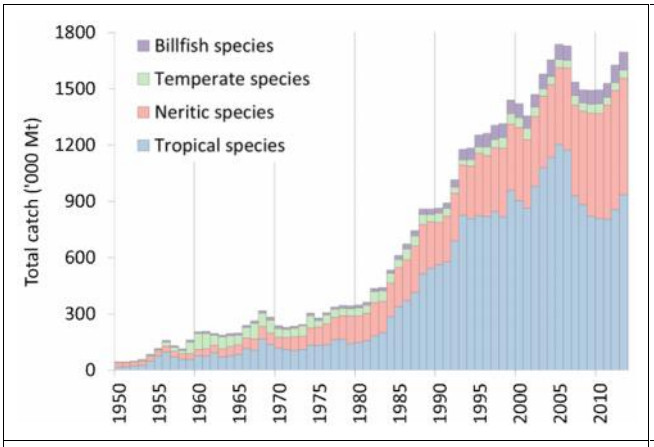
The contribution of tropical tunas to the total catches of IOTC species in the Indian Ocean has changed over the years (Fig. 1a-b.), in particular following the arrival of industrial purse seine fleets to the Indian Ocean in the early-1980s targeting tropical tunas which led to a significant increase in the amount of catch accounted for by tropical tuna species. With the onset of piracy in the late-2000s, the activities of fleets operating in the north-west Indian Ocean have been displaced or reduced – particularly the Asian longline fleet targeting tropical tunas – leading to a relative decline in the proportion of catches from tropical tuna species. In recent years (2009–13), the catches of tropical tunas in the Indian Ocean have accounted for 54% of the combined catches of all IOTC species (compared to 60% over the period 1950–2013). Since 2012, catches of tropical tunas appear to show signs of recovery, in particular catches from distant water longline fleets, as a result of the reduction of the threat of piracy and return of fleets and fishing effort to the north-west Indian Ocean.

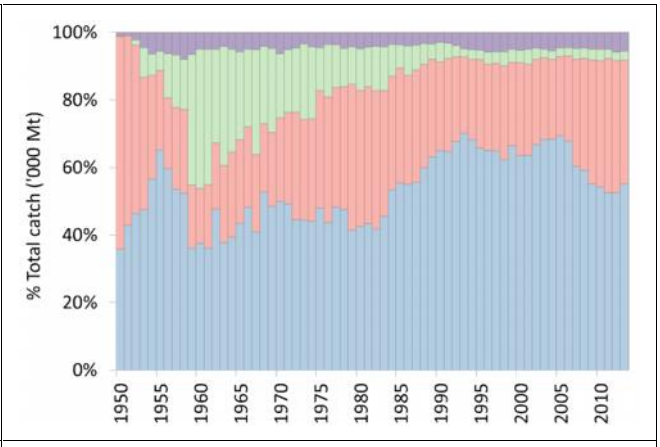
Among the tropical tuna species skipjack tuna dominate, with catches that account for 46% of the total catches of the combined catches of tropical tunas in recent years (2011-12; Fig. 1c.). While the catch levels of yellowfin tuna were also high during the same period (42%), the catches of bigeye tuna were at lower levels (12%).

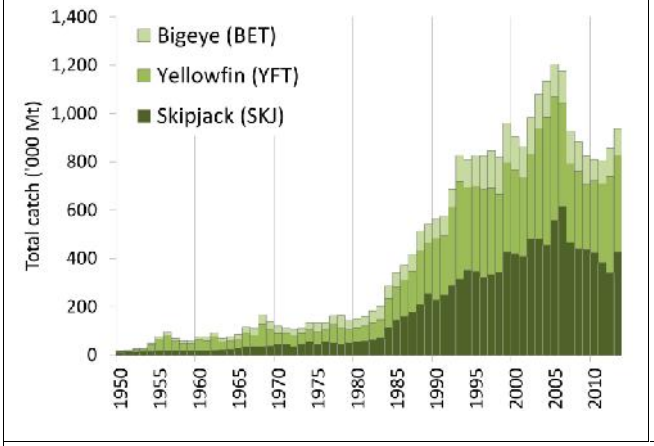
Tropical tunas are caught by both coastal countries and distant water fishing nations (Fig. 2): in recent years the coastal fisheries of five countries (Indonesia, Sri Lanka, Maldives, Iran, and India) have reported around 56% of the of the total catches of tropical tuna species from all countries and species combined, while the industrial purse seiners from and longliners flagged in EU-Spain, Seychelles and EU-France reported around 29% of the total catches of these species (from 2010-12; Fig. 2).

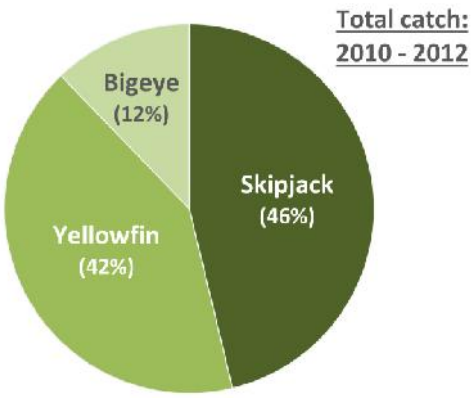
The majority of the catches of tropical tuna species are sold to international markets, including the *sashimi* market in Japan (large specimens of yellowfin tuna and bigeye tuna in fresh or deep-frozen condition), and processing plants in the Indian Ocean region or abroad (small specimens of skipjack tuna and, to a lesser extent, yellowfin tuna and bigeye tuna). A component of the catches of tropical tunas, in particular skipjack tuna caught by some coastal countries in the region, is sold in local markets or retain by the fishermen for direct consumption.

Tropical tunas are mainly caught using purse seines (accounting for 36% of the total catches of tropical tunas for 2011-13), with important catches also reported by several types of handlines and trolling (19%), gillnets (18%), longlines (15%), and pole-and-lines (11%), in both coastal waters and the high seas. Tropical tunas are the target of many fisheries although they are also caught as a bycatch of fisheries targeting other tunas, small pelagic species, or other non-tuna species (e.g. sharks).

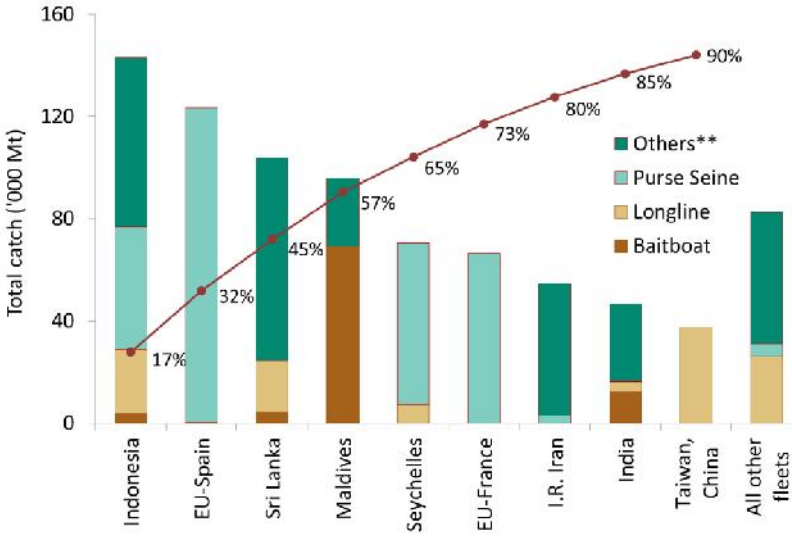








Figs. 1a-d. Top: Contribution of the three tropical tuna species under the IOTC mandate to the total catches of IOTC species in the Indian Ocean, over the period 1950-2013 (a. Top left: total catch; b. Top right percentage, same colour key as Fig. 1a).; **Bottom:** Contribution of each tropical tuna species to the total combined catches of tropical tunas (c. Bottom left: nominal catch of each species, 1950-2013; d. Bottom right: share of tropical tuna catch by species, 2010-12)



*** Other gears includes handline, gillnet, gillnet-longline, trawling.*

Fig. 2: All tropical tunas: average catches in the Indian Ocean over the period 2010–12, by country. Countries are ordered from left to right, according to the importance of catches of tropical tunas reported. The red line indicates the (cumulative) proportion of catches of tropical tunas for the countries concerned, over the total combined catches of species reported from all countries and fisheries.

MAIN ISSUES IDENTIFIED RELATING TO THE STATISTICS OF TROPICAL TUNAS

The following list is provided by the Secretariat for the consideration of the WPTT. The list covers the main issues which the Secretariat considers affect the quality of the statistics available at the IOTC, by type of dataset and type of fishery.

1. Catch-and-Effort data from Coastal Fisheries:

- **Drifting gillnet** fishery of **Iran**: In 2013 Iran reported catches of bigeye tuna for its drifting gillnet fishery for the first time, for the year 2012. Although Iran has reported catches of yellowfin tuna and skipjack tuna (average catches at around 60,000 t during 2008–12) it has not reported catch-and-effort data as per the IOTC standards, in particular for those vessels that operate outside of its EEZ. In addition, the IOTC Secretariat estimated caches of bigeye tuna for Iran for years before 2012, assuming various levels of activity of vessels using driftnets on the high seas, depending on the year, and catch ratios bigeye tuna:yellowfin tuna recorded for industrial purse seiners on free-swimming tuna schools in the northwest Indian Ocean. Catches of bigeye tuna were estimated for the period 2005–11, at around 700 t per year.
- **Drifting gillnet** fishery of **Pakistan**: To date, Pakistan has not reported catches of bigeye tuna for its gillnet fishery, although a component of the fleet is known to operate on the high seas, where catches of bigeye tuna are reported by other fleets operating the same area. In addition, Pakistan has not reported catch-and-effort data for its drifting gillnet fishery, in particular for those vessels that operate outside its EEZ. The IOTC Secretariat did not estimate catches of bigeye tuna for Pakistan. Pakistan reported catches of yellowfin tuna and skipjack tuna at around 9,500 t per year during 2008–13.
- **Gillnet/longline** fishery of **Sri Lanka**: Although Sri Lanka has reported catches of bigeye tuna for its gillnet/longline fishery the catches are considered to be too low (average catches at around 560 t during 2008–12). This is probably due to the mislabelling of catches of bigeye tuna as yellowfin tuna. The IOTC Secretariat estimated caches of bigeye tuna for Sri Lanka in 2012 with recent catches estimated at around 2,500 t per year. In addition, Sri Lanka has not reported catch-and-effort data as per the IOTC standards, including separate catch-and-effort data for longline and gillnet and catch-and-effort data for those vessels that operate outside its EEZ.
- **Pole-and-line** fishery of **Maldives**: Although the pole-and-line fishery of Maldives catches bigeye tuna, up to 2013 both yellowfin tuna and bigeye tuna were aggregated and reported as yellowfin tuna. The IOTC Secretariat has previously used the proportion of bigeye tuna in samples collected in the Maldives in the past to break the catches of yellowfin tuna, into yellowfin tuna and bigeye tuna, per year, with average catches of bigeye tuna estimated at around 850 t per year. Maldives has also not reported catch-and-effort data by gear type and geographic area for 2002–03[4].
- **Coastal** fisheries of **Indonesia, Madagascar, Sri Lanka**[5] (other than gillnet/longline) and **Yemen**: The catches of tropical tunas for these fisheries have been estimated by the IOTC Secretariat in recent years. The quality of the estimates is thought to be very poor due to the paucity of the information available about the fisheries operating in these countries.
- **Coastal** fisheries of **Comoros:** In 2011-12 the IOTC and the OFCF provided support to the strengthening of data collection for the fisheries of Comoros, including a Census of fishing boats and the implementation of sampling to monitor the catches unloaded by the fisheries in selected locations over the coast. The IOTC Secretariat and the *Centre National de resources Halieutiques* of Comoros derived estimates of catch using the data collected and the new catches estimated are at around half the values reported in the past by Comoros (around 5,000 t per year instead of 9,000 t). The IOTC Secretariat revised estimates of catch for the period 1995-2010 using the new estimates.

2. Catch-and-Effort data from Surface and Longline Fisheries:

- **Longline** fishery of **India**: India has reported catches and catch-and-effort data for its commercial longline fishery for activities inside of the EEZ of India. However, India has not reported catches of tropical tunas or other species for vessels under its flag, which the IOTC Secretariat had to estimate, with total catches of tropical tunas at around 4,000 t per year (average for 2008-12).

[4] It is important to note that Maldives has used the available catch-and-effort data to derive CPUE indices for its pole-and-line fishery, and have undertaken preliminary assessments of skipjack tuna in cooperation with the IOTC Secretariat, presented at the WPTT in 2011. In addition, in October 2012 Maldives provided catch-and-effort data for its pole-and-line fishery for the period 2004-11.

[5] In 2012-13 the Ministry of Fisheries and Aquatic Resources Development of Sri Lanka received support from IOTC, the OFCF and BOBLME to strengthen its data collection and processing system, which should lead to improvements in the estimate of catch for the coastal fisheries of Sri Lanka for 2012 and subsequent years.

- **Longline** fisheries of **Indonesia** and **Malaysia**: Indonesia and Malaysia have not reported catches for longliners under their flag that are not based in their ports. In addition Indonesia has not reported catch-and-effort data for its longline fishery to date.
- **Industrial tuna purse seine** fishery of **Iran**: Although Iran has reported catch-and-effort data for its purse seine fishery in recent years, data are not as per the IOTC standards.
- **Discard levels for all fisheries**: The total amount of tropical tunas discarded at sea remains unknown for most fisheries and time periods. Discards of tropical tunas are thought to be significant during some periods on industrial purse seine fisheries using fish aggregating devices (FADs) and may also be high due to depredation of catches of longline fisheries, by sharks or marine mammals, in tropical areas.

3. Size data from All Fisheries:

- **Longline** fisheries of **Japan** and **Taiwan,China:** In 2010, the IOTC Scientific Committee identified several issues concerning the size frequency statistics available for Japan and Taiwan,China, which remain unresolved. In 2013 the IOTC Secretariat presented a paper to WPTT-15 documenting the current data quality issues and inconsistences between the length frequency data and catch-and-effort reported in particular by Taiwan,China since the mid-2000s[6]. The WPTT recommended an inter-sessional meeting attached to the WPDCS and WPM on *data collection and processing systems for size data from the main longline fleets in the Indian Ocean*, be carried out in early 2014. Arrangements and timing for the inter-sessional meeting are still to be confirmed.
- In addition, the number of specimens sampled for length onboard longliners flagged in Japan in recent years remains under the minimum recommended by the IOTC, which is at least 1 fish per metric ton of catch measured for length (0.06 fish per metric ton of catch for all tropical tuna species combined).
- **Gillnet** fisheries of **Iran** and **Pakistan:** Even though both countries have reported size frequency data for its gillnet fisheries in recent years, data are not reported by geographic area and the numbers measured are under the minimum sample size recommended by the IOTC (0.16 fish measured per metric ton of catch for Iran and 0.02 for Pakistan).
- **Longline** fisheries of **India, Oman** and the **Philippines:** To date, these countries have not reported size frequency data for their longline fisheries.
- **Gillnet/longline** fishery of **Sri Lanka:** Although Sri Lanka has reported length frequency data for tropical tunas in recent years, sampling coverage is below recommended levels (0.17 fish measured per metric ton of catch) and lengths are not available by gear type or fishing area[7].
- **Longline** fisheries of **Indonesia** and **Malaysia**: Indonesia and Malaysia have reported some size frequency data for its fresh-tuna longline fishery in recent years. However, the samples cannot be fully broken by month and fishing area (5x5 grid) and they refer exclusively to longliners based in ports in those countries.
- **Coastal** fisheries of **India, Indonesia** and **Yemen**: To date, these countries have not reported size frequency data for their coastal fisheries.

4. Biological data for all tropical tuna species:

- Surface and longline fisheries, in particular **Taiwan,China**, **Indonesia**, **Japan**, and **China**: The IOTC database does not contain enough data to allow for the estimation of statistically robust length-weight or non-standard size to standard length keys for tropical tuna species due to the general paucity of biological data available from the Indian Ocean. A summary of the current biological length-weight equations and availability of alternative sources are documented in Appendix II for the consideration of the WPTT, following the recommendation of the WPDCS.

[6] See IOTC Secretariat, IOTC-2013-WPTT15-41 Rev_1, for more details.

[7] In 2012-13 the Ministry of Fisheries and Aquatic Resources Development of Sri Lanka received support from IOTC, the OFCF and BOBLME to strengthen its data collection and processing system, including collection of more length frequency data from the fisheries.

STATUS OF FISHERIES STATISTICS FOR TROPICAL TUNAS

Bigeye tuna (BET)

Fisheries and catch trends

Bigeye tuna is mainly caught by industrial longline (54% in 2013) and purse seine (31% in 2013) fisheries, with the remaining 16% of the catch taken by other fisheries (**Table 2**). However, in recent years the catches of bigeye tuna by gillnet fisheries are likely to be higher, due to major changes experienced in some of these fleets (e.g., Sri Lanka and I.R. Iran) - notably changes in boat size, fishing techniques and fishing grounds, with vessels using deeper gillnets on the high seas in areas where catches of bigeye tuna by other fisheries are important.

Table 2. Bigeye tuna: Best scientific estimates of the catches of bigeye tuna (*Thunnus obesus*) by gear and main fleets [or type of fishery] by decade (1950–2009) and year (2004–2013), in tonnes. Data as of September 2014. Catches by decade represent the average annual catch, noting that some gears were not used since the beginning of the fishery (refer to Fig. 3).

Fishery	By decade (average)						By year (last ten years)									
	1950s	1960s	1970s	1980s	1990s	2000s	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
BB	21	50	266	1,536	2,968	5,070	4,519	5,566	5,176	6,048	6,109	6,874	6,696	6,784	6,820	6,560
FS	0	0	0	2,340	4,823	6,196	4,085	8,484	6,406	5,672	9,646	5,302	3,792	6,223	7,180	4,654
LS	0	0	0	4,856	18,317	20,273	19,308	17,556	18,522	18,105	19,875	24,708	18,486	16,387	10,435	22,814
LL	6,488	21,984	30,284	42,893	62,312	71,275	90,622	75,863	72,934	74,172	51,599	51,557	32,255	35,803	66,605	44,562
FL	0	0	218	3,066	26,306	23,471	22,366	19,636	18,789	22,451	23,323	15,809	12,759	14,603	12,429	14,000
LI	43	294	658	2,384	4,278	5,774	5,601	6,230	5,740	6,700	6,683	7,338	7,706	7,510	7,237	8,423
OT	37	63	164	859	1,407	3,971	3,130	4,129	4,831	4,750	5,361	6,694	6,231	7,361	8,691	8,330
Total	**6,589**	**22,393**	**31,592**	**57,935**	**120,412**	**136,030**	**149,630**	**137,467**	**132,399**	**137,898**	**122,596**	**118,284**	**87,926**	**94,669**	**119,396**	**109,343**

Gears: Pole-and-Line (**BB**); Purse seine free-school (**FS**); Purse seine associated school (**LS**); Deep-freezing longline (**LL**); Fresh-tuna longline (**FL**); Line (handline, small longlines, gillnet & longline combine) (**LI**); Other gears nei (gillnet, trolling & other minor artisanal gears)(**OT**).

Table 3. Bigeye tuna: Best scientific estimates of the catches of bigeye tuna (*Thunnus obesus*) by area [as used for the assessment] by decade (1950–2009) and year (2004–2013), in tonnes. Data as of September 2014. Catches by decade represent the average annual catch.

Fishery	By decade (average)						By year (last ten years)									
	1950s	1960s	1970s	1980s	1990s	2000s	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
A1	2,484	12,090	17,529	34,656	58,595	76,990	89,600	84,915	81,683	80,195	67,501	57,782	38,665	39,095	71,770	64,204
A2	3,900	7,272	10,225	18,768	46,960	48,829	47,358	43,128	44,828	53,685	50,436	56,967	44,123	49,840	41,198	37,724
A3	205	3,031	3,838	4,511	14,856	10,211	12,672	9,426	5,888	4,018	4,660	3,535	5,137	5,734	6,429	7,414
Total	**6,589**	**22,393**	**31,592**	**57,935**	**120,412**	**136,030**	**149,630**	**137,467**	**132,399**	**137,898**	**122,596**	**118,284**	**87,926**	**94,669**	**119,396**	**109,343**

Areas: West Indian Ocean, including Arabian sea (A1); East Indian Ocean, including Bay of Bengal (A2); Southwest and Southeast Indian Ocean, including southern (A3). Catches in Areas (**0**) were assigned to the closest neighbouring area for the assessment.

Total annual catches have increased steadily since the start of the fishery, reaching the 100,000 t level in 1993 and peaking at over 160,000 t in 1999 (**Fig. 3**). Catches dropped since then to values between 130,000–150,000 t (2000–07), before dropping even further in recent years to values under 90,000 t (e.g., 2010–11), before increasing in 2012 to nearly 120,000 t. The SC believes that the recent drop in catches could be related, at least in part, with the expansion of piracy in the northwest Indian Ocean (West A1, **Table 3, Fig. 4b**), which led to a marked drop in the levels of longline effort in the core fishing area of these species in 2010-11 (**Figs. 6** and **7**).

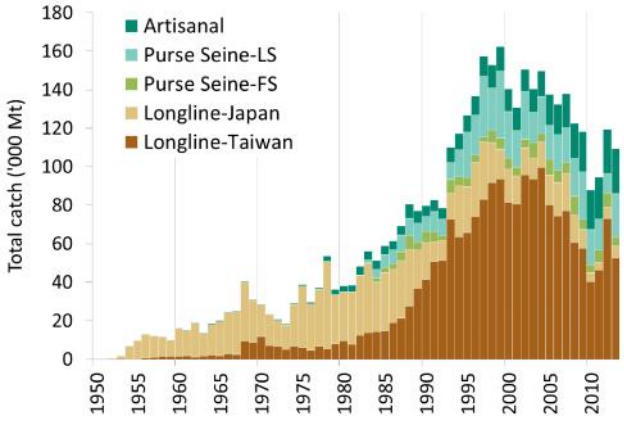


Fig. 3. Annual catches of bigeye tuna by gear (1950–2012). Data as of September 2014.

Gears (as agreed by WPTT): Longline Taiwan,China and associated fleets **(Longline-Taiwan);** Longline Japan and associated fleets **(Longline-Japan)**; Purse seine free-school (**FS**); Purse seine associated school (**LS**); Other gears nei (Pole-and-Line, handline, small longlines, gillnet, trolling & other minor artisanal gears) (**Artisanal**).

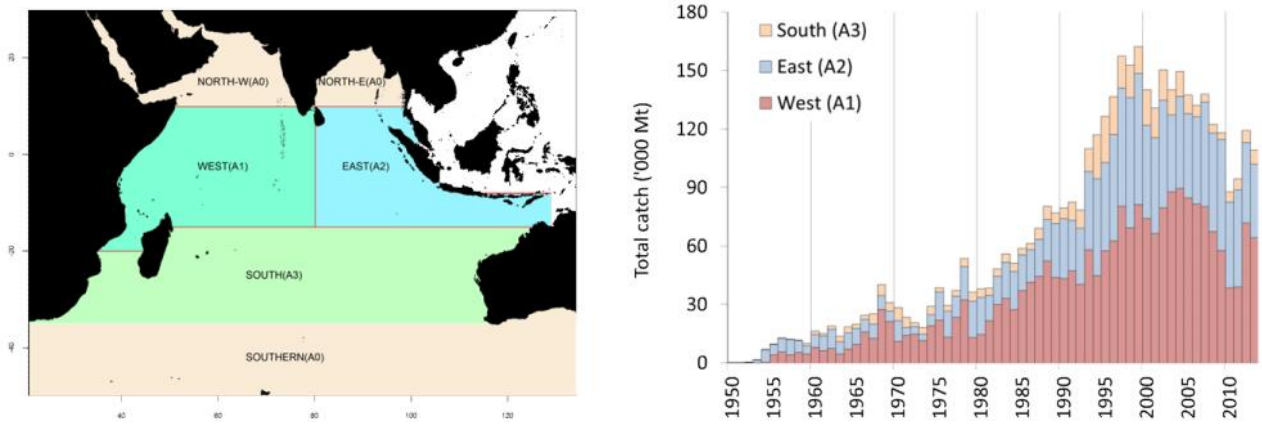


Fig. 4(a-b). Bigeye tuna: Catches of bigeye tuna by area by year estimated for the WPTT (1950–2012). Data as of September 2014. Catches outside the areas presented in the Map were assigned to the closest neighbouring area for the assessment.

Areas: West Indian Ocean (**A1**); East Indian Ocean (**A2**); Southwest and Southeast Indian Ocean (**A3**). Catches in Areas (**0**) were assigned to the closest neighbouring area for the assessment.

Bigeye tuna have been caught by industrial **longline** fleets since the early 1950's, but before 1970 only represented an incidental catch. After 1970, the introduction of fishing practices that improved catchability of the bigeye tuna resource, combined with the emergence of a *sashimi* market, resulted in bigeye tuna becoming a primary target species for the main industrial longline fleets. Large bigeye tuna (averaging just above 40 kg) are primarily caught by longliners, in particular deep longliners.

Total catches of bigeye tuna by longliners in the Indian Ocean increased steadily from the 1970's attaining values over 90,000 t between 1996 and 2007, and dropping markedly thereafter (**Fig. 3**). Since 2007 catches of bigeye tuna by longliners have been relatively low, with catches less than half the catch levels recorded before the onset of piracy in the Indian Ocean (e.g., ≈50,000 t). Since 2012 longline catches appear to show signs of recovery (e.g., 79,000 t in 2012), as a result of a reduction in the threat of piracy and return of fleets that appear to be resuming fishing activities in their main fishing grounds in the north-west Indian Ocean (West (A1), **Fig.4b**).

Since the late 1980's Taiwan,China has been the major longline fleet fishing for bigeye tuna in the Indian Ocean, taking as much as 40-50% of the total longline catch in the Indian Ocean (**Fig. 5**). However, catches of longliners from Taiwan,China between 2007 and 2011 decreased markedly (≈20,000 t), to values three times lower than those from the early-2000's. Although catches in 2012 were higher than in recent years, they still remain far below levels recorded in 2003 and 2004.

Since the late 1970's, bigeye tuna has been caught by **purse seine** vessels fishing on tunas aggregated on floating objects and, to a lesser extent, associated to free swimming schools (**Fig. 3**) of yellowfin tuna or skipjack tuna. The highest catch of bigeye tuna by purse seiners in the Indian Ocean was recorded in 1999 (≈44,000 t). Catches since

2000 have been between 20,000 and 30,000 t. Purse seiners under flags of EU countries and Seychelles take the majority of purse seine caught bigeye tuna in the Indian Ocean (**Fig. 5**). Purse seiners mainly take small juvenile bigeye (averaging around 5 kg) compared to longliners which catch much larger and heavier fish. While purse seiners take lower tonnages of bigeye tuna compared to longliners, they take larger numbers of individual fish. Even though the activities of purse seiners have been affected by piracy in the Indian Ocean, the impacts have not been as marked as for longline fleets. The main reason for this is the presence of security personnel onboard purse seine vessels of the EU and Seychelles, which has made it possible for purse seiners under these flags to continue operating in the northwest Indian Ocean (**Fig. 6**).

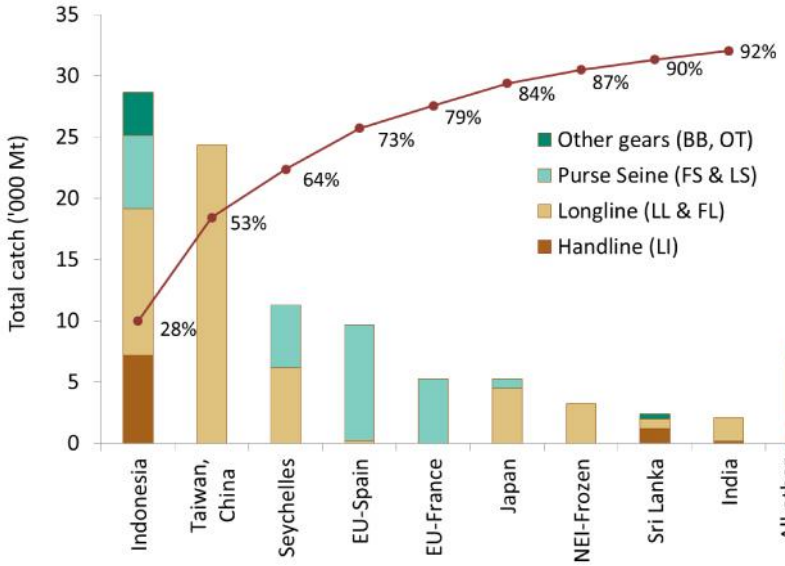


Fig. 5. Bigeye tuna: average catches in the Indian Ocean over the period 2010–12, by country. Countries are ordered from left to right, according to the importance of catches of bigeye reported. The red line indicates the (cumulative) proportion of catches of bigeye for the countries concerned, over the total combined catches of this species reported from all countries and fisheries. Data as of Sept. 2014.

By contrast with yellowfin tuna and skipjack tuna, for which the major catches are taken in the western Indian Ocean, bigeye tuna is also exploited in the eastern Indian Ocean (East (A2**)**, **Fig. 4** and **Table 3**). The relative increase in catches in the eastern Indian Ocean in the late 1990's was mostly due to increased activity of small longliners fishing tuna to be marketed fresh. This fleet started its operation in the mid 1970's. However, catches of bigeye tuna in the eastern Indian Ocean have shown a decreasing trend in recent years, as some of the vessels moved south to target albacore.

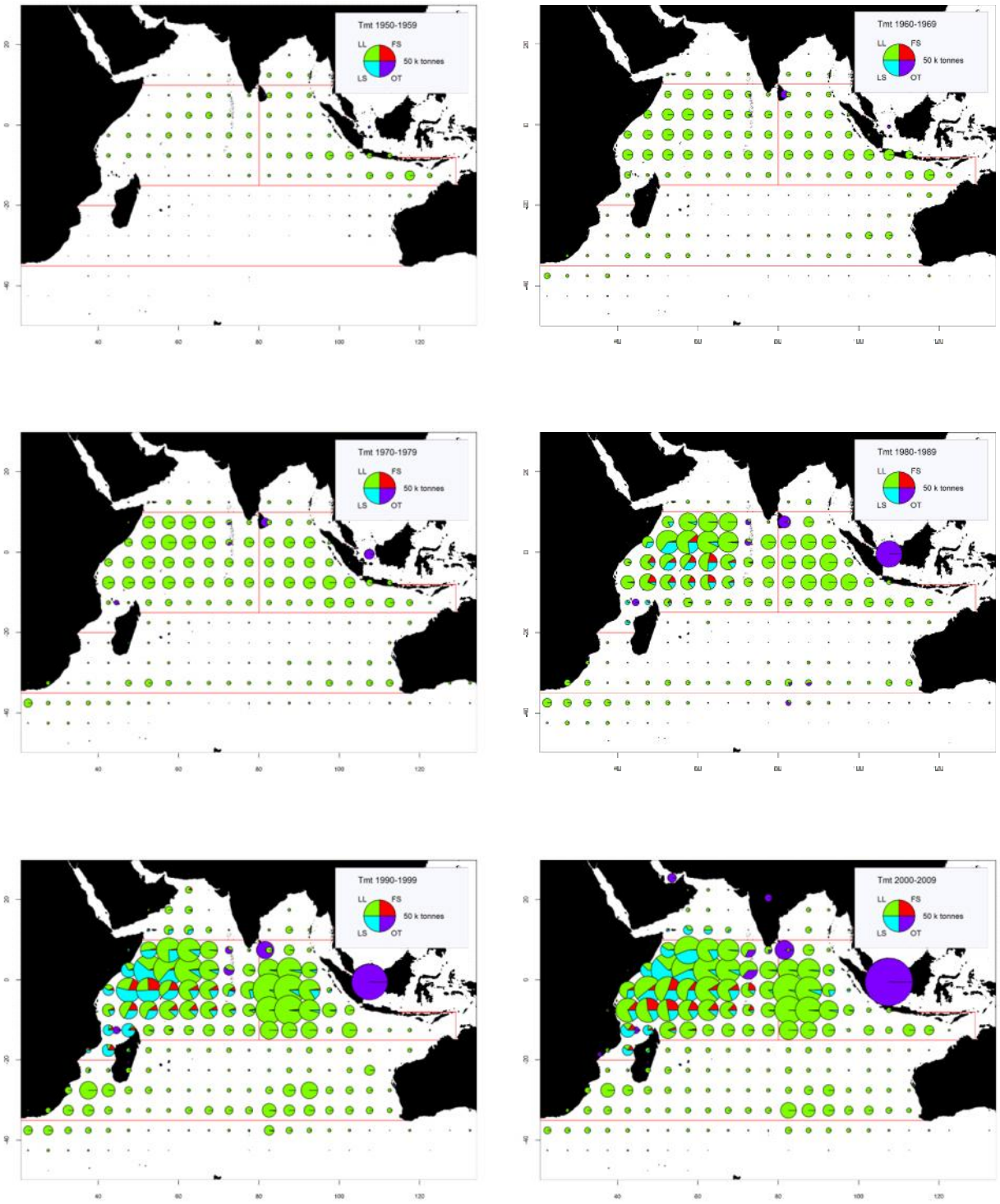


Fig. 6(a-f). Bigeye tuna: Time-area catches (total combined in tonnes) of bigeye tuna estimated for the period 1950–2009, by decade and type of gear.Longline (**LL**), Purse seine free-schools (**FS**), Purse seine associated-schools (**LS**), and other fleets (**OT**), including pole-and-line, drifting gillnets, and various coastal fisheries. Data as of September 2014. The catches of fleets for which the flag countries do not report detailed time and area data to the IOTC are recorded within the area of the countries concerned, in particular driftnets from Iran, gillnet and longline fishery of Sri Lanka, and coastal fisheries of Indonesia.

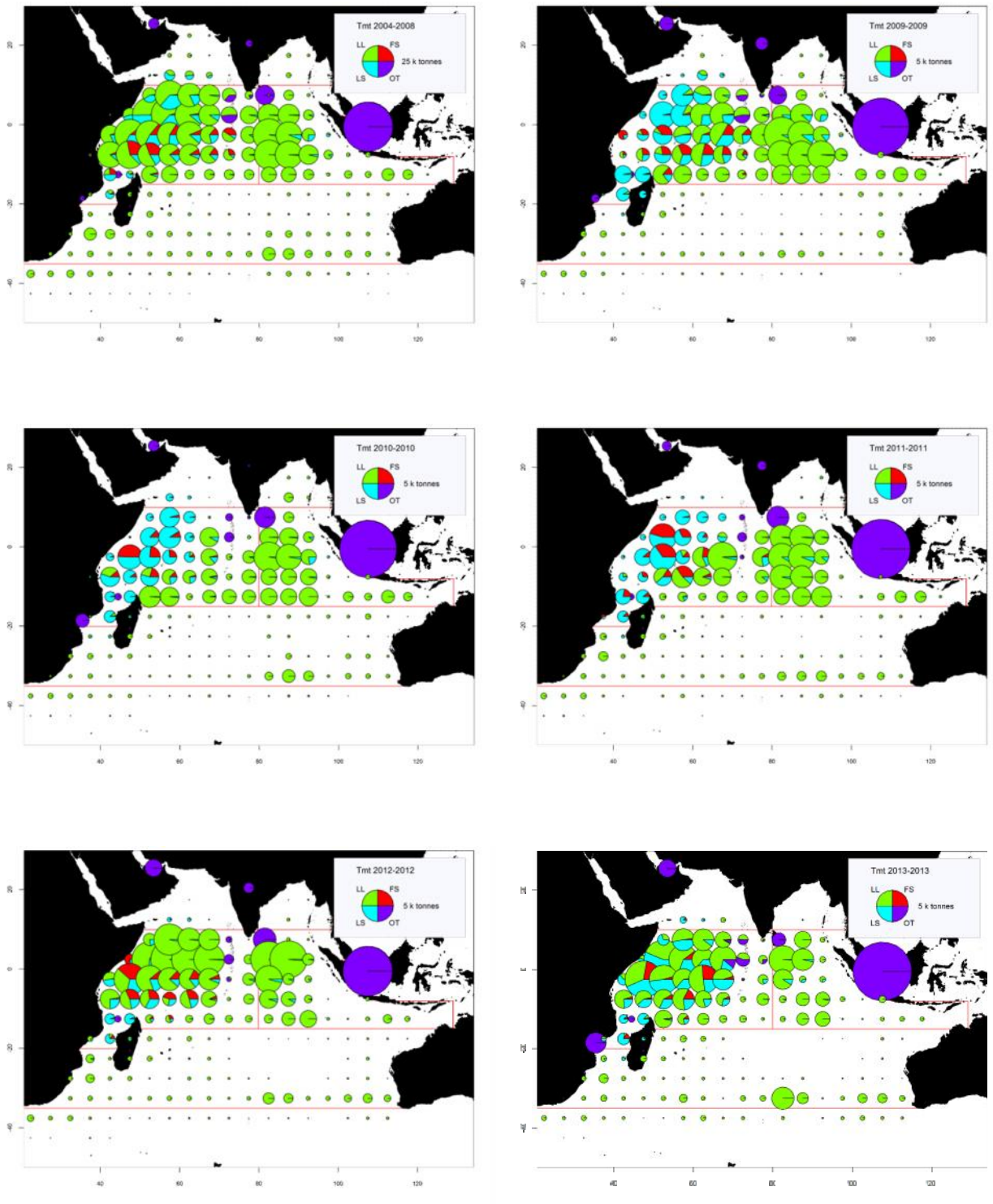


Fig. 7(a-f). Time-area catches (total combined in tonnes) of bigeye tuna estimated for the period 2004–2008 by type of gear and for 2009–13, by year and type of gear. Longline (**LL**), Purse seine free-schools (**FS**), Purse seine associated-schools (**LS**), and other fleets (**OT**), including pole-and-line, drifting gillnets, and various coastal fisheries; Data as of September 2014. The catches of fleets for which the flag countries do not report detailed time and area data to the IOTC are recorded within the area of the countries concerned, in particular driftnets from Iran, gillnet and longline fishery of Sri Lanka, and coastal fisheries of Indonesia.

Bigeye tuna: Status of Fisheries Statistics at the IOTC

Retained catches are thought to be well known for the major fleets (**Fig. 8a**); but are less certain for non-reporting industrial purse seiners and longliners (NEI) and for other industrial fisheries (e.g. longliners of India). Catches are also uncertain for some artisanal fisheries including the pole-and-line fishery in the Maldives, the gillnet fisheries of Iran (before 2012) and Pakistan, the gillnet and longline combination fishery in Sri Lanka and the artisanal fisheries in Indonesia, Comoros (before 2011) and Madagascar.

Discard levels are believed to be low although they are unknown for most industrial fisheries, excluding industrial purse seiners flagged in EU countries for the period 2003–07.

CPUE Series: Catch-and-effort data are generally available from the major industrial fisheries. However, these data are not available from some fisheries or they are considered to be of poor quality, especially throughout the 1990s and in recent years (**Fig. 8b**), for the following reasons:

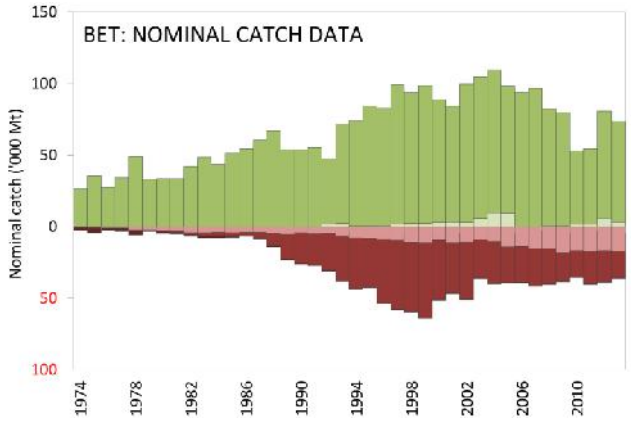
- non-reporting by industrial purse seiners and longliners (NEI)
- no data are available for the fresh-tuna longline fishery of Indonesia, over the entire time series, and data for the fresh-tuna longline fishery of Taiwan,China are only available since 2006
- uncertain data from significant fleets of industrial purse seiners from Iran and longliners from India, Indonesia, Malaysia, Oman, and Philippines.
- incomplete data for the driftnet fisheries of Iran and Pakistan and the gillnet/longline fishery of Sri Lanka, especially in recent years.

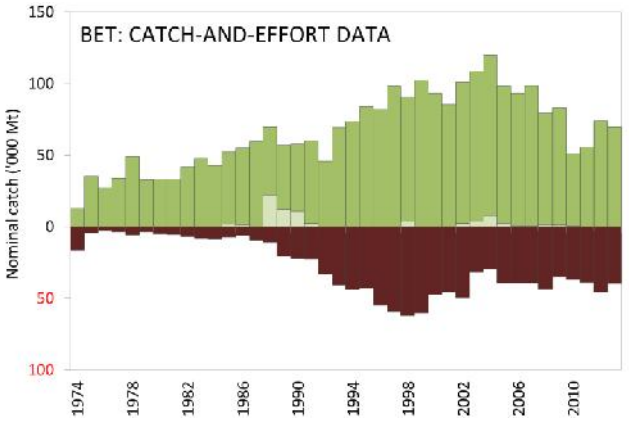
Trends in average weight can be assessed for several industrial fisheries although they are incomplete or of poor quality for most fisheries before the mid-1980s and for some fleets in recent years (e.g. Japan and Taiwan,China longline).

Catch-at-Size table: This is available but the estimates are more uncertain for some years and some fisheries due to (**Fig. 8c**):

- the 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 and Taiwan,China)
- the paucity of catch by area data available for some industrial fleets (NEI, India, Indonesia, Iran, Sri Lanka)

Changes to the catch series (Fig 9): There have been no major revisions to the catch series since WPTT meeting in 2013.





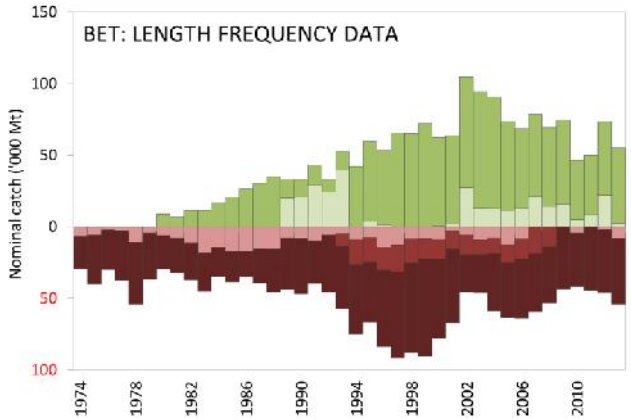


Fig. 8a-c. Bigeye tuna: data reporting coverage (1974–2013).

Each IOTC dataset (nominal catch, catch-and-effort, and length frequency) are assessed against IOTC reporting standards, where: a score of 0 indicates the amount of nominal catch associated with each dataset that is fully reported according to IOTC standards; a score of between 2 – 6 refers to the amount of nominal catch associated with each dataset that is partially reported by gear and/or species (i.e., adjusted by gear and species by the IOTC Secretariat) or any of the other reasons provided in the document; a score of 8 refers to the amount of nominal catch associated with catch-and-effort data that is not available.

Data as of September 2014.

Key to IOTC Scoring system

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

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

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

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

Key to colour coding

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

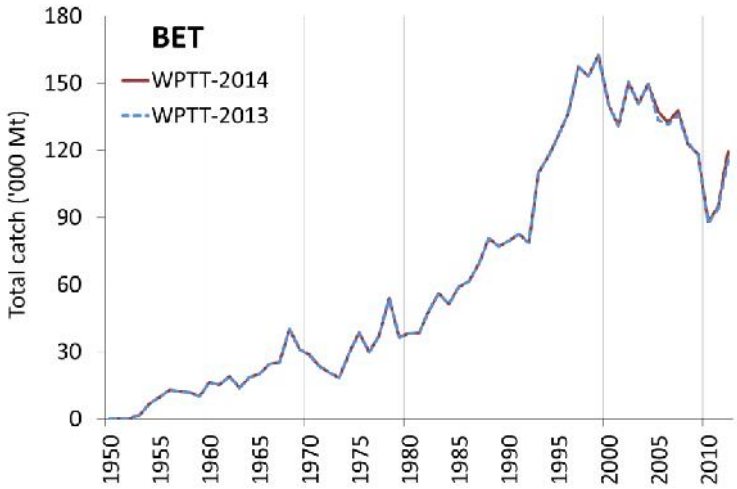


Fig. 9. Bigeye tuna: Catches used by the WPTT in 2013 versus those estimated for the WPTT in 2014 (1950–2012).

Bigeye tuna: Tagging data

A total of 35,997 bigeye tuna (17.9%) were tagged during the Indian Ocean Tuna Tagging Programme (IOTTP). Most of them (96.0%) were tagged during the main Regional Tuna Tagging Project-Indian Ocean (RTTP-IO) and released off the coast of Tanzania in the western Indian Ocean, between May 2005 and September 2007 (**Fig. 10**). The remaining were tagged during small-scale projects, and by other institutions with the support of the IOTC Secretariat, in the Maldives, Indian, and in the south west and the eastern Indian Ocean. To date, 5,806 specimens (16.1% of releases for this species) have been recovered and reported to the IOTC Secretariat. These tags were mainly reported from the purse seine fleets operating in the Indian Ocean (90.9%), while 5.3% were recovered from longline vessels.

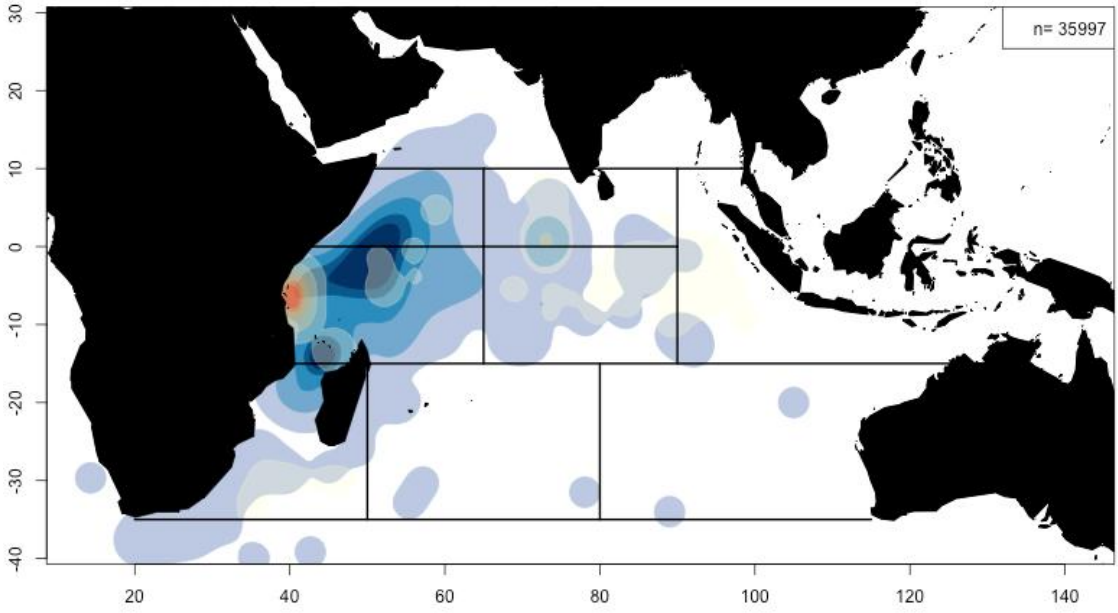


Fig. 10. Bigeye tuna: Densities of releases (in red) and recoveries (in blue). The black line represents the stock assessment areas. Includes specimens tagged during the IOTTP and also Indian Ocean (Maldivian) tagging programmes during the 1990s. Data as of September 2012.

Skipjack tuna (SKJ)

Fisheries and catch trends

Catches of skipjack tuna increased slowly from the 1950s, reaching around 50,000 t during the mid-1970s, mainly due to the activities of fleets using pole-and-lines and gillnets (**Table 4**; **Fig. 11**). The catches increased rapidly with the arrival of the purse seiners in the early 1980s, and skipjack became one of the most important commercial tuna species in the Indian Ocean. Annual catches peaked at over 600,000 t in 2006 (**Table 4**). Since 2006 catches have declined to around 340,000 t in 2012 – the lower catches recorded since 1998 – although preliminary figures for 2013 indicate an increase in catch levels to around 424,000 t.

Table 4. Skipjack tuna: Best scientific estimates of the catches of skipjack tuna (*Katsuwonus pelamis*) by gear and main fleets [or type of fishery] by decade (1950–2009) and year (2004–2013), in tonnes. Data as of September 2014. Catches by decade represent the average annual catch, noting that some gears were not used since the beginning of the fishery.

Fishery	By decade (average)						By year (last ten years)									
	1950s	1960s	1970s	1980s	1990s	2000s	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
BB	10,007	15,148	24,684	41,705	77,079	109,528	112,142	139,660	147,937	107,383	99,104	75,761	83,458	69,355	68,788	93,016
FS	0	0	41	15,251	30,614	25,724	18,565	43,166	34,930	24,199	16,274	10,433	8,774	9,000	2,984	5,775
LS	0	0	125	34,474	124,015	163,799	137,232	168,018	211,509	120,951	128,448	148,135	144,097	123,056	80,989	119,839
OT	4,999	11,712	21,951	38,282	87,732	177,024	187,541	204,363	221,524	213,015	195,418	203,406	186,560	180,998	185,283	205,951
Total	**15,006**	**26,860**	**46,801**	**129,713**	**319,440**	**476,075**	**455,481**	**555,208**	**615,900**	**465,547**	**439,243**	**437,736**	**422,889**	**382,409**	**338,045**	**424,580**

Gears: Pole-and-Line (**BB**); Purse seine free-school (**FS**); Purse seine associated school (**LS**); Other gears nei (**OT**).

The increase in skipjack tuna catches by **purse seiners** (**Fig. 11**) is due to the development of a fishery in association with Fish Aggregating Devices (FADs) (**Table 4**) in the 1980s. In recent years, over 90% of the skipjack tuna caught by purse seine vessels is taken from around FADs. Catches by purse seiners increased steadily since 1984 with the highest catches recorded in 2002 and 2006 (>240,000 t). Catches of skipjack dropped in the years 2003 and 2004, probably as a consequence of high purse seine catch rates on free schools of yellowfin tuna during those years. The constant increase in catches and catch rates of purse seiners until 2006 are believed to be associated with increases in fishing power and in the number of FADs (and the technology associated with them) used in the fishery. In 2007 purse seine catches declined by around 100,000 t (from around 245,000 t in 2005 145,000 t in 2007). The sharp decline in purse seine catches since 2007 coincided with a similar decline in the catches by Maldivian baitboats.

Table 5. Skipjack tuna: Best scientific estimates of the catches of skipjack tuna (*Katsuwonus pelamis*) by area [as used for the assessment] by decade (1950–2009) and year (2004–2013), in tonnes. Data as of September 2014. Catches by decade represent the average annual catch.

	By decade (average)						By year (last ten years)									
	1950s	1960s	1970s	1980s	1990s	2000s	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
R1	4,524	9,951	19,291	34,586	80,757	118,327	119,042	114,269	109,016	137,688	139,941	151,487	153,432	152,943	149,001	159,360
R2	1,483	4,110	8,235	59,667	170,901	257,243	231,897	310,526	370,153	232,052	213,718	221,230	197,872	176,977	137,910	192,638
R2b	9,000	12,800	19,275	35,459	67,782	100,505	104,542	130,412	136,730	95,807	85,584	65,018	71,585	52,489	51,134	72,583
Total	15,006	26,860	46,801	129,713	319,441	476,075	455,481	555,208	615,900	465,547	439,243	437,736	422,889	382,409	338,046	424,581

Areas: East Indian Ocean (**R1**); West Indian Ocean, (**R2**); Maldives baitboat (R2b).

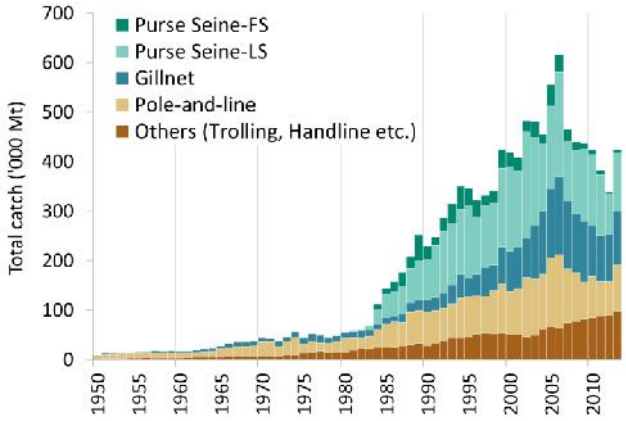


Fig. 11. Annual catches of skipjack tuna by gear (1950–2013). Data as of Sept. 2014.

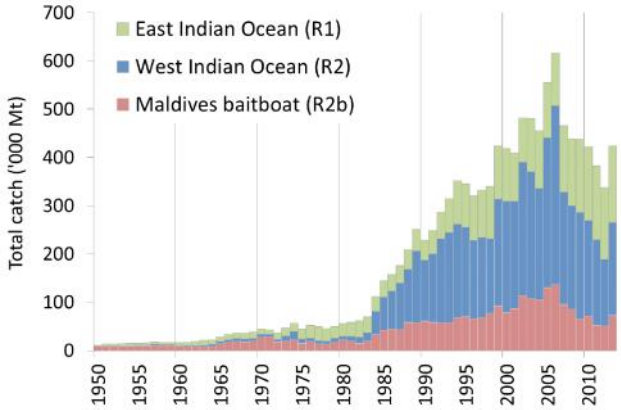


Fig. 12. Skipjack tuna: Catches of skipjack tuna by area by year estimated for the WPTT (1950–2013). Data as of September 2014.

Areas: East Indian Ocean (**R1**); West Indian Ocean (**R2**); Maldives baitboat (**R2b**)

The Maldivian fishery (**Fig. 11**) has effectively increased its fishing effort with the mechanisation of its **pole-and-line** fleet since 1974, including an increase in boat size and power and the use of anchored FADs since 1981. Skipjack tuna represents around 80% of the total catch of Maldives, where skipjack catch rates regularly increased between 1980 and 2006 – the year in which the highest skipjack catch was recorded for this fishery (≈140,000 t). Catches of skipjack tuna reported by Maldives have since declined in recent years to as low as 55,000 t, representing less than half the catches taken in 2006, although catches of around 75,000 t have been reported in 2013. The recent decline in skipjack catches by Maldives is, in part, related to the introduction of handlines targeting large specimens of yellowfin tuna.

Several fisheries using **gillnets** have reported large catches of skipjack tuna in the Indian Ocean (**Fig. 13, 14 and 15**), including the gillnet/longline fishery of Sri Lanka, driftnet fisheries of Iran and Pakistan, and gillnet fisheries of Indonesia. In recent years gillnet catches have represented as much as 20% to 30% of the total catches of skipjack tuna in the Indian Ocean. Although it is known that vessels from Iran and Sri Lanka have been using gillnets on the high seas in recent years, reaching as far as the Mozambique Channel, the activities of these fleets are poorly understood, as no time-area catch-and-effort series have been made available for those fleets to date.

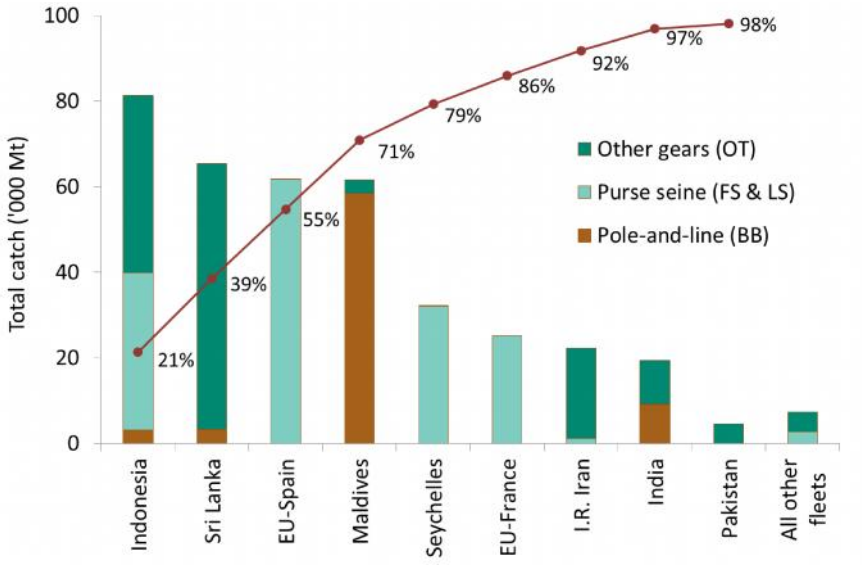


Fig. 13. Skipjack tuna: average catches in the Indian Ocean over the period 2010–12, by country. Countries are ordered from left to right, according to the importance of catches of skipjack reported. The red line indicates the (cumulative) proportion of catches of skipjack for the countries concerned, over the total combined catches of this species reported from all countries and fisheries. Data as of Sept. 2014.

The majority of the catches of skipjack tuna originate from the western Indian Ocean (**Figs. 12 and 14**). Since 2007 however, catches of skipjack tuna in the western Indian Ocean have dropped considerably, especially in areas off Somalia, Kenya, Tanzania and around the Maldives. The drop in catches are considered by the SC to be partially explained by the reduction in fishing effort by some fisheries due to the effects of piracy in the western Indian Ocean region, including industrial purse seiners and fleets using driftnets from Iran and Pakistan; and, as already noted, a decrease in catches of skipjack tuna by Maldivian baitboats following the introduction of handlines targeting yellowfin tuna.

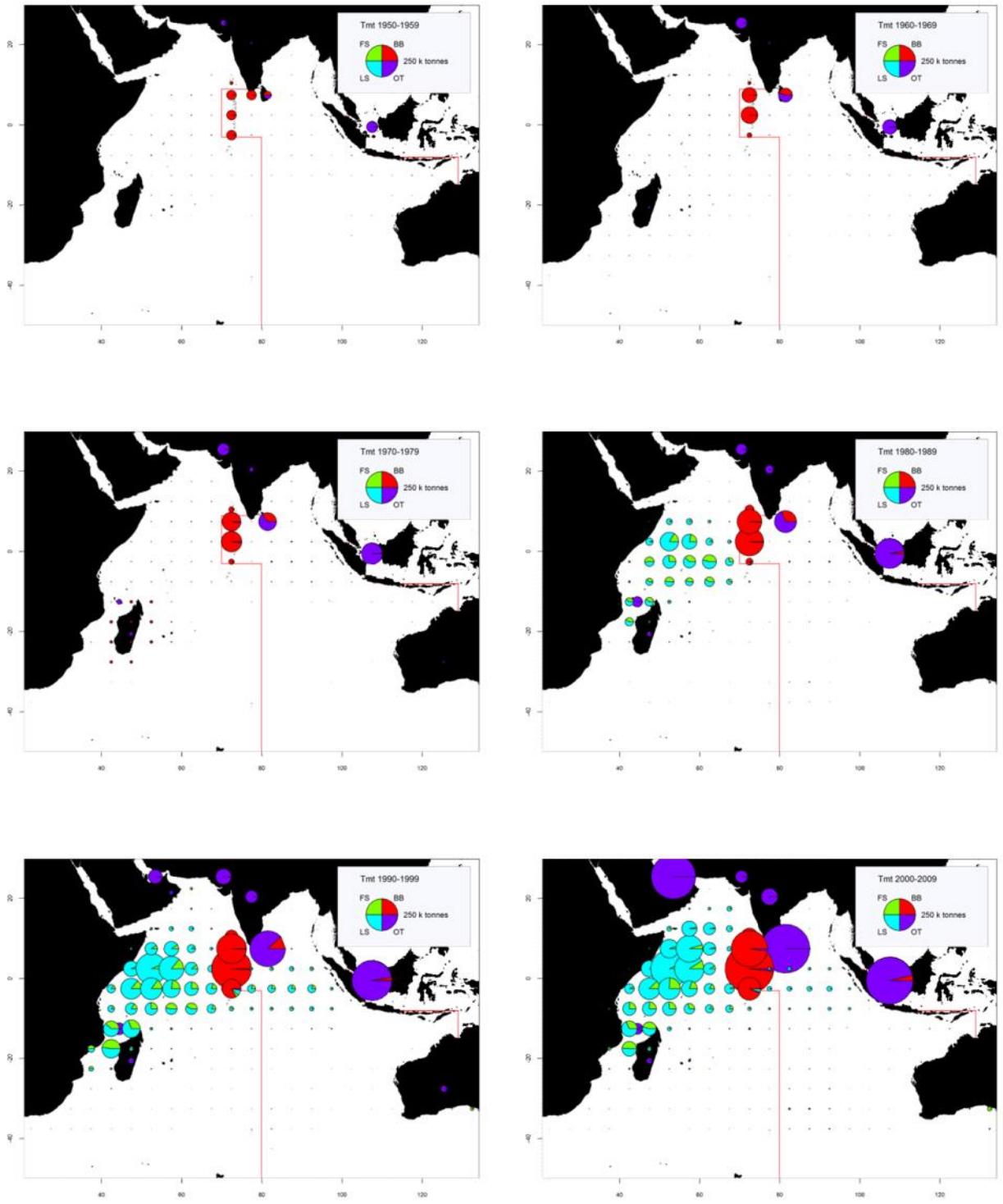


Fig. 14(a-f). Skipjack tuna: Time-area catches (total combined in tonnes) of skipjack tuna estimated for the period 1950–2009, by decade and type of gear. Purse seine free-schools (**FS**), Purse seine associated-schools (**LS**), pole-and-line (**BB**), and other fleets (**OT**), including longline, drifting gillnets, and various coastal fisheries. Data as of September 2014. The catches of fleets for which the flag countries do not report detailed time and area data to the IOTC are recorded within the area of the countries concerned, in particular driftnets from Iran and Pakistan, gillnet and longline fishery of Sri Lanka, and coastal fisheries of Comoros, Indonesia and India.

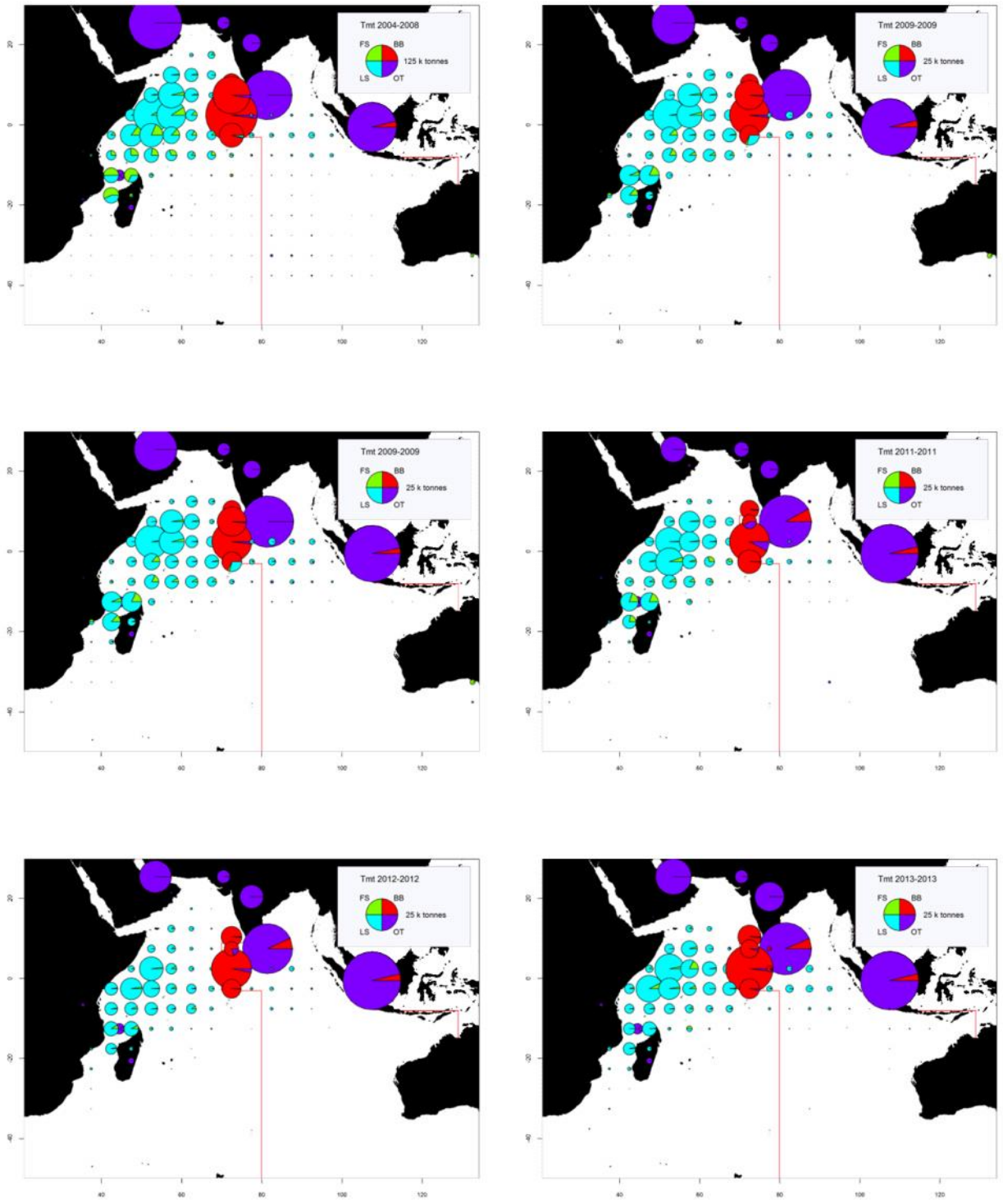


Fig. 15(a-f). Skipjack tuna: Time-area catches (total combined in tonnes) of skipjack tuna estimated for the period 2004–08 by type of gear and for 2009–13, by year and type of gear. Purse seine free-schools (**FS**), Purse seine associated-schools (**LS**), pole-and-line (BB), and other fleets (**OT**), including longline, drifting gillnets, and various coastal fisheries. Data as of September 2014. The catches of fleets for which the flag countries do not report detailed time and area data to the IOTC are recorded within the area of the countries concerned, in particular driftnets from Iran and Pakistan, gillnet and longline fishery of Sri Lanka, and coastal fisheries of Comoros, Indonesia and India.

Skipjack tuna: Status of Fisheries Statistics at the IOTC

Retained catches are generally well known for the industrial fisheries but are less certain for many artisanal fisheries (**Fig. 16a**), notably because:

- catches are not being reported by species
- there is uncertainty about the catches from some significant fleets including the Sri Lankan coastal fisheries, and the coastal fisheries of Comoros and Madagascar.

Discard levels are believed to be low although they are unknown for most industrial fisheries, excluding industrial purse seiners flagged in EU countries for the period 2003–2007.

CPUE Series: Catch and effort data are available from various industrial and artisanal fisheries (**Fig. 16b**). However, these data are not available from some important fisheries or they are considered to be of poor quality for the following reasons:

- insufficient data available for the gillnet fisheries of Iran and Pakistan
- the poor quality effort data for the gillnet/longline fishery of Sri Lanka

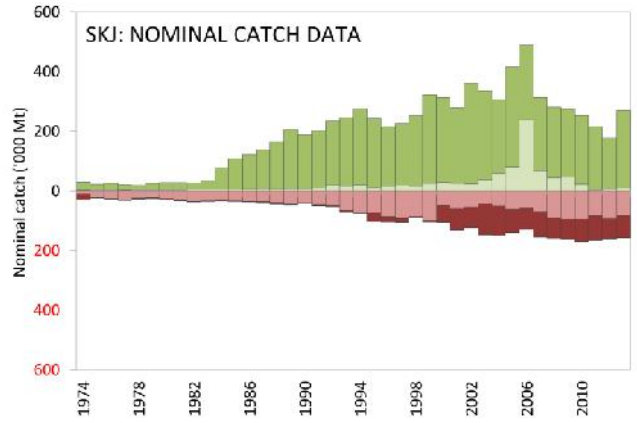
no data are available from important coastal fisheries using hand and/or troll lines, in particular Indonesia, India and Madagascar.

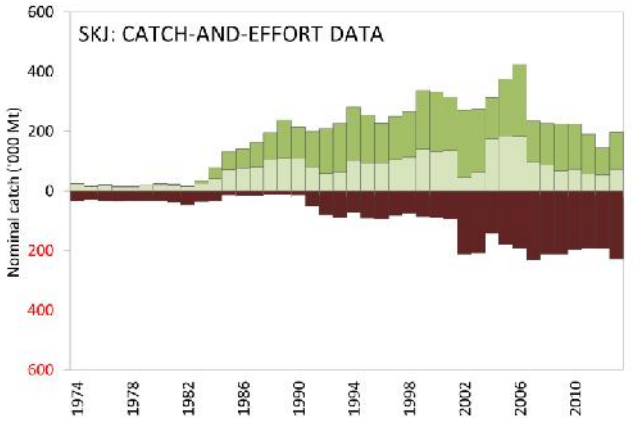
Trends in average weight cannot be assessed before the mid-1980s and are incomplete for most artisanal fisheries thereinafter, namely hand lines, troll lines and many gillnet fisheries (Indonesia).

Catch-at-Size table: CAS are available but the estimates are uncertain for some years and fisheries due to (**Fig. 16c**):

- the lack of size data before the mid-1980s
- the paucity of size data available for some artisanal fisheries, notably most hand lines and troll lines (Madagascar, Comoros) and many gillnet fisheries (Indonesia, Sri Lanka).

Changes to the catch series: There have been no major changes to the catches of skipjack tuna since the WPTT in 2012 (**Fig. 17**).





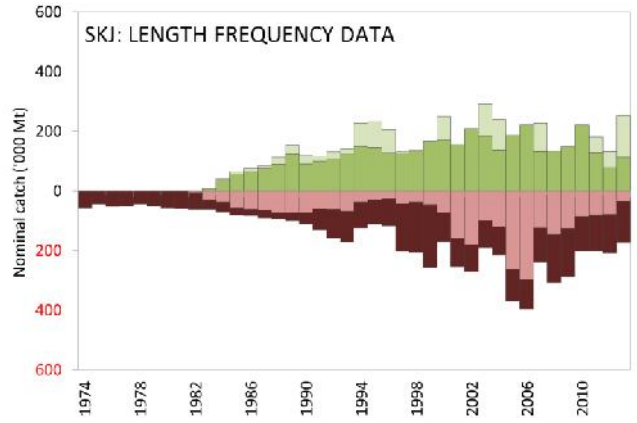


Fig. 16a-c. Skipjack tuna: data reporting coverage (1974–2013).

Each IOTC dataset (nominal catch, catch-and-effort, and length frequency) are assessed against IOTC reporting standards, where: a score of 0 indicates the amount of nominal catch associated with each dataset that is fully reported according to IOTC standards; a score of between 2 – 6 refers to the amount of nominal catch associated with each dataset that is partially reported by gear and/or species (i.e., adjusted by gear and species by the IOTC Secretariat) or any of the other reasons provided in the document; a score of 8 refers to the amount of nominal catch associated with catch-and-effort data that is not available.

Data as of September 2014.

Key to IOTC Scoring system

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

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

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

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

Key to colour coding

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

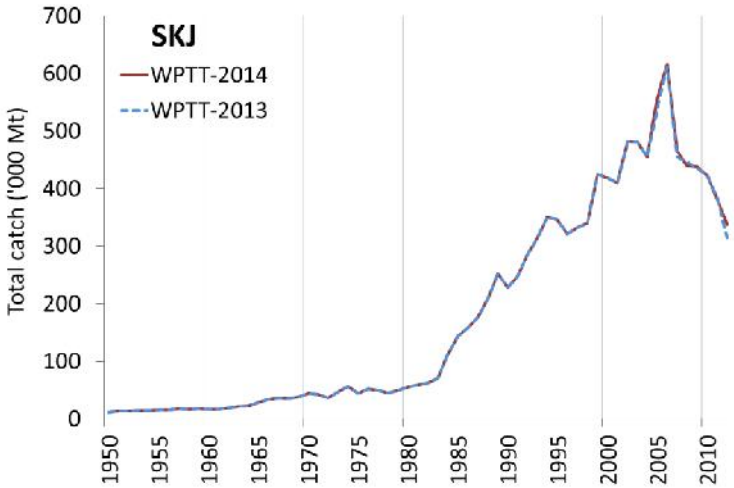


Fig. 17. Skipjack tuna: Catches used by the WPTT in 2013 versus those estimated for the WPTT in 2014 (1950–2012).

Skipjack tuna: Tagging data

A total of 101,212 skipjack (representing 50.2% of the total number of fish tagged) were tagged during the Indian Ocean Tuna Tagging Programme (IOTTP). Most of them, 77.4%, were released during the main Regional Tuna Tagging Project-Indian Ocean (RTTP-IO) and were released around Seychelles, in the Mozambique Channel and off the coast of Tanzania, between May 2005 and September 2007 (**Fig. 18**). The remaining were tagged during small-scale tagging projects, and by other institutions with the support of IOTC, around the Maldives, India, and in the south west and the eastern Indian Ocean. To date, 17,667 specimens (17.5% of releases for this species), have been recovered and reported to the IOTC Secretariat. Around 69.6% of the recoveries were from the purse seine fleets operating from the Seychelles, and around 28.8% by the pole-and-line vessels mainly operating from the Maldives. The addition of the data from the past projects in the Maldives (in 1990s) added 14,506 tagged skipjack tuna to the databases, or which 1,960 were recovered mainly in the Maldives.

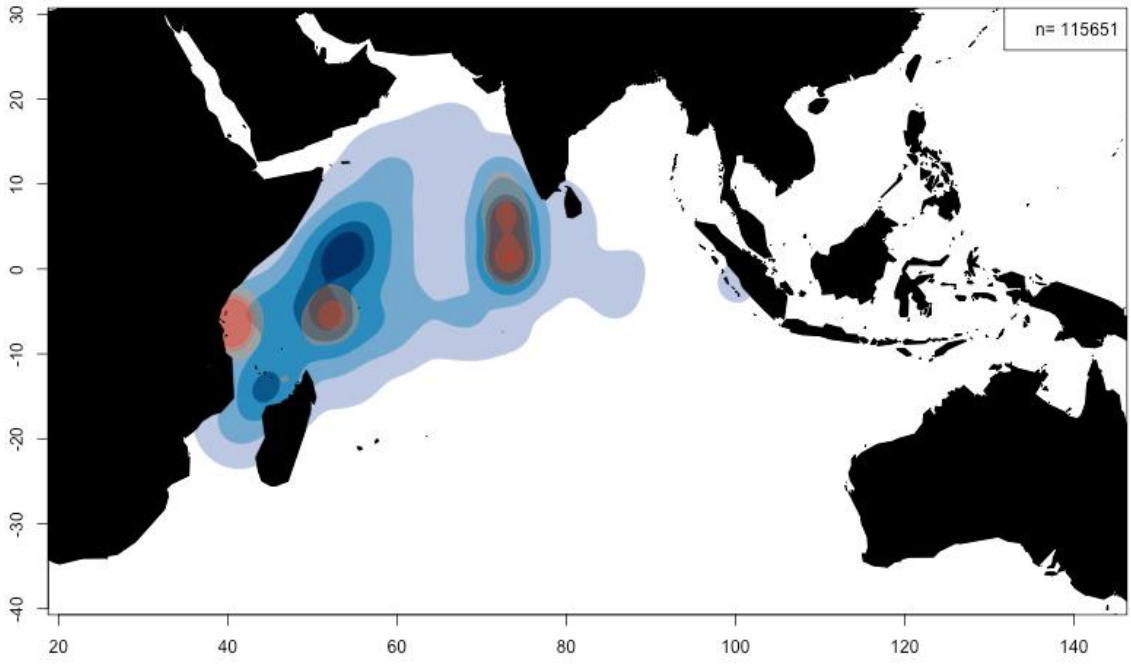


Fig. 18. Skipjack tuna: Densities of releases (in red) and recoveries (in blue). Includes specimens tagged during the IOTTP and also Indian Ocean (Maldivian) tagging programmes during the 1990s. Data as of September 2012.

Yellowfin tuna (YFT)

Fisheries and catch trends

Catches of yellowfin tuna (**Table 6**; **Fig. 19**) remained more or less stable between the mid-1950s and the early-1980s, ranging between 30,000 and 70,000 t, owing to the activities of longliners and, to a lesser extent, gillnetters. The catches increased rapidly with the arrival of the purse seiners in the early 1980s and increased activity of longliners and other fleets, reaching over 400,000 t in 1993. Catches of yellowfin tuna between 1994 and 2002 remained stable, between 330,000 and 350,000 t. Yellowfin tuna catches during 2003, 2004, 2005 and 2006 were much higher than in previous years, with the highest catches ever recorded in 2004 (over 525,000 t), while catches of bigeye tuna which are generally associated with the same fishing grounds as yellowfin tuna remained at average levels. After 2006 catches of yellowfin tuna dropped markedly, with the lowest catches recorded in 2009 at less than 270,000 t. Since 2009 catches of yellowfin tuna have once again been increasing, with catches over 400,000 t recorded in 2012 and 2013.

Table 6. Yellowfin tuna: Best scientific estimates of the catches of yellowfin tuna (*Thunnus albacares*) by gear and main fleets [or type of fishery] by decade (1950–2009) and year (2004–2013), in tonnes. Data as of September 2014. Catches by decade represent the average annual catch, noting that some gears were not used since the beginning of the fishery.

Fishery	By decade (average)						By year (last ten years)									
	1950s	1960s	1970s	1980s	1990s	2000s	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
FS	0	0	18	31,555	64,956	89,204	168,146	123,997	85,044	53,526	74,986	36,050	32,136	36,453	64,594	34,458
LS	0	0	17	17,616	56,293	61,892	59,901	69,877	74,612	43,778	41,546	51,352	73,383	76,659	66,166	101,905
LL	22,131	42,460	31,016	37,274	76,926	76,814	108,277	137,677	94,955	71,439	45,764	41,893	43,720	38,842	43,417	30,606
LF	0	0	615	4,286	47,572	34,149	32,938	35,949	31,751	33,303	34,343	23,125	21,501	20,510	27,182	36,326
BB	2,111	2,318	5,810	8,295	12,805	16,076	15,876	16,843	18,043	16,327	18,279	16,826	14,098	14,003	15,506	24,119
GI	1,572	4,115	7,838	11,899	39,420	49,243	74,001	61,210	62,488	43,452	47,978	41,945	50,780	51,053	63,626	56,843
HD	588	566	3,236	8,301	20,705	36,647	44,249	43,373	35,154	36,465	33,840	32,079	36,660	62,093	83,543	78,585
TR	1,102	1,981	4,335	6,912	11,568	16,010	20,609	17,186	18,180	19,783	18,221	16,586	19,717	19,940	28,049	31,007
OT	80	193	453	1,871	3,373	5,424	4,834	5,831	5,804	6,837	6,611	7,401	7,717	7,901	8,209	8,236
Total	**27,584**	**51,633**	**53,339**	**128,008**	**333,619**	**385,459**	**528,832**	**511,945**	**426,033**	**324,911**	**321,567**	**267,255**	**299,713**	**327,453**	**400,292**	**402,084**

Gears: Purse seine free-school (**FS**); Purse seine associated school (**LS**); Deep-freezing longline (**LL**); Fresh-tuna longline (**FL**); Pole-and-Line (**BB**); Gillnet (**GI**); Hand line (**HD**); Trolling (**TR**); Other gears nei (**OT**).

Table 7. Yellowfin tuna: Best scientific estimates of the catches of yellowfin tuna (*Thunnus albacares*) by area by decade (1950–2009) and year (2004–2013), in tonnes. Data as of September 2014. Catches by decade represent the average annual catch. The areas are presented in Fig. 20(a).

Fishery	By decade (average)						By year (last ten years)									
	1950s	1960s	1970s	1980s	1990s	2000s	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
R1	2,041	4,282	6,619	16,158	76,021	87,775	129,790	133,335	113,553	80,990	73,850	57,508	64,989	79,716	103,730	108,224
R2	11,870	23,055	21,135	71,743	134,778	174,247	261,240	239,622	188,414	120,829	131,981	99,716	117,940	140,865	173,989	175,352
R3	766	7,404	5,510	9,308	23,201	24,159	26,350	24,900	24,196	24,837	21,082	19,513	18,942	20,356	18,418	22,100
R4	997	1,919	1,633	1,325	3,633	3,337	5,674	4,372	3,090	1,293	1,225	1,145	1,364	1,431	1,408	1,707
R5	11,911	14,973	18,442	29,474	95,986	95,941	105,781	109,717	96,779	96,959	93,429	89,372	96,479	85,088	102,751	94,699
Total	**27,584**	**51,633**	**53,339**	**128,008**	**333,619**	**385,459**	**528,832**	**511,945**	**426,033**	**324,911**	**321,567**	**267,255**	**299,713**	**327,453**	**400,292**	**402,084**

Areas: Arabian Sea (**R1**); Off Somalia (**R2**); Mozambique Channel including southern (**R3**); South Indian Ocean including southern (**R4**); East Indian Ocean including Bay of Bengal(**R5**).

Although some Japanese purse seiners have fished in the Indian Ocean since 1977, the **purse seine (Fig. 19)** fishery developed rapidly with the arrival of European vessels between 1982 and 1984. Since then, there has been an increasing number of yellowfin tuna caught, with a larger proportion of the catches consisting of adult fish, as opposed to catches of bigeye tuna, which are mostly composed of juvenile fish. Purse seine vessels typically take fish ranging from 40 to 140 cm fork length (FL), while smaller fish are more common in catches taken north of the equator.

Catches of yellowfin tuna by purse seiners increased rapidly to around 130,000 t in 1993, and subsequently fluctuated around that level, until 2003–05 when catches increased substantially (i.e., around 200,000 t). The amount of effort exerted by the EU purse seine vessels (fishing for yellowfin tuna and other tunas) varies seasonally and from year to year.

The purse seine fishery is characterized by the use of two different fishing modes (**Table 6** and **Fig. 19**). The fishery on floating objects (FADs) catches large numbers of small yellowfin tuna in association with skipjack tuna and juvenile bigeye tuna, compared to the fishery on free swimming schools, which catches larger yellowfin tuna on multi-specific or mono-specific sets. Between 1995 and 2003, the FAD component of the purse seine fishery represented 48–66% of the sets undertaken (60–80% of the positive sets) and accounted for 36–63% of the yellowfin tuna catch by weight (59–76% of the total catch). The proportion of yellowfin tuna caught (in weight) on free-schools during 2003–06 (64%) was much higher than in previous or following years (at around 50%).

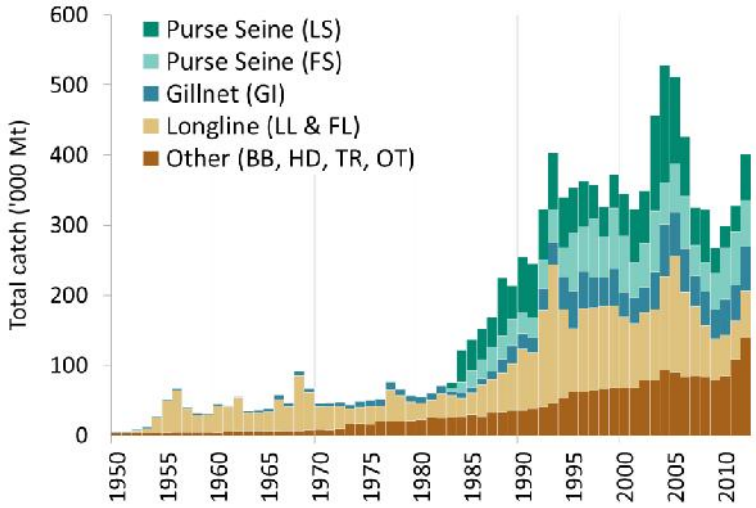
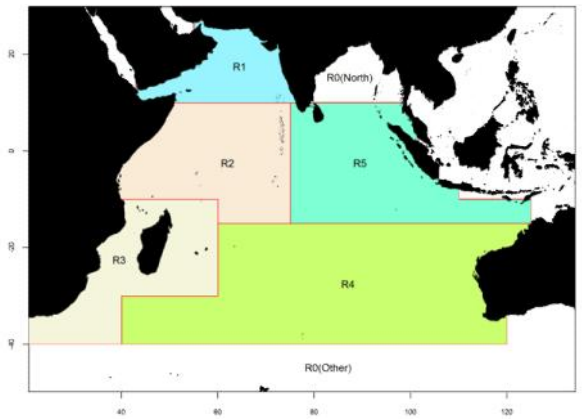


Fig. 19. Annual catches of yellowfin tuna by gear (1950–2012). Data as of Sept. 2014.



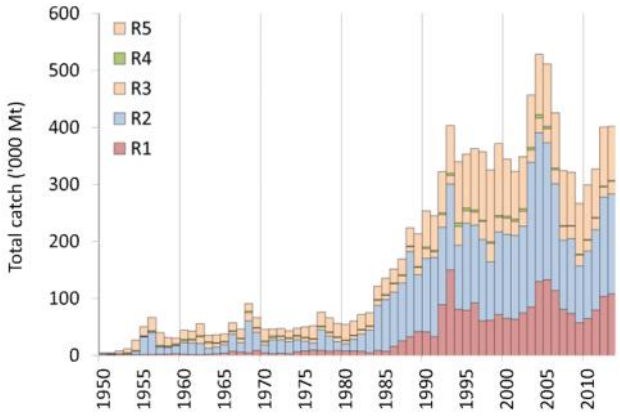


Fig. 20(a-b). Yellowfin tuna: Catches of yellowfin tuna by area by year estimated for the WPTT (1950–2013). Data as of September 2014. Catches in areas R0 were assigned to the closest neighbouring area for the assessment.

Areas: Arabian Sea (**R1**); Off Somalia (**R2**); Mozambique Channel, including southern (**R3**); South Indian Ocean including southern (**R4**); East Indian Ocean, including Bay of Bengal(**R5**).

The **longline** fishery (**Table 6**; **Fig. 19**) started in the early 1950's and expanded rapidly over throughout the Indian Ocean. Longline gear mainly catches large fish, from 80 to 160 cm FL, although smaller fish in the size range 60 cm – 100 cm (FL) have been taken by longliners from Taiwan,China since 1989 in the Arabian Sea. The longline fishery targets several tuna species in different parts of the Indian Ocean, with yellowfin tuna and bigeye tuna being the main target species in tropical waters. The longline fishery can be subdivided into a deep-freezing longline component (large scale deep-freezing longliners operating on the high seas from Japan, Korea and Taiwan,China) and a fresh-tuna longline component (small to medium scale fresh tuna longliners from Indonesia and Taiwan,China).

The total longline catch of yellowfin tuna reached a maximum in 1993 (≈200,000 t). Catches between 1994 and 2004 fluctuated between 85,000 t and 130,000 t. The second highest catches of yellowfin tuna by longliners were recorded in 2005 (≈165,000 t). Similar to the trend for the purse seine fleets, since 2005 longline catches have declined with current catches estimated to be at around 60,000 t – more than a 60% decrease in catch levels compared to 2005. The SC believes that the recent drop in longline catches could be related, at least in part, with the expansion of piracy in the northwest Indian Ocean, which led to a marked drop in the levels of longline effort in one of the core fishing areas of the species (i.e., Area R2) (**Figs. 20, 22 and 23**).

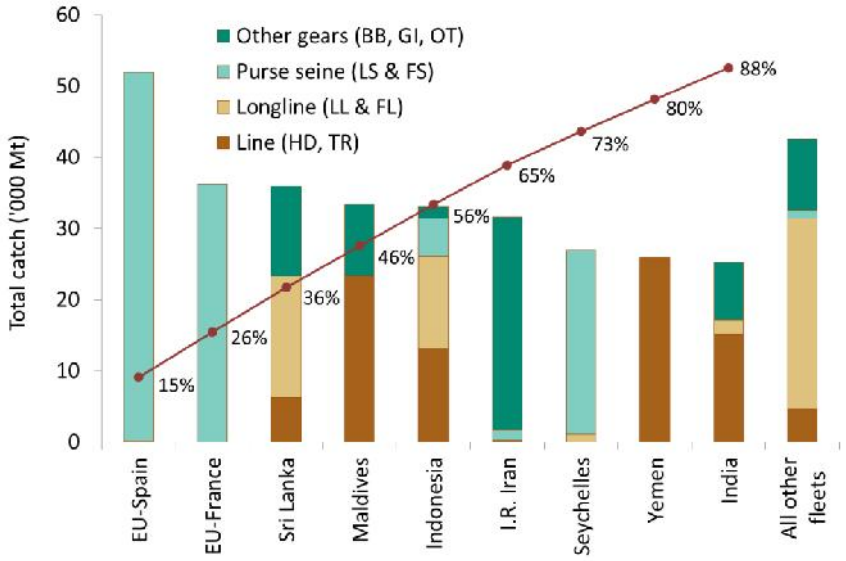


Fig. 21. Yellowfin tuna: average catches in the Indian Ocean over the period 2010–12, by country. Countries are ordered from left to right, according to the importance of catches of yellowfin reported. The red line indicates the (cumulative) proportion of catches of yellowfin for the countries concerned, over the total combined catches of this species reported from all countries and fisheries. Data as of Sept. 2014.

Catches by **other gears**, namely pole-and-line, gillnet, troll, hand line and other minor gears, have increased steadily since the 1980s (**Table 6**; **Fig. 19**). Contrary to the situation in other oceans, the artisanal fishery component of catches in the Indian Ocean are substantial, accounting for around 30% of the total catches of yellowfin tuna until the early 2000s. In recent years artisanal catches of yellowfin tuna have been around 135,000 t, increaseing to over 200,000 t in 2012 and 2013 – more than half the total catches of yellowfin tuna in each of the last two years. Artisanal catches of yellowfin tuna are dominated by gillnets, with catches of around 50,000 t since 2011.

Purse seiners currently take the bulk of the yellowfin tuna catch, mostly from the western Indian Ocean, around Seychelles and off the coast of Somalia (area R2) and Mozambique Channel (area R3) (**Table 6-7**; **Figs. 20a**). However in recent years the catches of yellowfin tuna in the western Indian Ocean have dropped considerably, especially in areas off Somalia, Kenya and Tanzania between 2007 and 2011 (**Figs. 22** and **23**). The drop in catches is, in part, the consequence of a drop in fishing effort due to the effect of piracy in the western Indian Ocean region – although the effects have not been as marked as with longliners. The main reason for this is the presence of security personnel onboard purse seine vessels of the EU and Seychelles, which has made it possible for purse seiners under these flags to continue operating in the northwest Indian Ocean. Longline effort levels in the western tropical area have also increased in 2012 and 2013, as a consequence of increased security in the region.

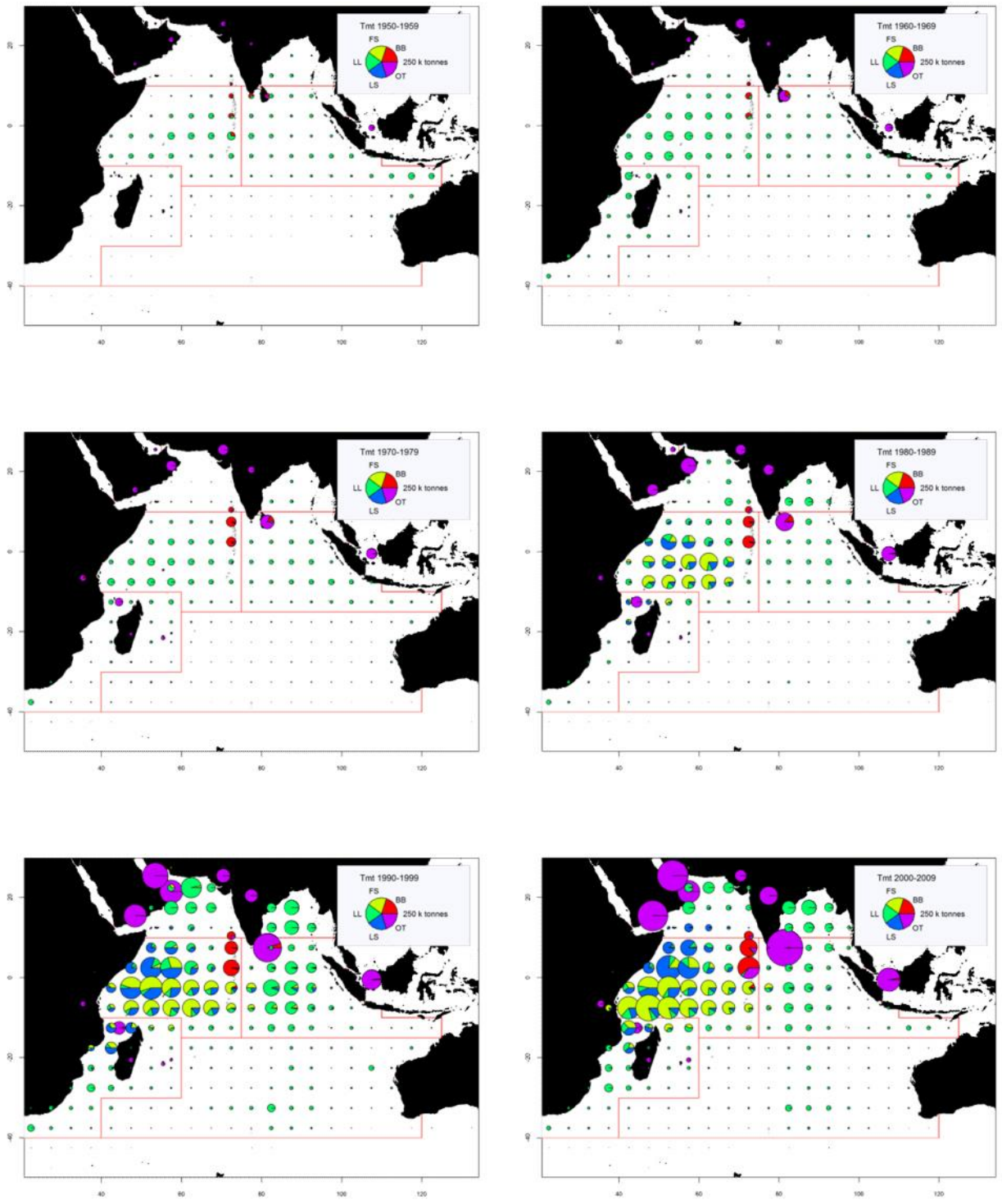


Fig. 22(a-f). Yellowfin tuna: Time-area catches (total combined in tonnes) of yellowfin tuna estimated for the period 1950–2009, by decade and type of gear. Longline (**LL**), Purse seine free-schools (**FS**), Purse seine associated-schools (**LS**), pole-and-line (**BB**), and other fleets (**OT**), including drifting gillnets, and various coastal fisheries. Data as of September 2014. The catches of fleets for which the flag countries do not report detailed time and area data to the IOTC are recorded within the area of the countries concerned, in particular driftnets from Iran and Pakistan, gillnet and longline fishery of Sri Lanka, and coastal fisheries of Yemen, Oman, Comoros, Indonesia and India.

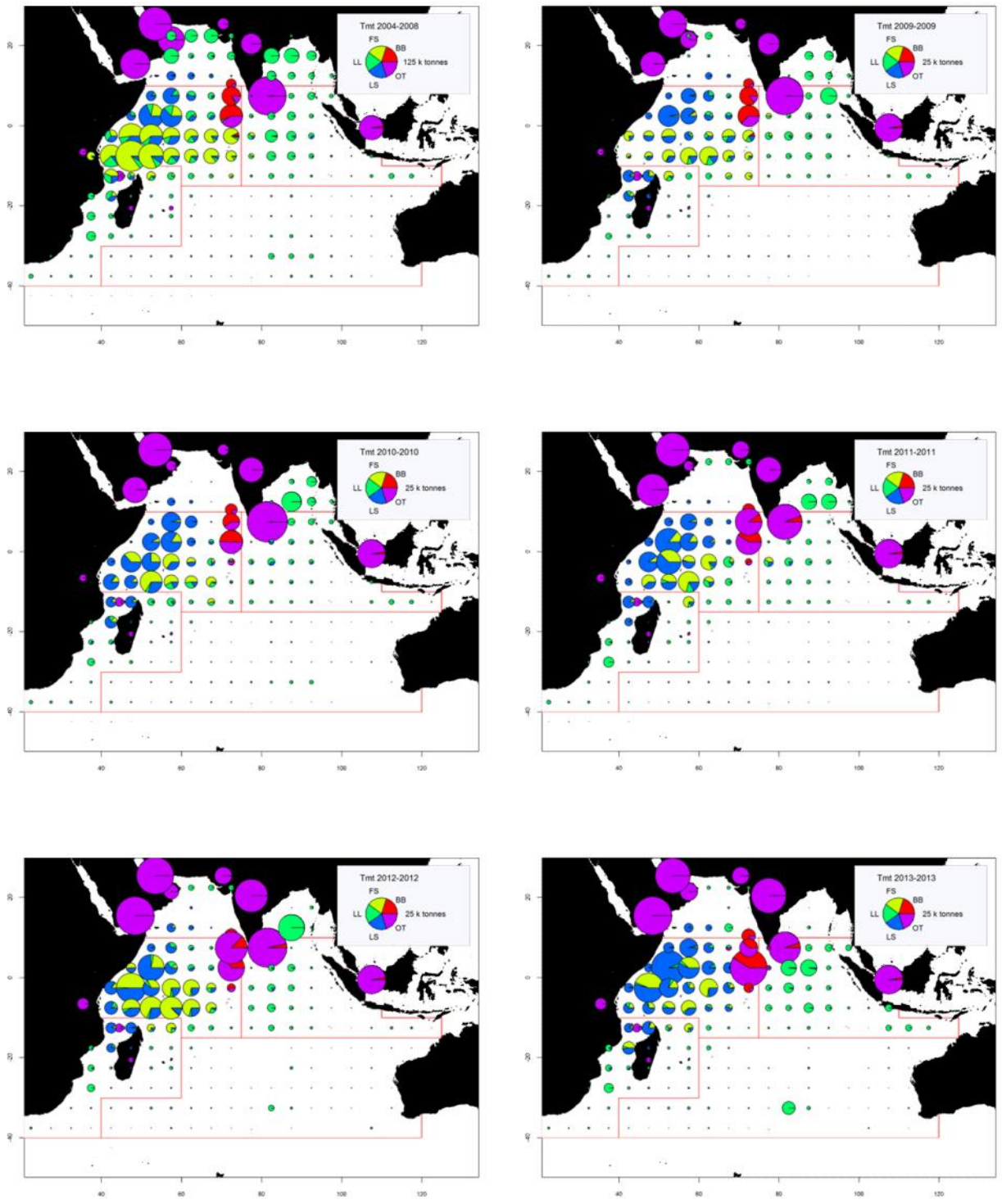


Fig. 23(a-f). Time-area catches (total combined in tonnes) of yellowfin tuna estimated for the period 2004–2008 by type of gear and for 2009–2013, by year and type of gear. Longline (**LL**), Purse seine free-schools (**FS**), Purse seine associated-schools (**LS**), pole-and-line (**BB**), and other fleets (**OT**), including drifting gillnets, and various coastal fisheries. Data as of September 2013. The catches of fleets for which the flag countries do not report detailed time and area data to the IOTC are recorded within the area of the countries concerned, in particular driftnets from Iran and Pakistan, gillnet and longline fishery of Sri Lanka, and coastal fisheries of Yemen, Oman, Comoros, Indonesia and India.

Yellowfin tuna: Status of Fisheries Statistics at the IOTC

Retained catches are generally well known (**Fig. 24a**); however, catches are less certain for:

- many coastal fisheries, notably those from Indonesia, Sri Lanka, Yemen, and Madagascar
- the gillnet fishery of Pakistan
- non-reporting industrial purse seiners and longliners (NEI), and longliners of India.

Discard levels are believed to be low although they are unknown for most industrial fisheries, excluding industrial purse seiners flagged in EU countries for the period 2003–2007.

CPUE Series: Catch-and-effort data are available from the major industrial and artisanal fisheries (**Fig. 24b**). However, these data are not available for some important fisheries or they are considered to be of poor quality for the following reasons:

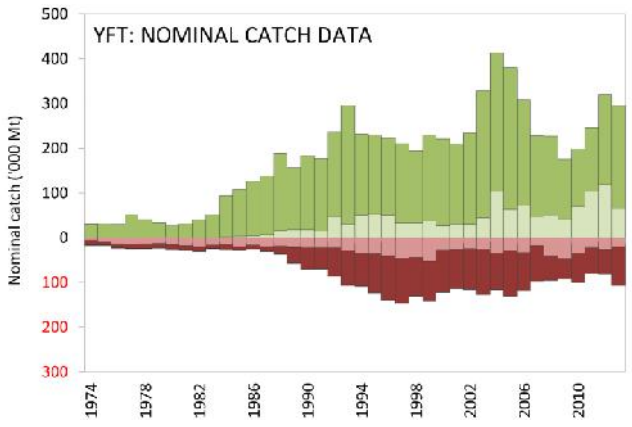
- no data are available for the fresh-tuna longline fishery of Indonesia, over the entire time series, and data for the fresh-tuna longline fishery of Taiwan,China are only available since 2006
- insufficient data for the gillnet fisheries of Iran and Pakistan
- the poor quality effort data for the significant gillnet/longline fishery of Sri Lanka
- no data are available from important coastal fisheries using hand and/or troll lines, in particular Yemen, Indonesia, and Madagascar.

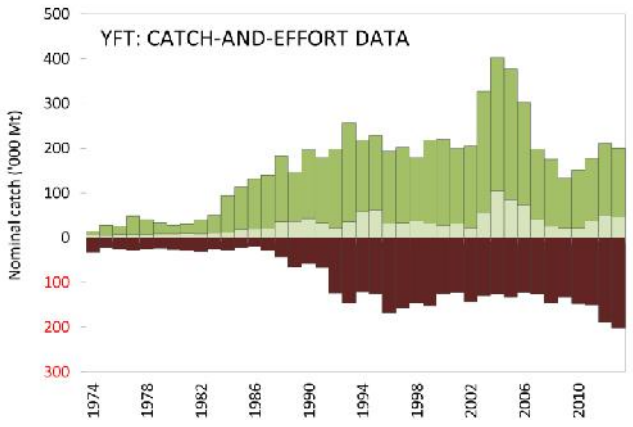
Trends in average weight can be assessed for several industrial fisheries but they are very incomplete or of poor quality for some fisheries, namely hand lines (Yemen, Comoros, Madagascar), troll lines (Indonesia) and many gillnet fisheries.

Catch-at-Size table: This is available (**Fig. 24c**) although the estimates are more uncertain in some years and some fisheries due to:

- size data not being available from important fisheries, notably Yemen, Pakistan, Sri Lanka and Indonesia (lines and gillnets) and Comoros and Madagascar (lines)
- the paucity of size data available from industrial longliners from the late-1960s up to the mid-1980s, and in recent years (Japan and Taiwan,China)
- the paucity of catch by area data available for some industrial fleets (NEI, Iran, India, Indonesia, Malaysia).

Changes to the catch series: There have been no significant changes to the total catches of yellowfin tuna since the WPTT in 2013 (**Fig. 25**).





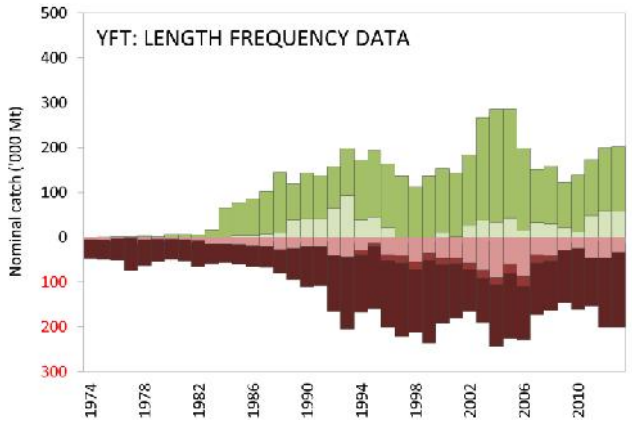


Fig. 24a-c. Yellowfin tuna: data reporting coverage (1974–2013).

Each IOTC dataset (nominal catch, catch-and-effort, and length frequency) are assessed against IOTC reporting standards, where: a score of 0 indicates the amount of nominal catch associated with each dataset that is fully reported according to IOTC standards; a score of between 2 – 6 refers to the amount of nominal catch associated with each dataset that is partially reported by gear and/or species (i.e., adjusted by gear and species by the IOTC Secretariat) or any of the other reasons provided in the document; a score of 8 refers to the amount of nominal catch associated with catch-and-effort data that is not available.

Data as of September 2014.

Key to IOTC Scoring system

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

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

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

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

Key to colour coding

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

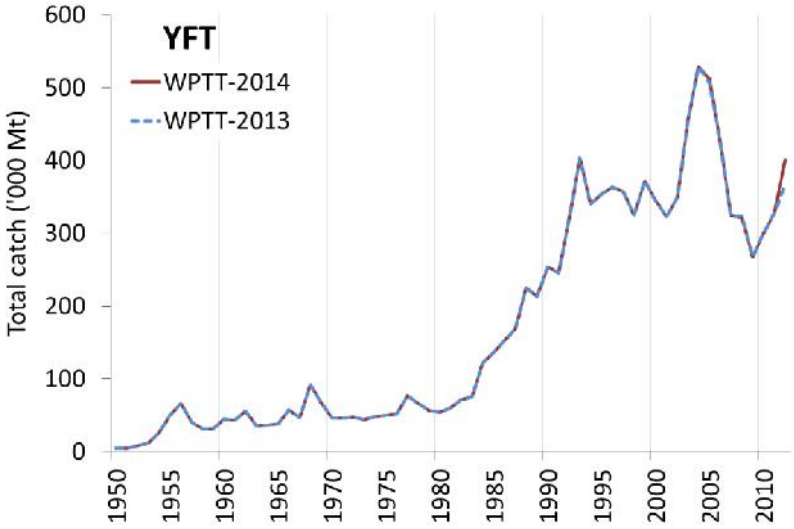


Fig. 25. Yellowfin tuna: Catches used by the WPTT in 2013 versus those estimated for the WPTT in 2014 (1950–2012).

Yellowfin tuna: tagging data

A total of 63,328 yellowfin tuna (representing 31.4% of the total number of specimens tagged) were tagged during the Indian Ocean Tuna Tagging Programme (IOTTP). Most of them (86.4%) were released during the main Regional Tuna Tagging Project-Indian Ocean (RTTP-IO) and were released around Seychelles, in the Mozambique Channel, along the coast of Oman and off the coast of Tanzania, between May 2005 and September 2007 (**Fig. 26**). The remaining were tagged during small-scale tagging projects, and by other institutions with the support of IOTC Secretariat, in Maldives, India, and in the south west and the eastern Indian Ocean. To date, 10,838 specimens (17.1%), have been recovered and reported to the IOTC Secretariat. More than 85.9% of these recoveries we made by the purse seine fleets operating in the Indian Ocean, while around 9.1% were made by pole-and-line and less than 1% by longline vessels. The addition of the data from the past projects in the Maldives (in 1990s) added 3,211 tagged yellowfin tuna to the databases, or which 151 were recovered, mainly from the Maldives.

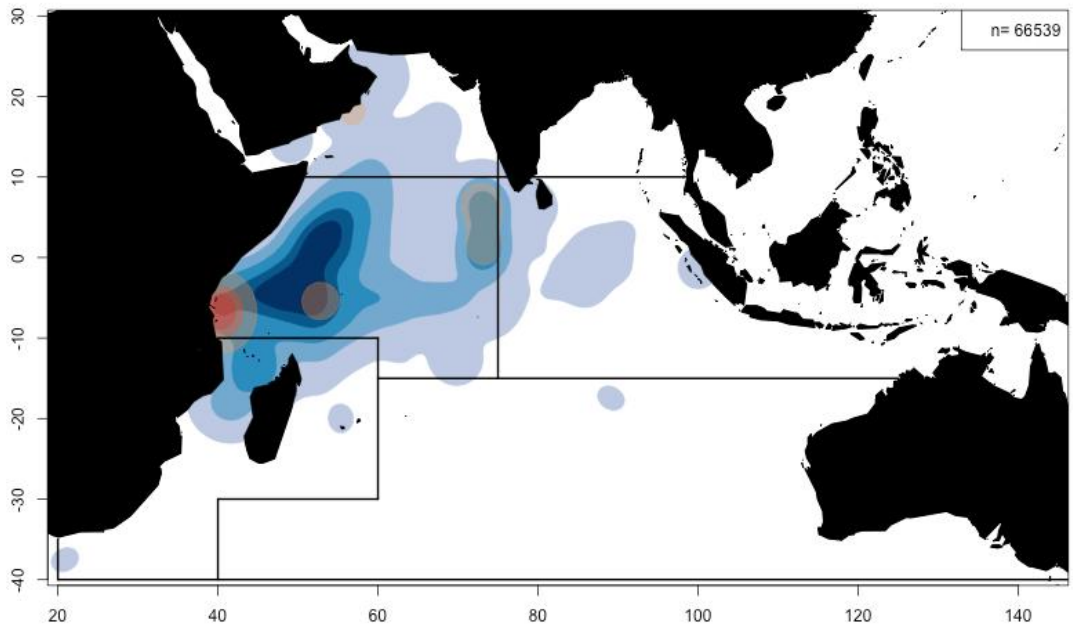


Fig. 26. Yellowfin tuna: Densities of releases (in red) and recoveries (in blue). The black line represents the stock assessment areas. Includes specimens tagged during the IOTTP and also Indian Ocean (Maldivian) tagging programmes during the 1990s. Data as of September 2012.

APPENDIX I

ESTIMATION OF CATCHES OF NON-REPORTING FLEETS

The estimates of catches of non-reporting fleets were updated in 2014:

The high number of non-reporting fleets operating in the Indian Ocean between the mid-1980's and the late 1990's led to large increases in the amount of catch that had to be estimated for that period. This reduced confidence in the catch estimates for yellowfin tuna and bigeye tuna, and to a lesser extent, skipjack tuna during those years. In recent years the number of fleets from non-IOTC Parties has decreased significantly. However, the decrease in the numbers of industrial vessels fishing in the Indian Ocean from non-IOTC parties has coincided with an increase in the numbers of vessels fishing under flags of some IOTC parties, including coastal countries in the IOTC region (India, Indonesia, Iran, Kenya, Malaysia, Oman, Seychelles, Tanzania and Thailand) and deep-water fishing nations (Belize, Guinea and Senegal), the quality of the statistics collected by these countries varying depending on the case.

- **Purse seine** (**Fig. 33**): Catches for the six former Soviet Union purse seiners, currently under the Thailand flag, were estimated for January-August 2005 and those for the remaining purse seiner (Equatorial Guinea) for 2005–2006. Total catches were estimated using the number of vessels available, the average catches of the former Soviet Union purse seiners in previous years, and average catches available for other fleets for 2005–2006. Total catches were assigned to species and type of school fished according to data available for Thailand purse seiners during the same period (2005–2006). The amount of catch that the Secretariat has to estimate for this fleet has decreased considerably in recent years. It is thought that there are no longer purse seiners operating under flags of non-reporting countries.

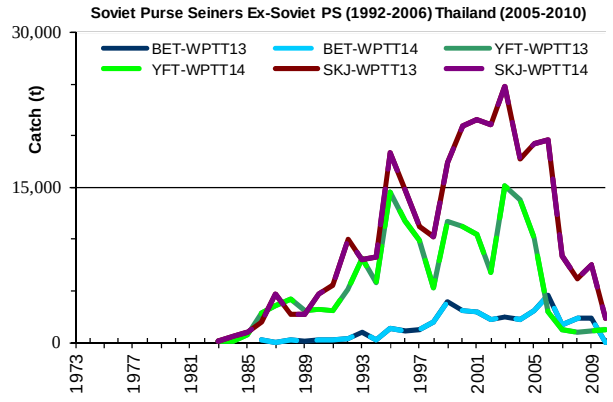


Fig. 33. Catches of Soviet, ex-Soviet and Thai purse seiners estimated in 2012 versus previous catches estimated in 2011 (1983–2010)

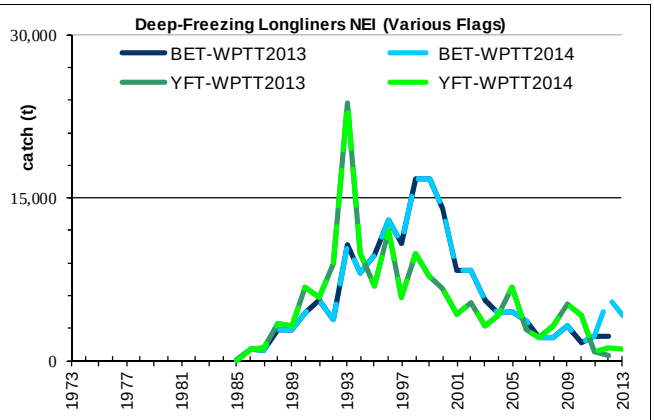


Fig. 34. Catches of deep-freezing longline vessels in the Indian Ocean estimated in 2014 versus catches estimated in 2013 (1985–2013)

- **Deep-freezing longline** (**Fig. 34**): The catches by large longliners from several non-reporting countries were estimated using IOTC vessel records and the catch data from Taiwanese, Japanese or Spanish longliners, based on the assumption that most of the vessels operate in a way similar to the longliners from Taiwan,China, Japan, or EU-Spain. The collection of new information on the activities of non-reporting fleets during the last year, in particular the numbers and characteristics of non-reporting longliners, led to improved estimates of catches. Since 1999 the number of non-reporting longliners in the Indian Ocean has decreased considerably leading to a marked decrease in catch levels. Such decrease has coincided with an increase in the numbers of vessels operated by some IOTC CPC's. Although these countries usually report catches to the Secretariat, the data reported are, in some cases, considered incomplete (as indicated in Section 3)
- **Fresh tuna longline** (**Fig. 35-36**): Fresh tuna longline vessels, mainly from China, Taiwan,China, India, Malaysia, Belize and Indonesia, have been operating in the Indian Ocean since the early 1970's. The catches of these fleets have been estimated by the IOTC Secretariat by using information from the following three sources:
    - Catches reported by the flag countries: Although China reported total catches for its longline fleet they were not reported by type of longline until 2006 (fresh-tuna longline or deep-freezing longline). The Secretariat estimated the catches of fresh-tuna longliners for 1999–2005 by using the total catches

reported, the numbers of fresh-tuna longline vessels provided by China and catch rates for fresh-tuna longliners available from other years.

- Information on catches and vessel activity collected through several catch monitoring schemes implemented in the main ports of landing for these vessels, involving the IOTC-OFC[8] and/or institutions in the countries where the fleets are based and/or foreign institutions. This applies to Indonesia (2002–2006), Thailand (1998–2006), Sri Lanka (2002–03), Malaysia (2000–2006), Oman (2004–2005) and Seychelles (2000–2002). Since 2007 Indonesia and Malaysia have reported catches for their longline fleets. However, the catches reported are thought to be incomplete as Indonesia and Malaysia do not monitor the activities of vessels under their flags based in other countries. The Secretariat estimated the catches of this component as for the countries indicated below.
- Information available on the number of fresh-tuna longline vessels operating in other ports or on the activity of those vessels (e.g. the number of vessel unloading or total catches unloaded). This applies to India (2005-13), Indonesia (1973–2001), Thailand (1994–2013), Sri Lanka (1990–2001; 2004–13), Malaysia (1989–2012), Singapore, Mauritius and Maldives (recent years). The catches in these ports and years were estimated from the known/presumed levels of activity of the vessels and the average catches obtained in ports that were covered through sampling.

In 2006 Taiwan,China provided total catches for its longline tuna fleet operating in the Indian Ocean for the period 2000 to 2005. The catches for 2006-12 have also been provided, including time area catches and effort for 2007-13. The catches published by Taiwan,China were slightly higher than those that the IOTC Secretariat had estimated from the data collected through port sampling. The new catches provided for 2001-05 were used to replace those in the IOTC database. This was done on the assumption that vessels from Taiwan,China had operated in ports of non-reporting countries, their catches not accounted for in estimates made by the Secretariat. The Secretariat has been using the catches published by Taiwan,China since 2006.

The catches for fleets other than Taiwan,China for 1973–2013 and for Taiwan,China in years prior to 2001 were estimated as explained in the three bullet points above.

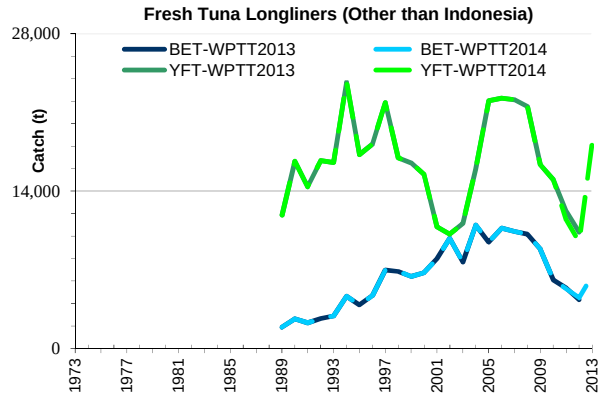


Fig. 35. Catches of fresh-tuna longline vessels based in India, Malaysia, Maldives, Mauritius, Oman, Seychelles, Singapore, Sri Lanka, Thailand and Yemen (mainly registered in China, Taiwan,China and Indonesia) estimated in 2013 versus catches estimated in 2014 (1989–2013)

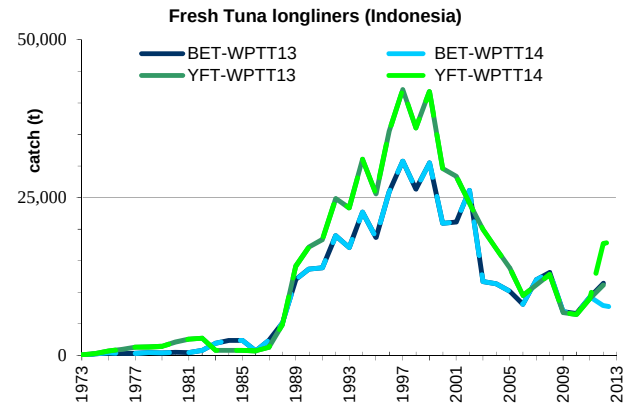


Fig. 36. Catches of fresh-tuna longline vessels based in Indonesia (domestic and foreign) estimated in 2013 versus catches estimated in 2014 (1973–2013)

[8] Overseas Fishery Cooperation Foundation of Japan

APPENDIX II

ESTIMATION OF CATCHES AT SIZE FOR IOTC TROPICAL TUNA SPCIES

Table 1: Current IOTC equations to convert from non-standard measurements into standard length (fork length), by species

Species: Yellowfin tuna — ***Standard length: Tip of snout to fork of tail***

Type Measurement	*Equation*	*Parameters*	*Sample size*	*Size*	*Variance*	*Covariance ab*	*Mean Residual*	*Gradient*
Weight gilled and gutted[A]	$a*W^{b}$	a= 44.28699 b= 0.3008591	2,361	Min:14 Max:71	a=0.00752476509 b=2.86244E-07	-4.626246E-05	4.095958	a=3.033852 b=495.6385
Length to the base of the 1st dorsal fin[B]	$a*L^{b}$	a=2.0759 b=1.1513	7,036	Min: 29 Max: 164				

Species: Bigeye tuna — ***Standard length: Tip of snout to fork of tail***

Type Measurement	*Equation*	*Parameters*	*Sample size*	*Size*	*Variance*	*Covariance ab*	*Mean Residual*	*Gradient*
Weight gilled and gutted[A]	$a*W^{b}$	a= 42.2186 b= 0.3012349	316	Min:12 Max:107	a=0.0321755341 b=1.299934E-06	-0.0002034041	3.98137	a=3.03806 b=473.1455
Length to the base of the 1st dorsal fin[C]	$\frac{(L+a)^2}{(b)^2}$	a=21.45108 b=5.28756	2,858	Min:13 Max:48				

Sources:

A: Data from Penang Sampling Programme (1992-93)

B: Data from the Indian Ocean (Marsac, F. et al in IOTC-2006-WPTT-09)

C: Data from the Atlantic Ocean, Champagnat et Pianet (1974) (ibid. B)

Table 2: Current IOTC equations used to convert from standard length into round weight, per species

Species	*Gear Type/s*	*From type measurement – To type measurement*	*Equation*	*Parameters*	*Sample size*	*Length*
Yellowfin tuna	Purse seine Pole and Line Gillnet	Fork length – Round Weight(kg)[D]	$RND=a*L^{b}$	a= 0.00001886 b= 3.0195	6,752	Min: 29 Max: 164
	Longline Line Other Gears	Fork length(cm) – Gilled and gutted weight(kg)[E] Gilled and gutted weight(kg) - Round Weight(kg)[F]	$GGT=a*L^{b}$ $RND=GGT*1.13$	a= 0.0000094007 b= 3.126843987	15,133	Min:72 Max:177
Bigeye tuna	Purse seine Pole and Line Gillnet Trolling	Fork length(cm) – Round Weight(kg)[G]	$RND=a*L^{b}$	a= 0.000027000 b= 2.95100	n/a	n/a
	Longline Line Other Gears	Fork length(cm) – Gilled and gutted weight(kg)[E] Gilled and gutted weight(kg) - Round Weight(kg)[F]	$GGT=a*L^{b}$ $RND=GGT*1.13$	a= 0.0000159207 b= 3.0415414023	12,047	Min:70 Max:187
Skipjack tuna	All gears	Fork length(cm) – Round Weight(kg)[H]	$RND=a*L^{b}$	a= 0.0000074800 b= 3.25260	14,140	Min:32 Max:78

Sources:

D: Data from the Indian Ocean (Marsac, F., et al. in IOTC-2006-WPTT-09)

E: Multilateral catch monitoring Benoa (2002-04)

F: ICCAT Field Manual (Appendix 4: Population parameters for key ICCAT species. Product Conversion Factors)

G: Cort (1986)

H: Data from the Atlantic Ocean, Cayré et Laloë (Fonteneau, A. et J. Marcille (eds), 1988: Ressources, pêche et biologie des thonidés tropicaux de l'Atlantique Centre-Est. FAO Doc.Tech.Pêches, (292), page262)

Sources of alternative equations:

Andrade, et al. (2001), Allometry coefficient variations of the length–weight relationship of skipjack tuna (Katsuwonus pelamis) caught in the southwest South Atlantic, Fisheries Research, 55: 307-312.

Batista da Silva, et al. (2011), Weight length relationship and length conversion of yellowfin tuna, from fisheries associated with an offshore buoy in the western equatorial Atlantic, Arquivos de Ciências do Mar, 44 (2): 83 – 88.

Chang, et al. (2008), Preliminary estimation of length-weight relationship of Atlantic bigeye tuna from Taiwanese observer data, ICCAT, 62(2): 480-484.

Kaymaram, et al. (2014), Estimates of Length-Based Population Parameters of Yellowfin Tuna (Thunnus albacares) in the Oman Sea, Turkish Journal of Fisheries and Aquatic Sciences, 14: 101-111.

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Rohit, et al. (2008), Yellowfin tuna fishery by traditional fishermen at Visakhapatnam, Andhra Pradesh, Journal of the Marine Biological Association of India, 50 (1) : 62 – 68.

Sun, et al. (2006), Reproductive biology of bigeye tuna in the Western and Central Pacific Ocean, WCPFC-SC2-2006/BI WP-1.

Zhu, et al. (2008), Length-frequency composition and weight-length relations for bigeeye tuna, yellowfin tuna, and albacore in the Atlantic, Indian, and Eastern Pacific Oceans, Acta Ichthyological et Piscatoria, 38 (2): 157-161.

Zorica, et al. (2008), Biometry, length-length and length-weight relationships of juveniles and adults of Atlantic bonito, Sarda sarda, in the eastern Middle Adriatic Sea, Acta Adriatica, 49(1): 65-72.

Table 3: Number and proportion of samples reported to the IOTC Secretariat by measurement type and species (data as of Sept. 2014).

Measurement type	Bigeye tuna	Skipjack tuna	Yellowfin tuna
Fork length	47,102,890	465,344,150	144,053,004
Fork length (by using a Board)		259,093	57,047
Fork length (converted from weight/length)	1,736		1,854
Fork length (converted tape measure lengths)	30	474,431	176,614
Fork length (unconverted tape measure lengths)	2,888	1,143,739	274,656
Gilled and gutted weight	429,804		625,034
First dorsal fin-fork length	582		939
First dorsal fin-fork length (Tape measure length)	18		57
Round Weight	563,071		770,336
Total no. of samples**	48,101,019	467,221,413	145,959,541

Measurement type	Bigeye tuna	Skipjack tuna	Yellowfin tuna
Fork length	97.9%	99.6%	98.7%
Fork length (by using a Board)	0.0%	0.1%	0.0%
Fork length (converted from weight/length)	0.0%	0.0%	0.0%
Fork length (converted tape measure lengths)	0.0%	0.1%	0.1%
Fork length (unconverted tape measure lengths)	0.0%	0.2%	0.2%
Gilled and gutted weight	0.9%	0.0%	0.4%
First dorsal fin-fork length	0.0%	0.0%	0.0%
First dorsal fin-fork length (Tape measure length)	0.0%	0.0%	0.0%
Round Weight	1.2%	0.0%	0.5%
Total no. of samples**	100.0%	100.0%	100.0%

** Includes a mixture of raised (i.e., Purse seine) and unraised (e.g., Longline and Gillnet) specimens sampled for length/weight.

Figure i: Charts showing standard length and weigh conversion equations for tropical tuna species.

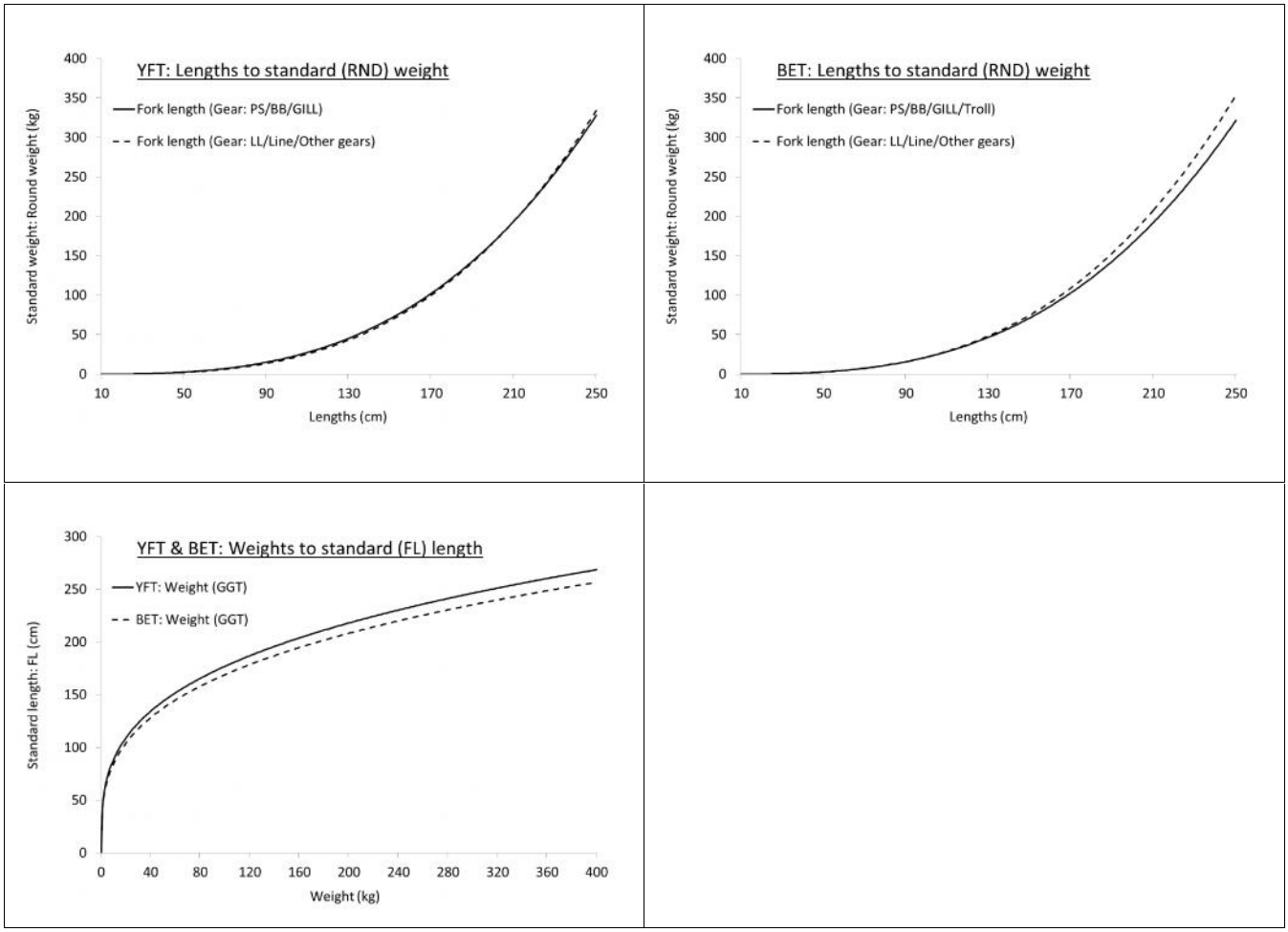
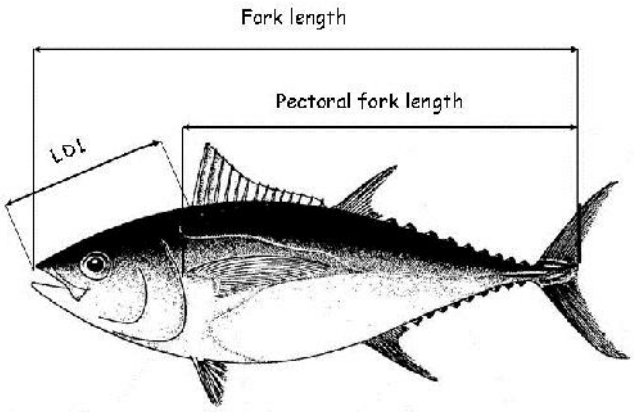


Fig ii. Types of measurements used for tuna



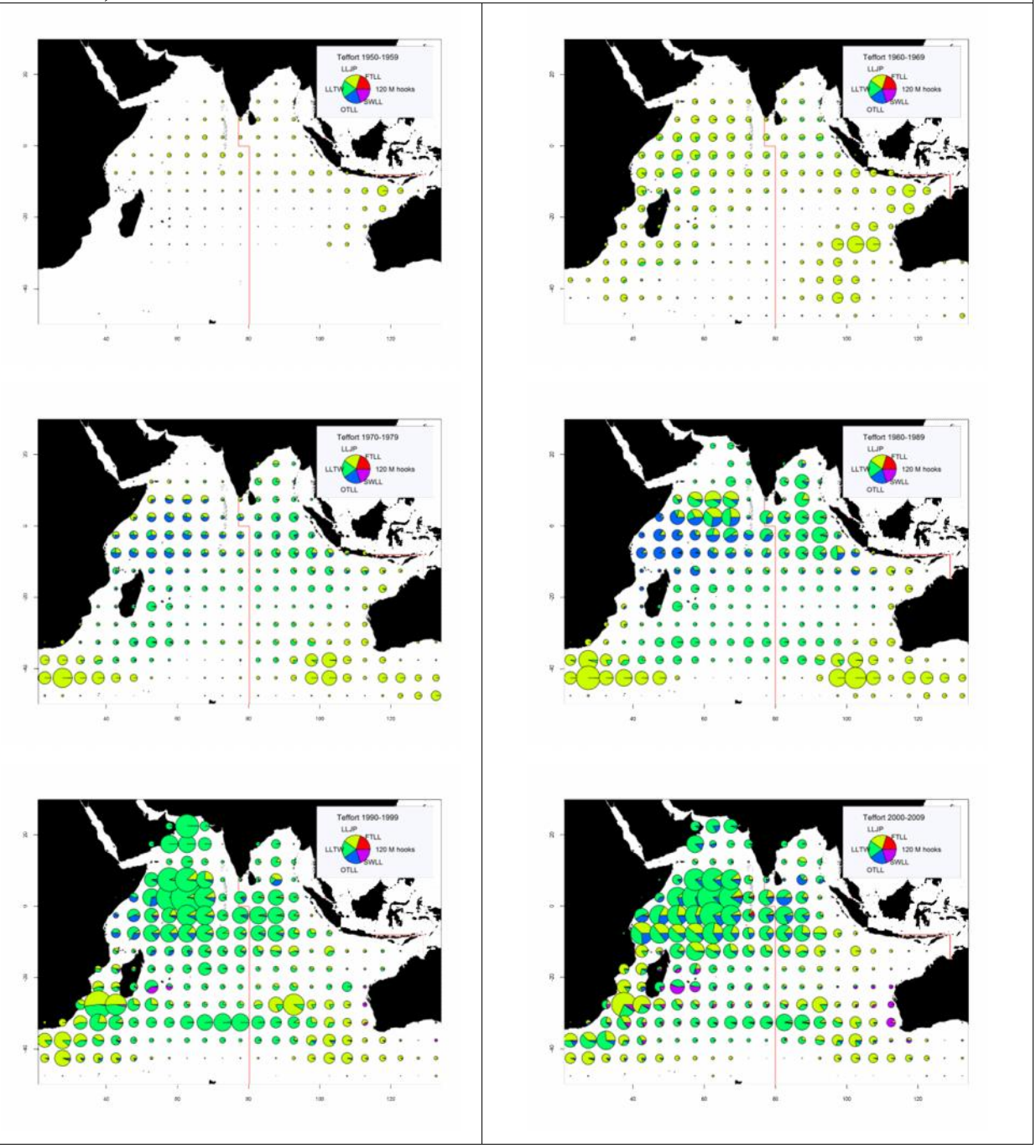
APPENDIX III

REVIEW OF FISHERIES TRENDS FOR TROPICAL TUNAS

1. EFFORT

a) Longline

Effort exerted by LONGLINE fleets in the Indian Ocean, in millions (M) of hooks set, by decade (1950-2009) and main fleet:
LLJP (light green): deep-freezing longliners from Japan
LLTW (dark green): deep-freezing longliners from Taiwan,China
SWLL (turquoise): swordfish longliners (Australia, EU, Mauritius, Seychelles and other fleets)
FTLL (red) : fresh-tuna longliners (China, Taiwan,China and other fleets)
OTLL (blue): Longliners from other fleets (includes Belize, China, Philippines, Seychelles, South Africa, South Korea and various other fleets)



Effort exerted by LONGLINE fleets in the Indian Ocean, in millions (M) of hooks set, for 2004-08 and 2009-13, by year, and main fleet:

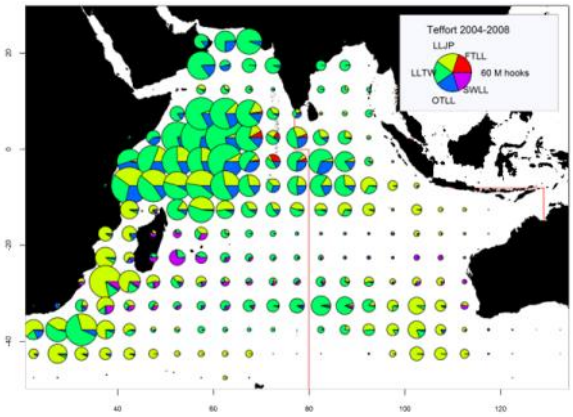
LLJP (light green): deep-freezing longliners from Japan

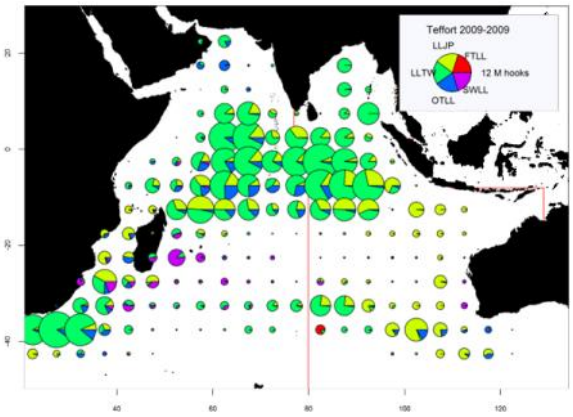
LLTW (dark green): deep-freezing longliners from Taiwan,China

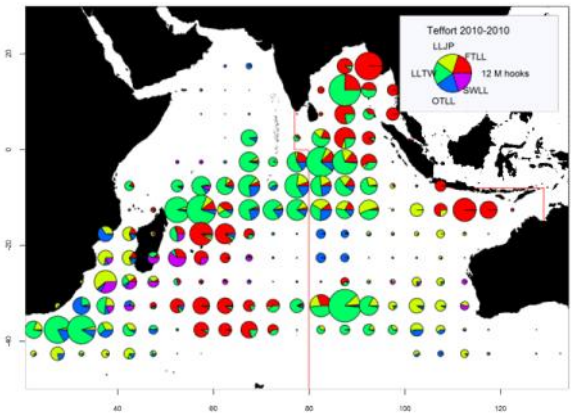
SWLL (turquoise): swordfish longliners (Australia, EU, Mauritius, Seychelles and other fleets)

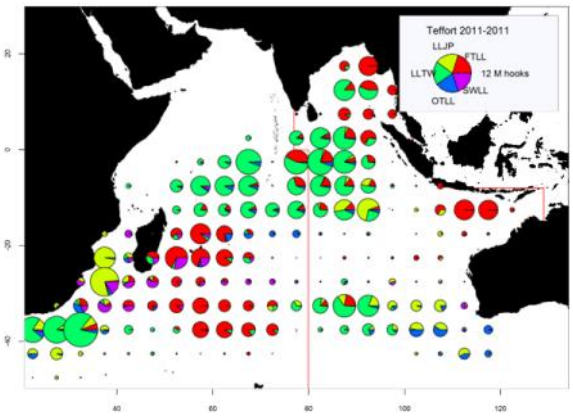
FTLL (red) : fresh-tuna longliners (China, Taiwan,China and other fleets)

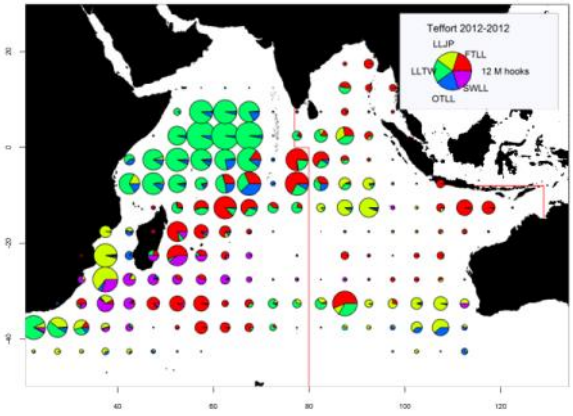
OTLL (blue): Longliners from other fleets (includes Belize, China, Philippines, Seychelles, South Africa, South Korea and various other fleets)

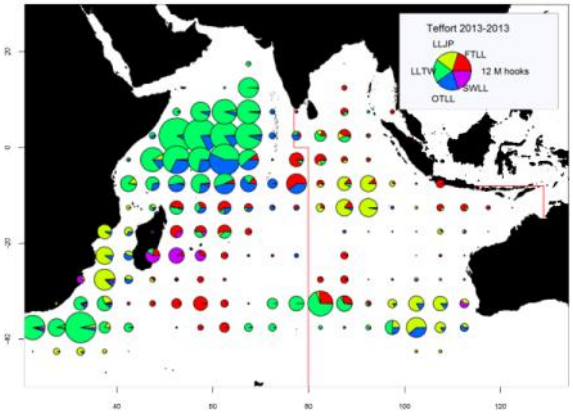












Effort exerted by LONGLINE fleets in the Indian Ocean, in millions (M) of hooks set, for 2004-09 and 2009-13, by year, quarter, and main fleet:

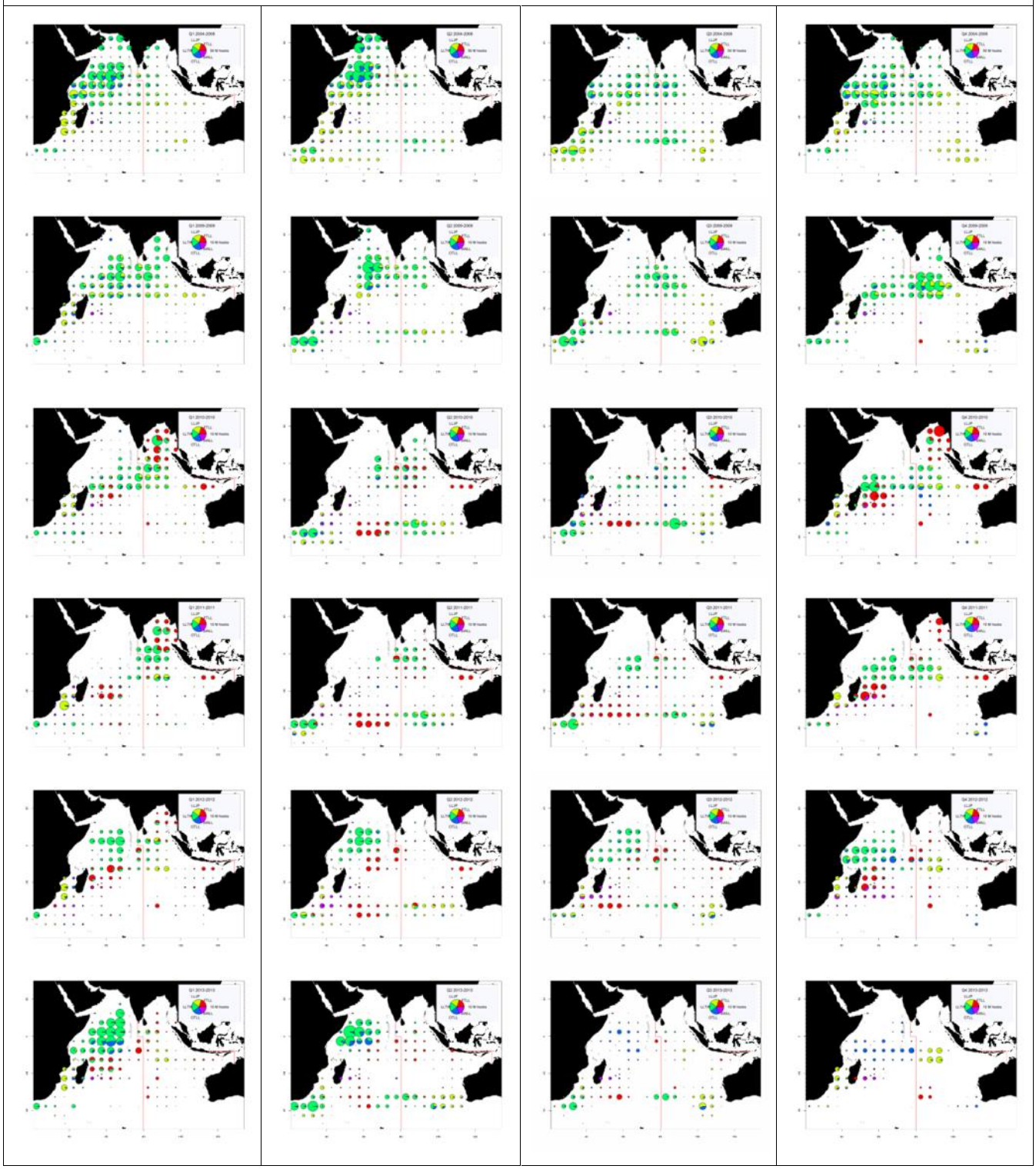
LLJP (light green): deep-freezing longliners from Japan

LLTW (dark green): deep-freezing longliners from Taiwan,China

SWLL (turquoise): swordfish longliners (Australia, EU, Mauritius, Seychelles and other fleets)

FTLL (red) : fresh-tuna longliners (China, Taiwan,China and other fleets)

OTLL (blue): Longliners from other fleets (includes Belize, China, Philippines, Seychelles, South Africa, South Korea and various other fleets)



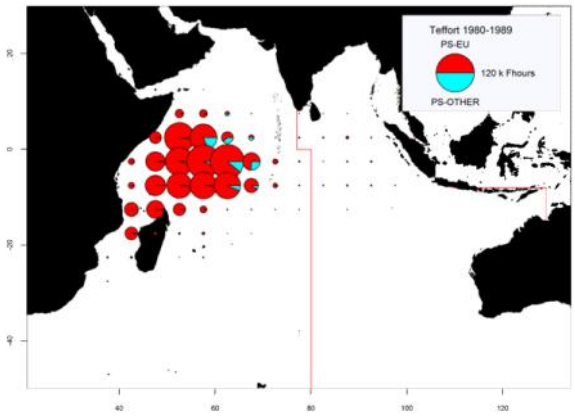
Purse seine

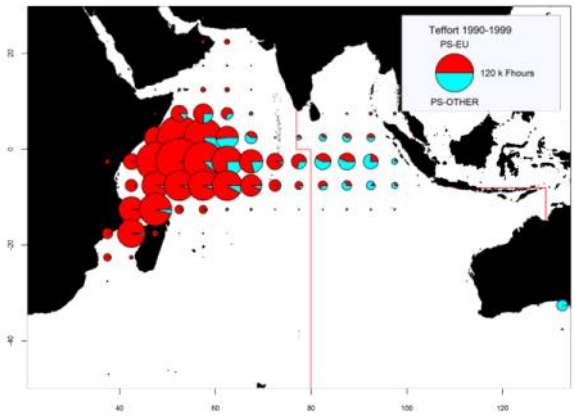
Effort exerted by industrial PURSE SEINE fleets in the Indian Ocean, in thousands (k) of fishing hours (Fhours), by decade (1980-2009) and main fleet:

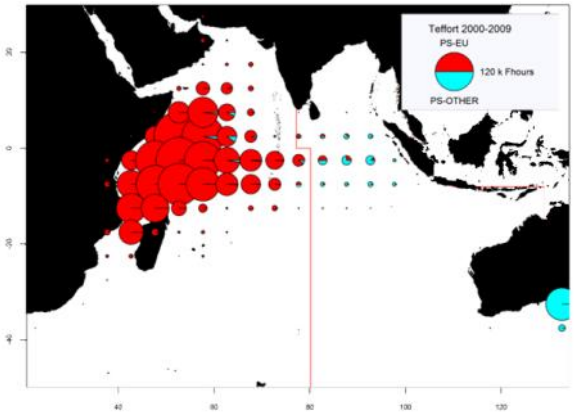
PS-EU (red): Industrial purse seiners monitored by the EU and Seychelles (operating under flags of EU countries, Seychelles and other flags)

PS-OTHER (green): Industrial purse seiners from other fleets (includes Japan, Mauritius and purse seiners of Soviet origin)

(excludes effort data for purse seiners of Iran and Thailand; data for Australia refers to days-at-sea)







Effort exerted by industrial PURSE SEINE fleets in the Indian Ocean, in thousands (k) of fishing hours (Fhours), for 2004-08 and 2009-13, by year, and main fleet:

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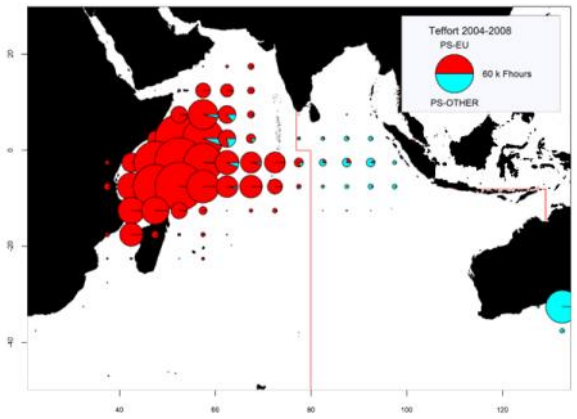
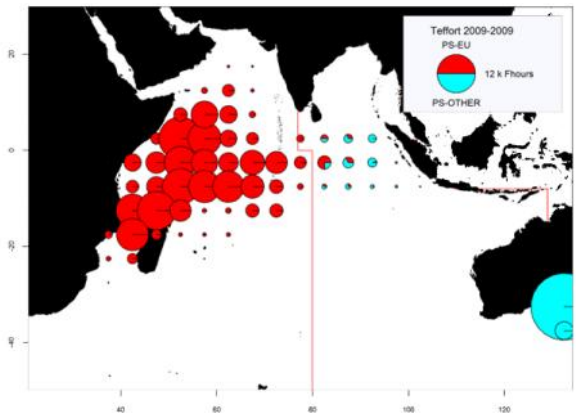
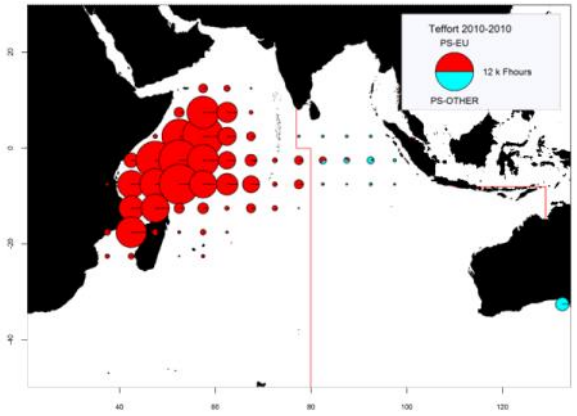
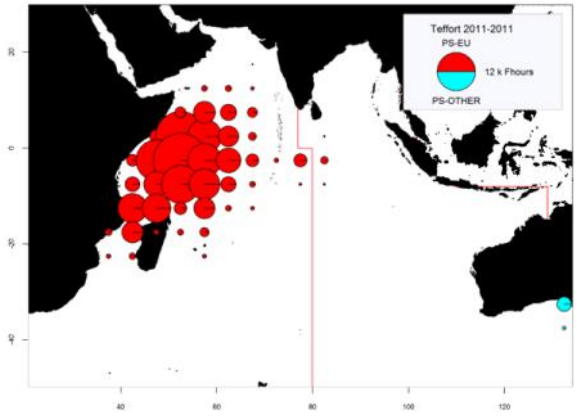
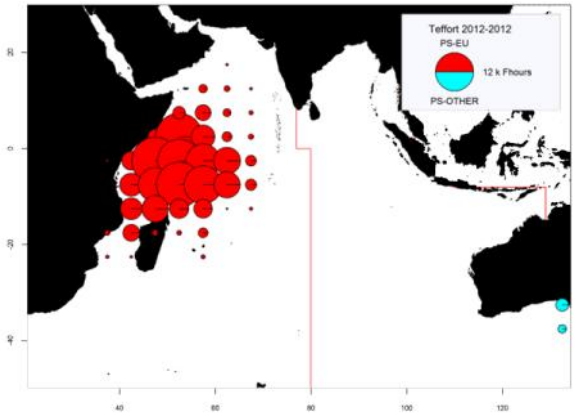
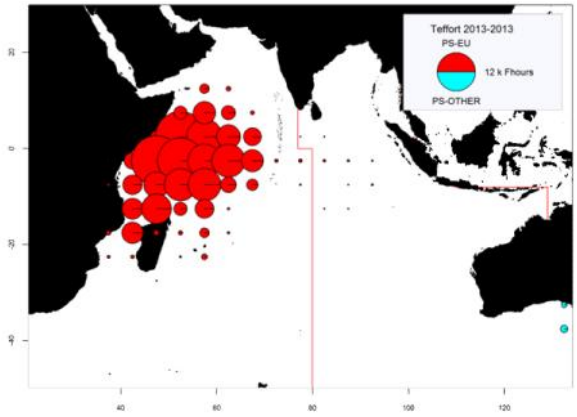












Effort exerted by industrial PURSE SEINE fleets in the Indian Ocean, in thousands (k) of fishing hours (Fhours), for 2004-08 and 2009-13 by year, quarter, and main fleet:

PS-EU (red): Industrial purse seiners monitored by the EU and Seychelles (operating under flags of EU countries, Seychelles and other flags)

PS-OTHER (green): Industrial purse seiners from other fleets (includes Japan, Mauritius and purse seiners of Soviet origin)

(excludes effort data for purse seiners of Iran and Thailand; data for Australia refers to days-at-sea)

b) *Pole-and-line*

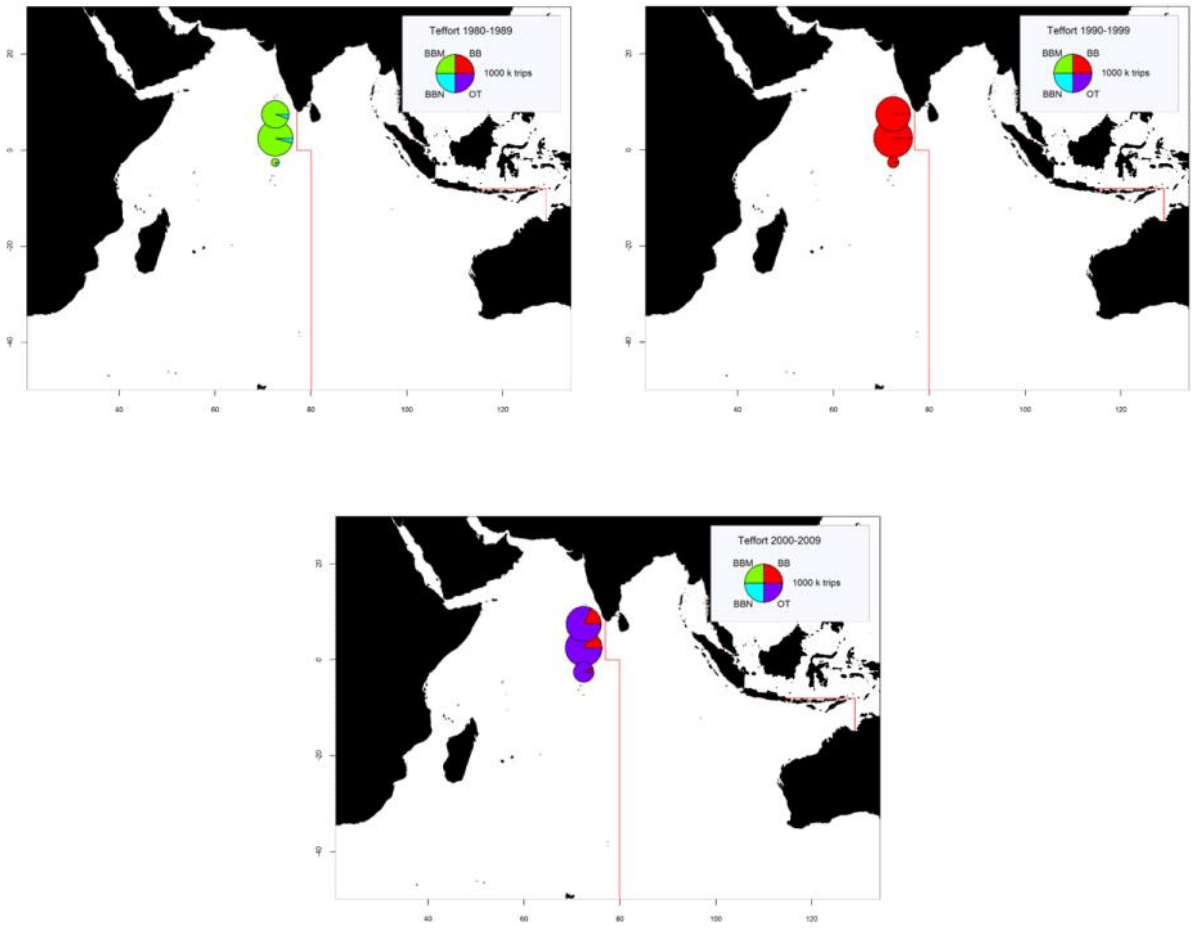
Effort exerted by POLE-AND-LINE fleets in the Indian Ocean, in thousands (k) of trips (equivalent to fishing days), by decade (1980-2009) and type of boat:

BBM (green): Pole-and-line (mechanized baitboats)

BBN (blue): Pole-and-line (non-mechanized baitboats)

BB (red): Pole-and-line (all types of baitboat, especially mechanized)

OT (purple): Pole-and-line and other gears unidentified (effort not available by gear)



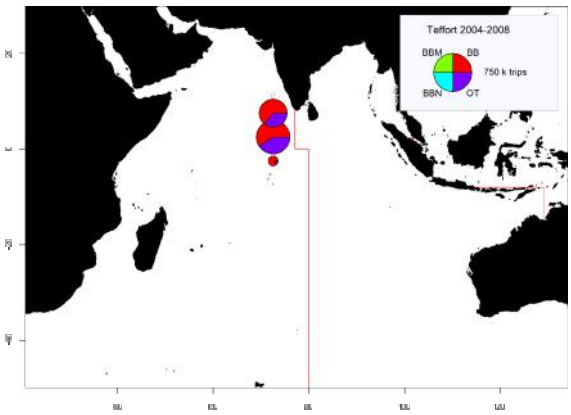
Effort exerted by POLE-AND-LINE fleets in the Indian Ocean, in thousands (k) of trips (equivalent to fishing days), for 2004-08 and 2009-13, by year, and type of boat:

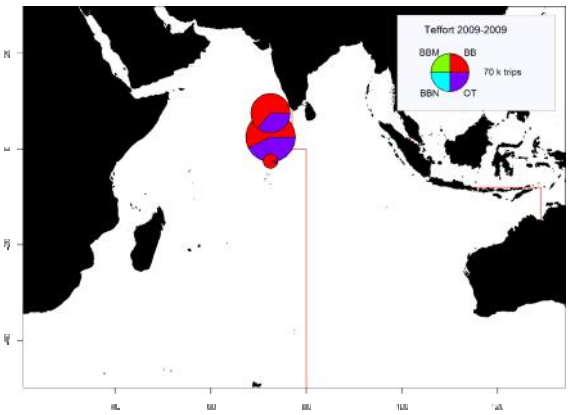
BBM (green): Pole-and-line (mechanized baitboats)

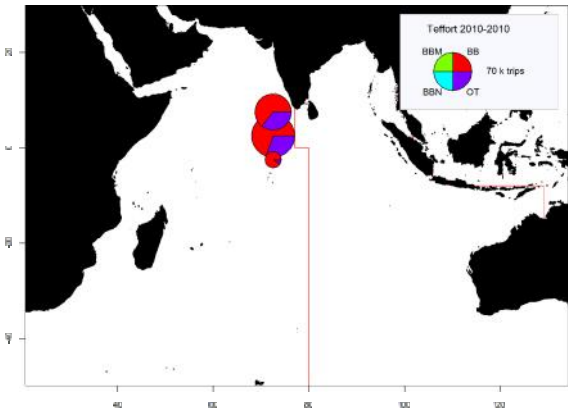
BBN (blue): Pole-and-line (non-mechanized baitboats)

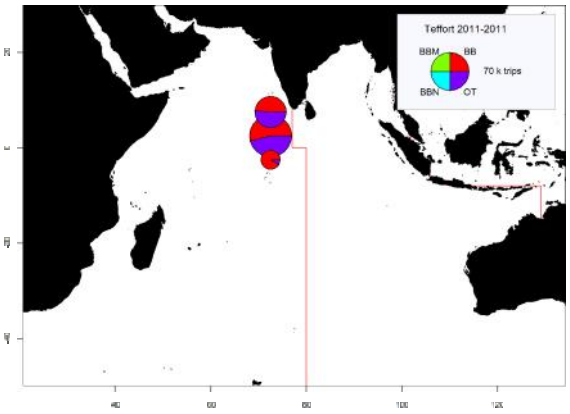
BB (red): Pole-and-line (all types of baitboat, especially mechanized)

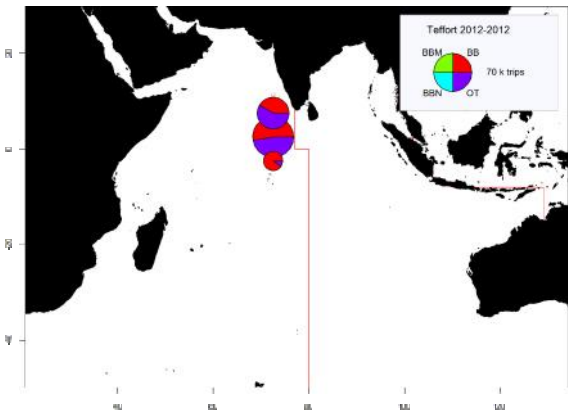
OT (purple): Pole-and-line and other gears unidentified (effort not available by gear)

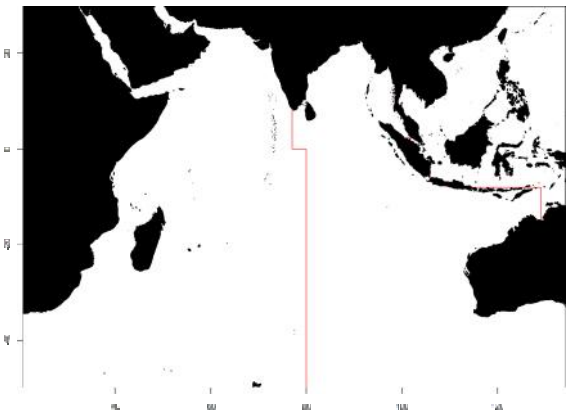












2. TIME-AREA CATCHES

a. Major species: By gear

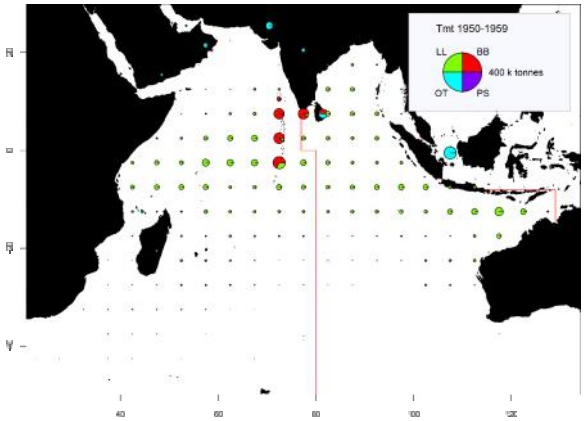
Time-area catches (total combined in tonnes) of major IOTC species (tropical tunas, albacore and swordfish) estimated by gear and decade (1950-2009):

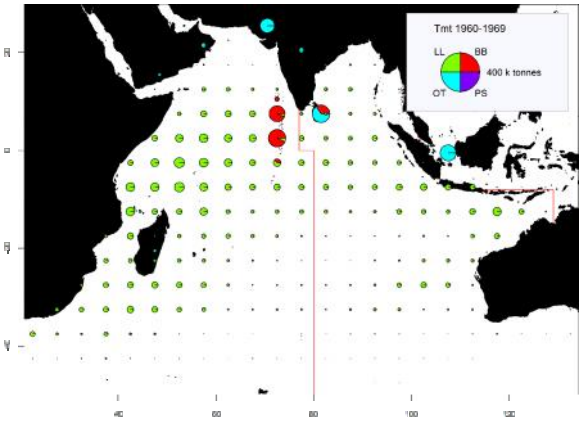
Longline (LL, bright green): freezing longliners from Japan, Taiwan,China, EU, Seychelles, South Korea, and other fleets.

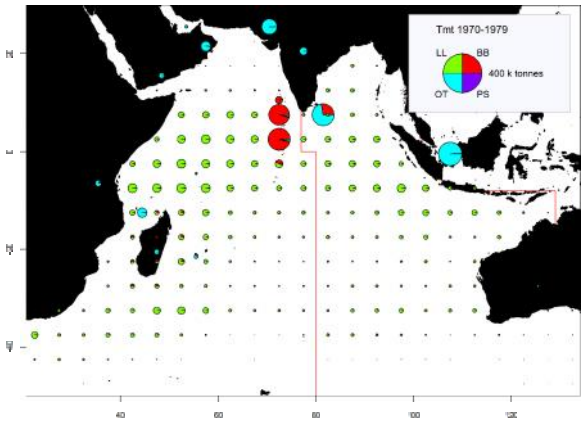
Purse seine (PS, purple) from EU, Iran, I.R., Japan, Seychelles, Thailand and other fleets.

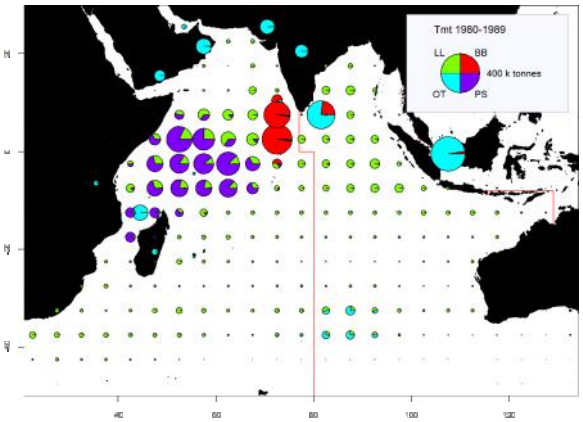
Pole-and-line (BB, red): baitboat fisheries from Maldives, India, and other countries.

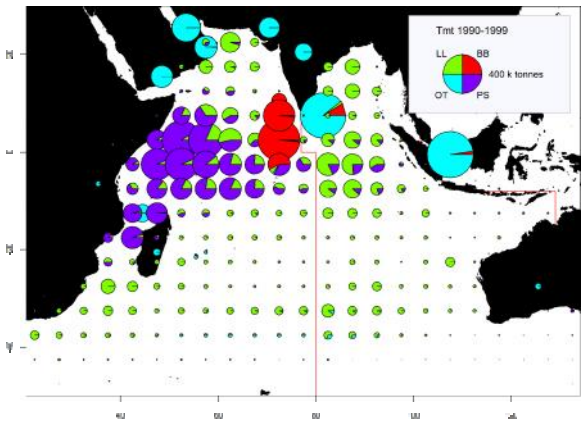
Other fleets (OTHR, blue): other fleets, especially small-scale fisheries operating in coastal waters.

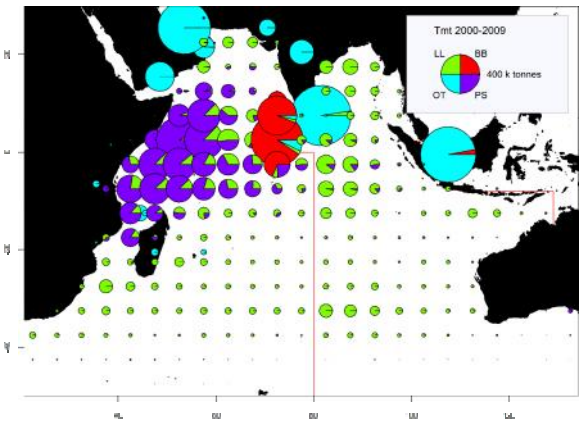












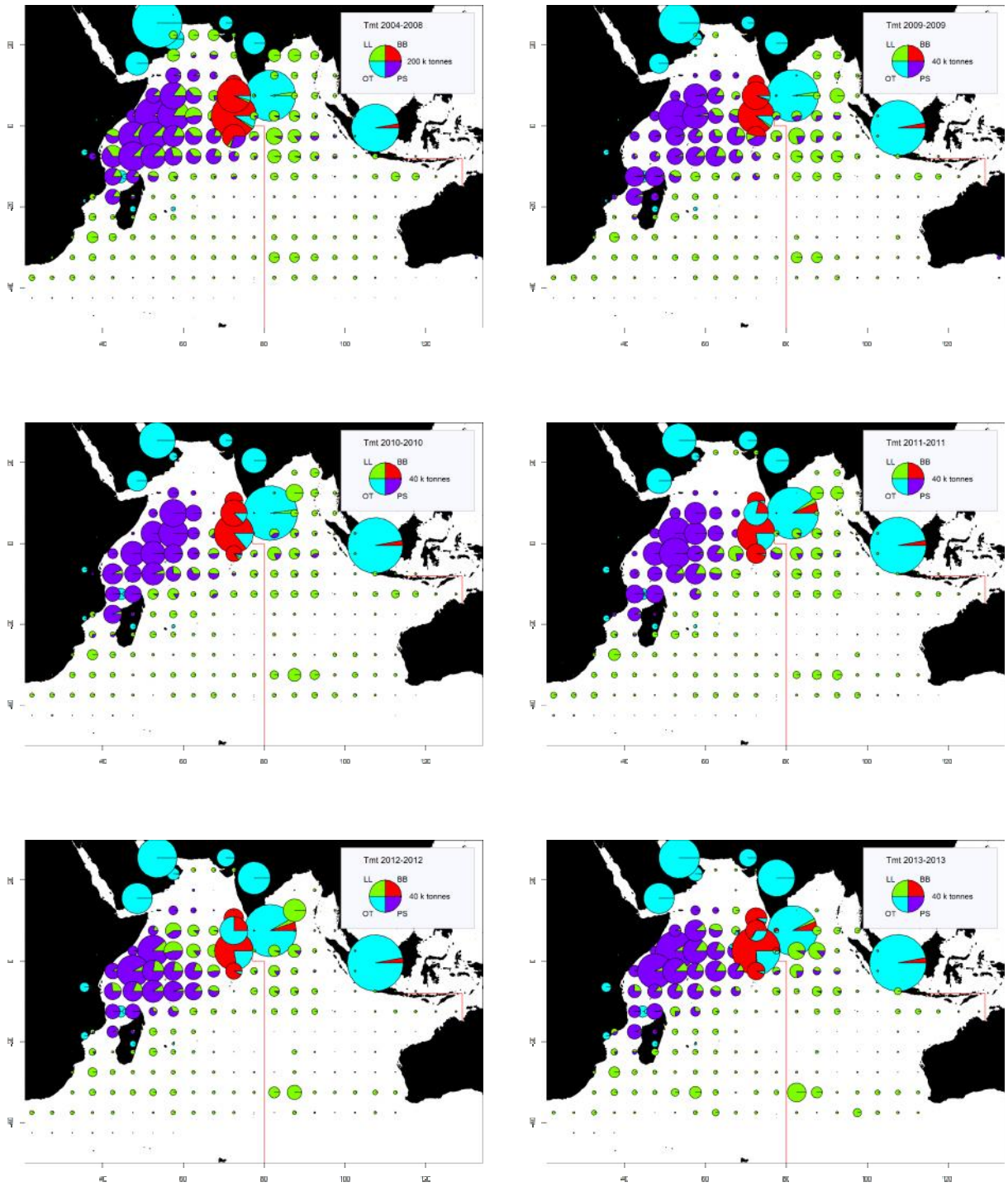
Time-area catches (total combined in tonnes) of major IOTC species (tropical tunas, albacore and swordfish) estimated for 2004-08 and 2009-13, by year and gear:

Longline (LL, bright green): freezing longliners from Japan, Taiwan,China, EU, Seychelles, South Korea, and other fleets.

Purse seine (PS, purple) from EU, Iran, I.R., Japan, Seychelles, Thailand and other fleets.

Pole-and-line (BB, red): baitboat fisheries from Maldives, India, and other countries.

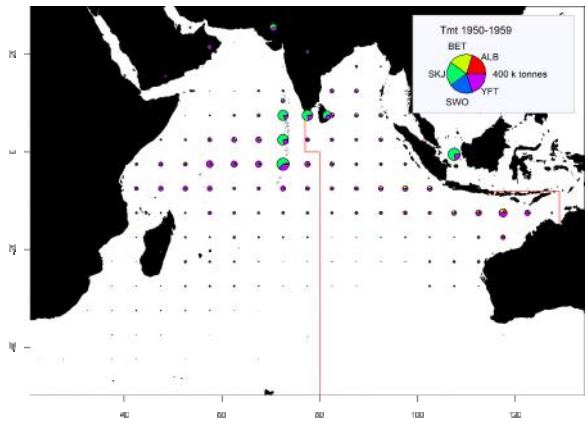
Other fleets (OTHR, blue): other fleets, especially small-scale fisheries operating in coastal waters.

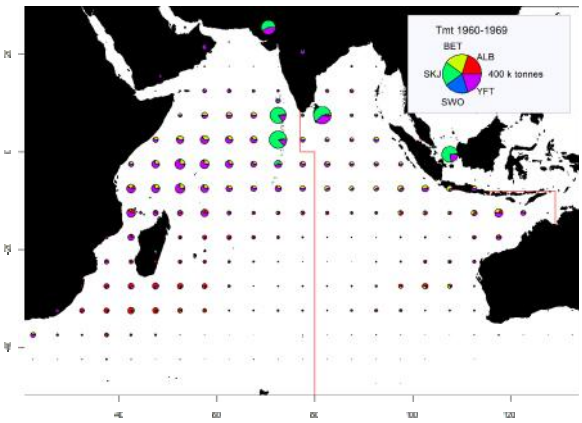


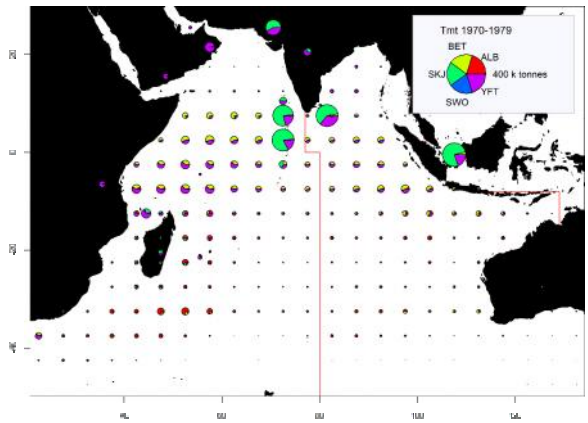
b. Major species: By species

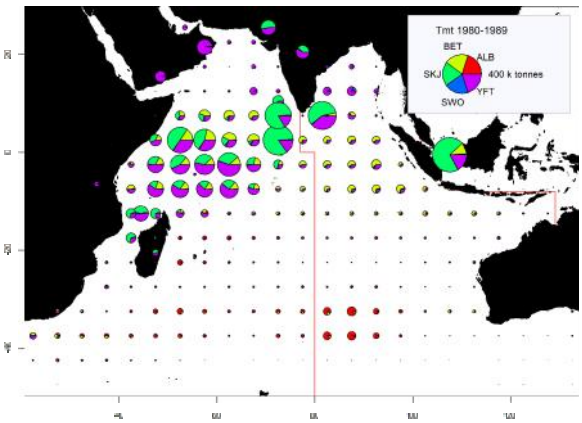
Time-area catches (total combined in tonnes) of major IOTC species (tropical tunas, albacore and swordfish) estimated by species and decade (1950-2009):

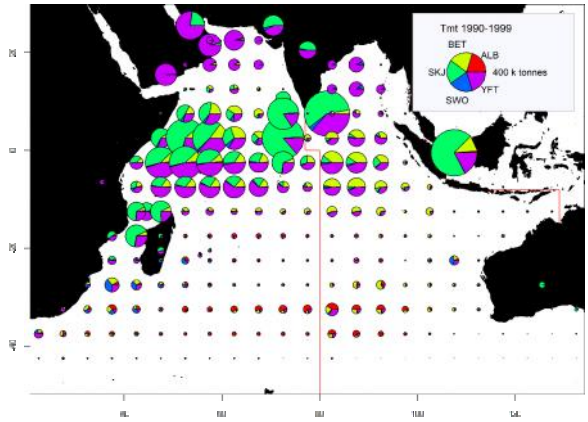
Albacore (ALB, red); **yellowfin tuna** (YFT, purple); **swordfish** (SWO, dark blue); **skipjack tuna** (SKJ, bright green); **bigeye tuna** (BET, light yellow)

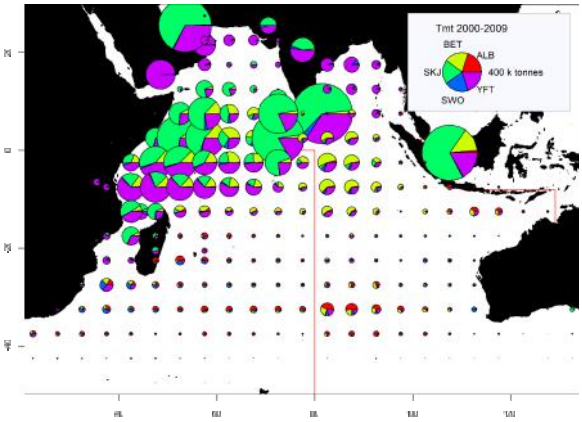






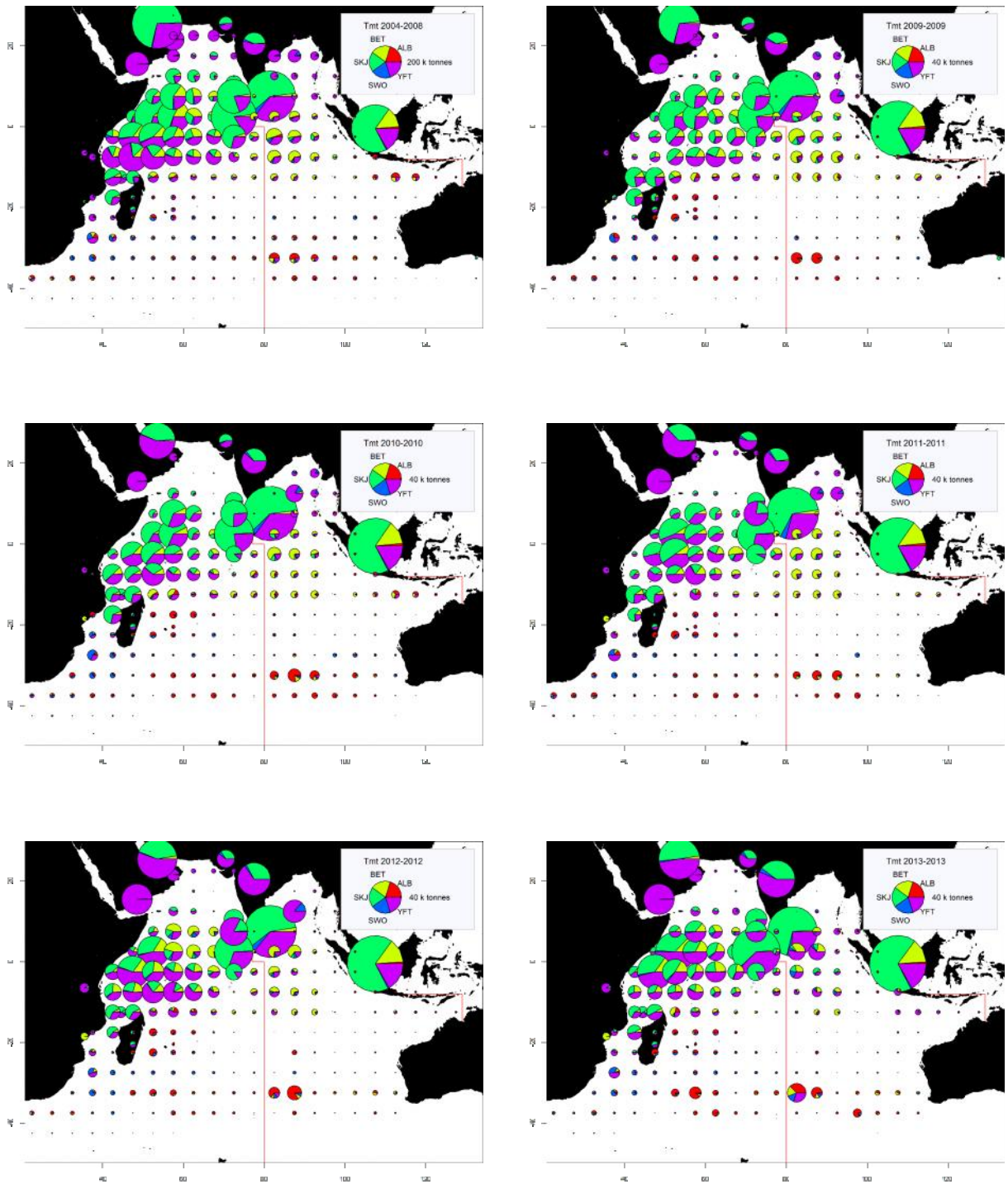






Time-area catches (total combined in tonnes) of major IOTC species (tropical tunas, albacore and swordfish) estimated for 2004-08 and 2009-13, by year and species:

Albacore (ALB, red); **yellowfin tuna** (YFT, purple); **swordfish** (SWO, dark blue); **skipjack tuna** (SKJ, bright green); **bigeye tuna** (BET, light yellow)



c. Yellowfin tuna (YFT): Recent catches

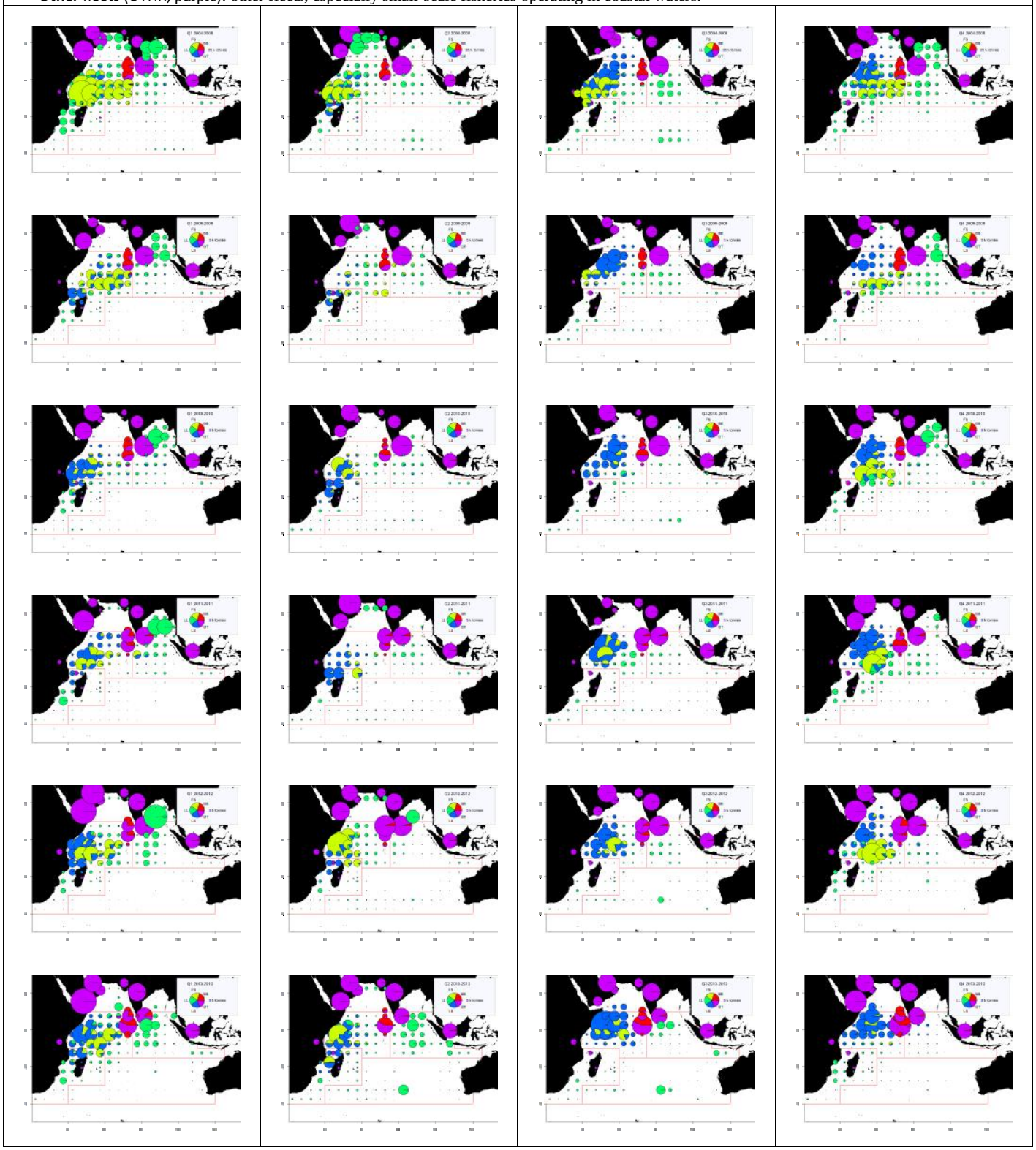
Time-area catches (total combined in tonnes) of YFT estimated for 2004-08 and 2009-13, by year, and quarter:

Longline (LL, bright green): freezing longliners from Japan, Taiwan,China, EU, Seychelles, South Korea, and other fleets.

Purse seiners from EU, Iran, I.R., Japan, Seychelles, Thailand and other fleets, on **free-swimming** (FS, dark yellow) or **associated** (LS, dark blue) schools.

Pole-and-line (BB, red): baitboat fisheries from Maldives, India, and other countries.

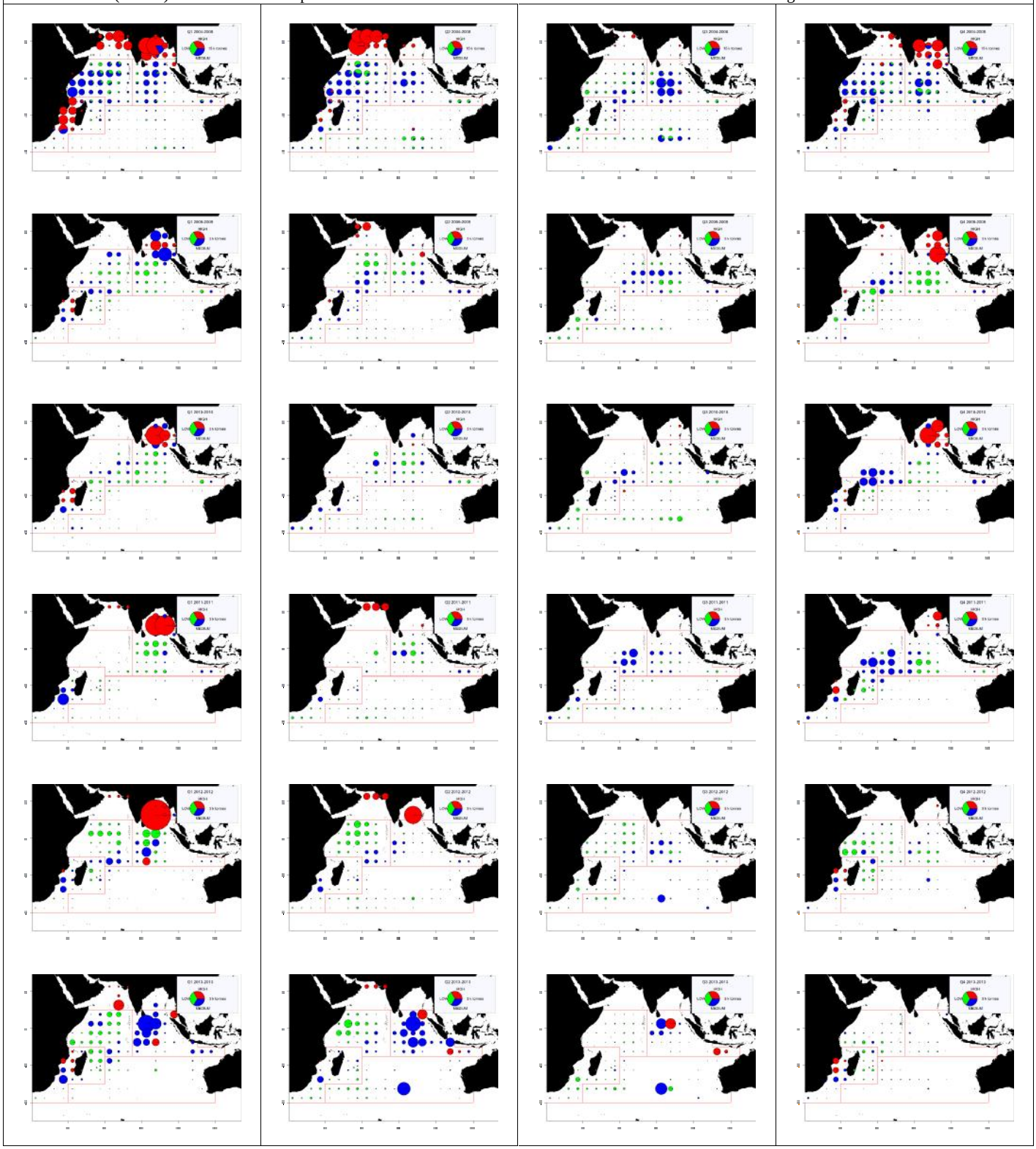
Other fleets (OTHR, purple): other fleets, especially small-scale fisheries operating in coastal waters.



d. Yellowfin tuna (YFT): Main Fishing Areas

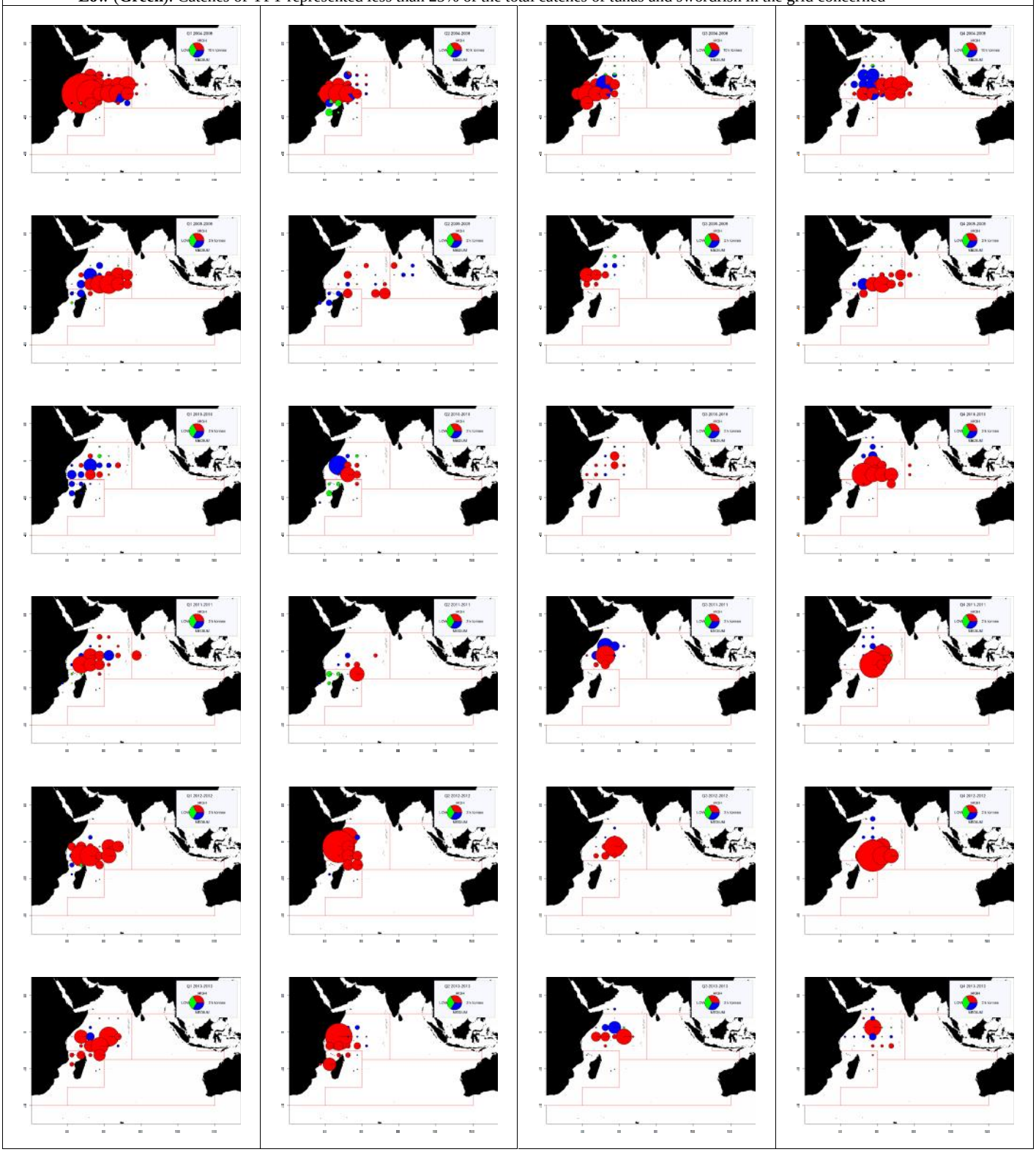
Catches of yellowfin tuna (YFT) taken by longline vessels by year, quarter and 5 degree square grid, for the years 2004-13. The different colors show the proportion that the catches of yellowfin tuna on each quarter and 5 degrees square grid made out of the total catches of tropical tunas, albacore and swordfish over the same area and period:

- **High** (**Red**): Catches of YFT represented 75% or more of the total catches of tunas and swordfish in the grid concerned
- **Medium** (**Blue**): Catches of YFT represented 25-75% of the total catches of tunas and swordfish in the grid concerned
- **Low** (**Green**): Catches of YFT represented less than 25% of the total catches of tunas and swordfish in the grid concerned



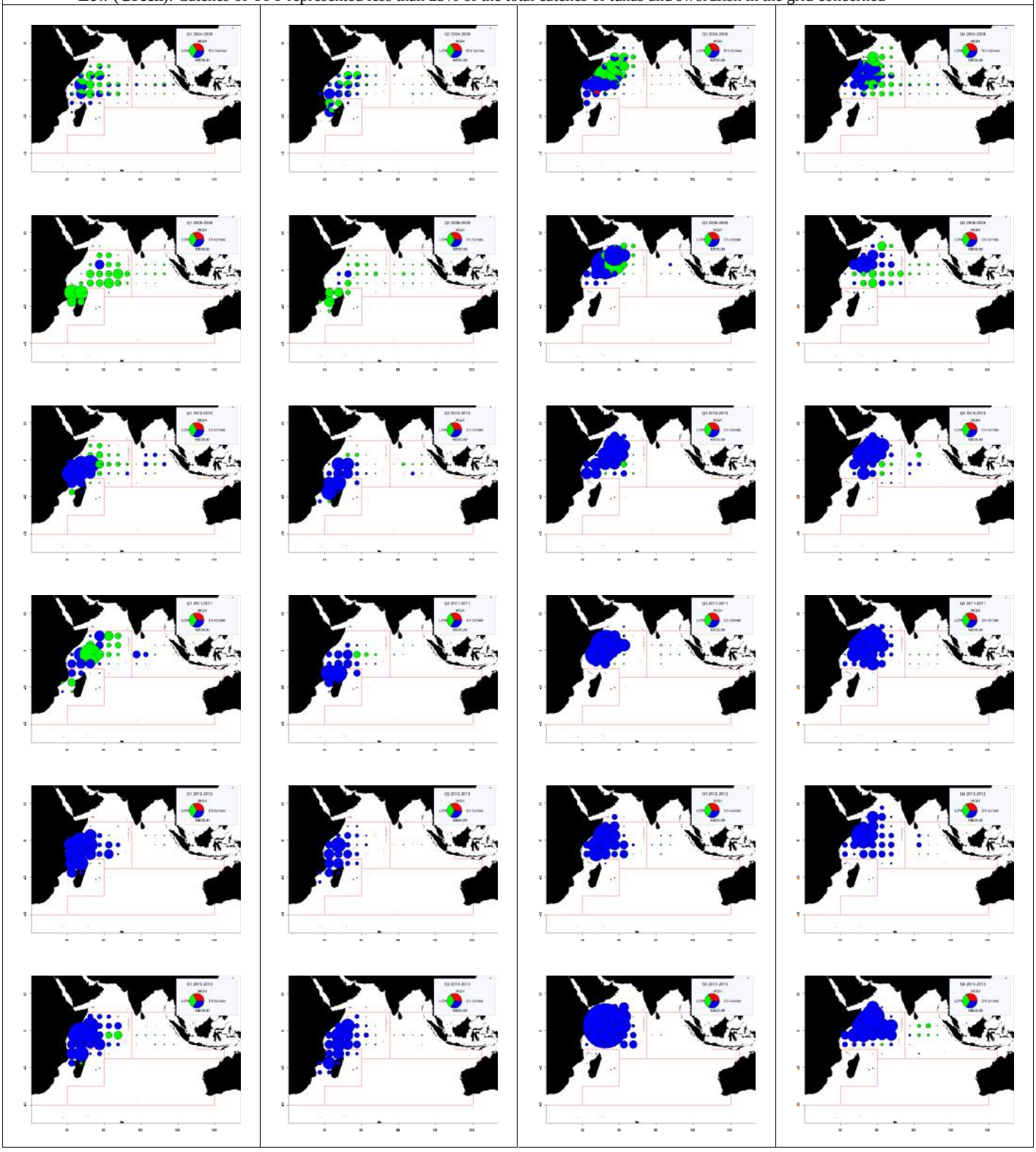
Catches of yellowfin tuna (YFT) taken by purse seine vessels on free swimming schools by year, quarter and 5 degree square grid, for the years 2004-13. The different colors show the proportion that the catches of yellowfin tuna on each quarter and 5 degrees square grid made out of the total catches of tropical tunas, albacore and swordfish over the same area and period:

- **High** (**Red**): Catches of YFT represented 75% or more of the total catches of tunas and swordfish in the grid concerned
- **Medium** (**Blue**): Catches of YFT represented 25-75% of the total catches of tunas and swordfish in the grid concerned
- **Low** (**Green**): Catches of YFT represented less than 25% of the total catches of tunas and swordfish in the grid concerned



Catches of yellowfin tuna (YFT) taken by purse seine vessels on associated schools by year, quarter and 5 degree square grid, for the years 2004-13. The different colors show the proportion that the catches of yellowfin tuna on each quarter and 5 degrees square grid made out of the total catches of tropical tunas, albacore and swordfish over the same area and period:

- **High** (**Red**): Catches of YFT represented 75% or more of the total catches of tunas and swordfish in the grid concerned
- **Medium** (**Blue**): Catches of YFT represented 25-75% of the total catches of tunas and swordfish in the grid concerned
- **Low** (**Green**): Catches of YFT represented less than 25% of the total catches of tunas and swordfish in the grid concerned



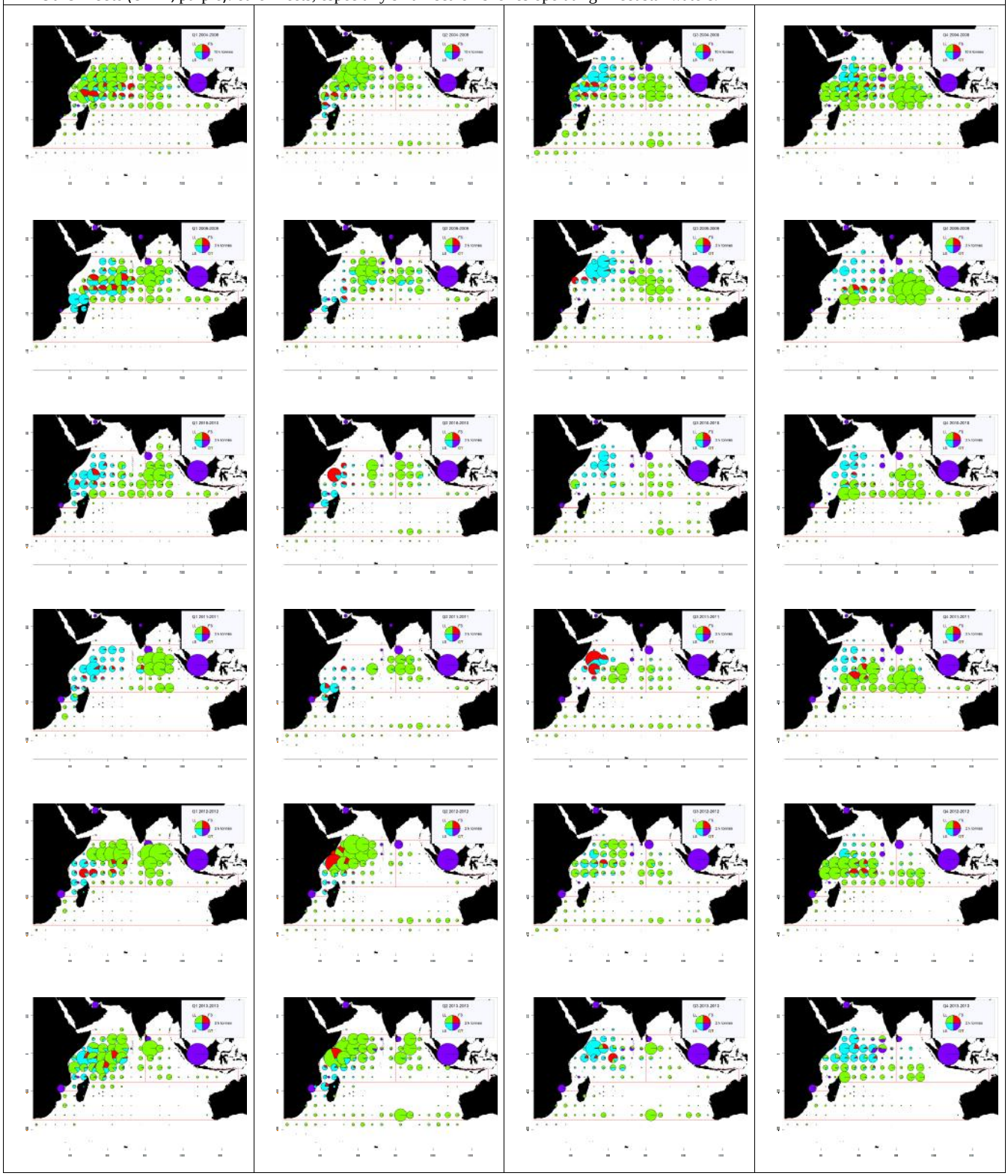
e. Bigeye tuna (BET): Recent catches

Time-area catches (total combined in tonnes) of BET estimated for 2004-08 and 2009-13, by year, and quarter:

Longline (LL, bright green): freezing longliners from Japan, Taiwan,China, EU, Seychelles, South Korea, and other fleets.

Purse seine: industrial tuna purse seiners from EU, Iran, I.R., Japan, Seychelles, Thailand and other fleets, on **free-swimming** (FS, red) or **associated** (LS, light blue) schools.

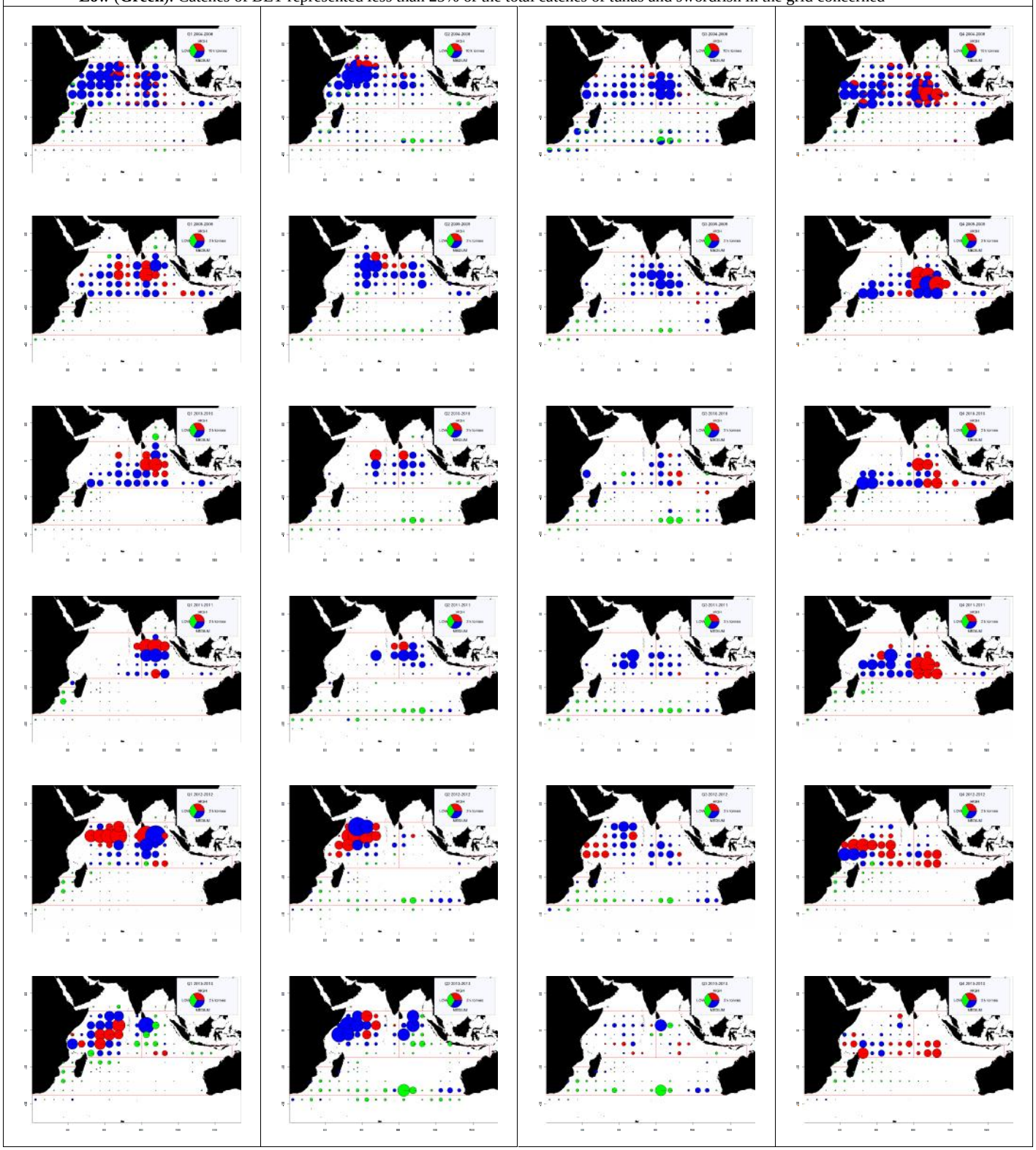
Other fleets (OTHR, purple): other fleets, especially small-scale fisheries operating in coastal waters.



f. Bigeye tuna (BET): Main Fishing Areas

Catches of bigeye tuna (BET) taken by longline vessels by year, quarter and 5 degree square grid, for the years 2004-13. The different colors show the proportion that the catches of yellowfin tuna on each quarter and 5 degrees square grid made out of the total catches of tropical tunas, albacore and swordfish over the same area and period:

- **High** (**Red**): Catches of BET represented 75% or more of the total catches of tunas and swordfish in the grid concerned
- **Medium** (**Blue**): Catches of BET represented 25-75% of the total catches of tunas and swordfish in the grid concerned
- **Low** (**Green**): Catches of BET represented less than 25% of the total catches of tunas and swordfish in the grid concerned



g. Skipjack tuna (SKJ): Recent catches

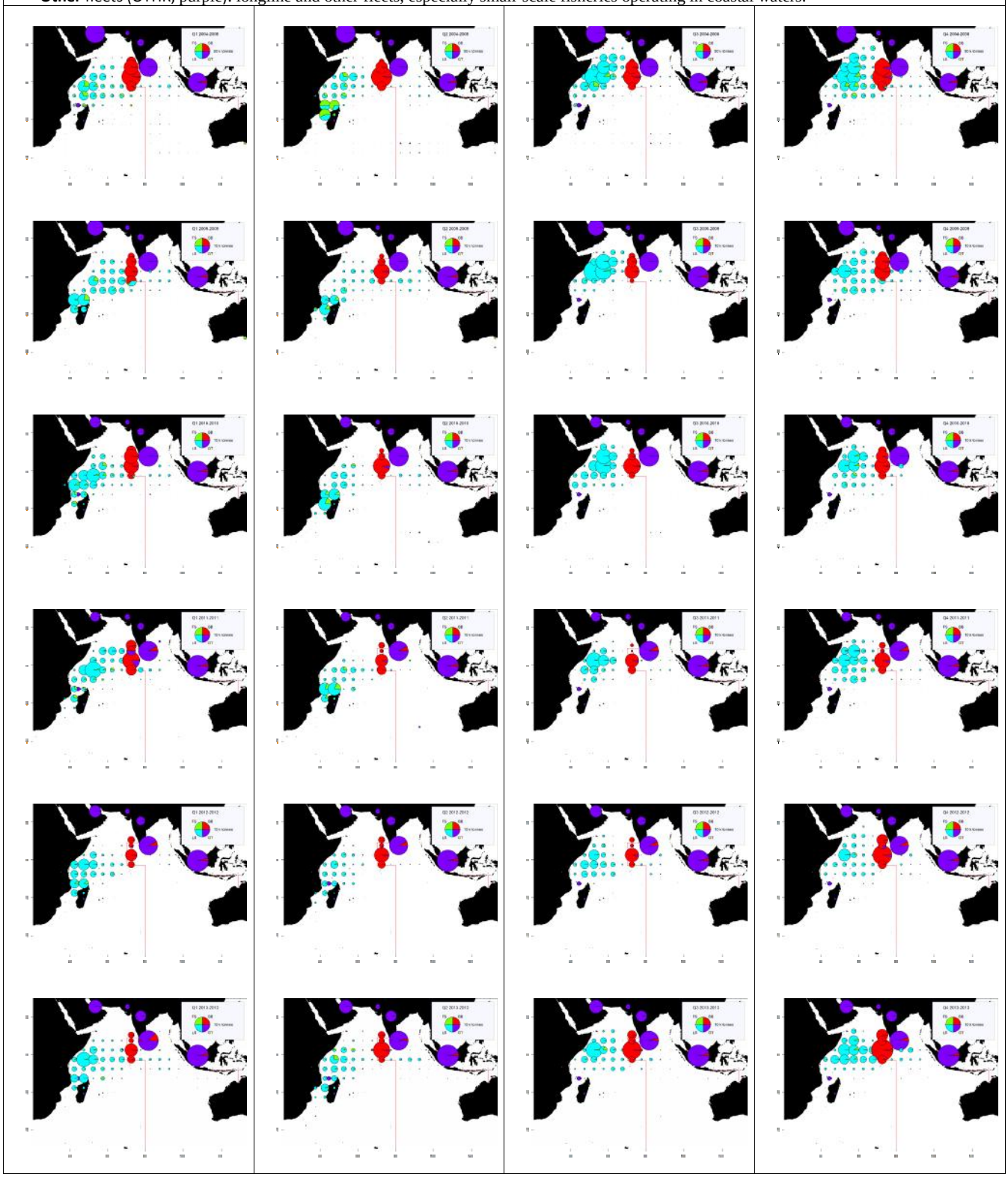
Time-area catches (total combined in tonnes) of SKJ estimated for 2004-08 and 2009-13, by year, and quarter:

Longline (LL, bright green): freezing longliners from Japan, Taiwan,China, EU, Seychelles, South Korea, and other fleets.

Purse seine: industrial tuna purse seiners from EU, Iran, I.R., Japan, Seychelles, Thailand and other fleets, on **free-swimming** (FS, bright green) or **associated** (LS, light blue) schools.

Pole-and-line (BB, red): baitboat fisheries from Maldives, India, and other countries.

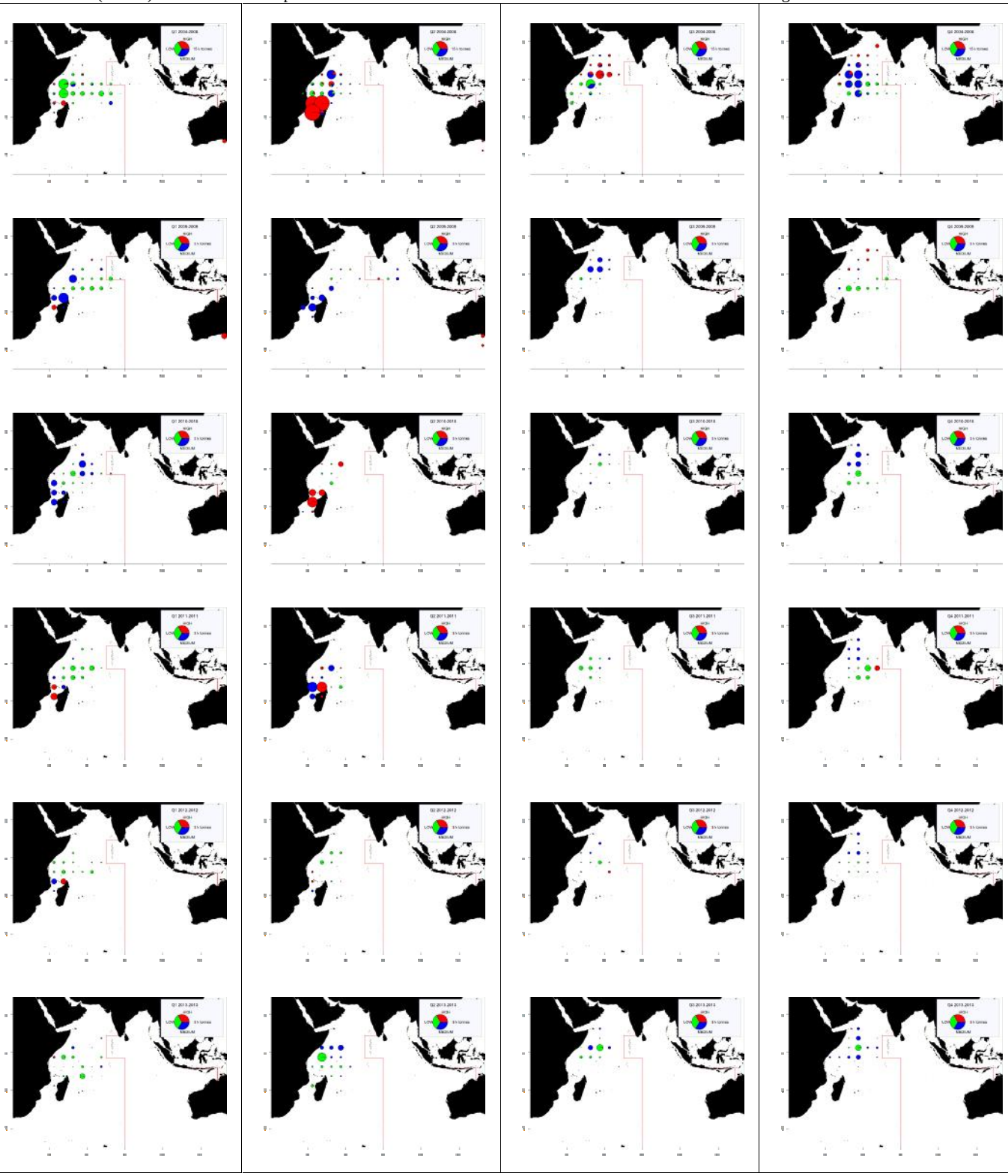
Other fleets (OTHR, purple): longline and other fleets, especially small-scale fisheries operating in coastal waters.



h. Skipjack tuna (SKJ): Main Fishing Areas

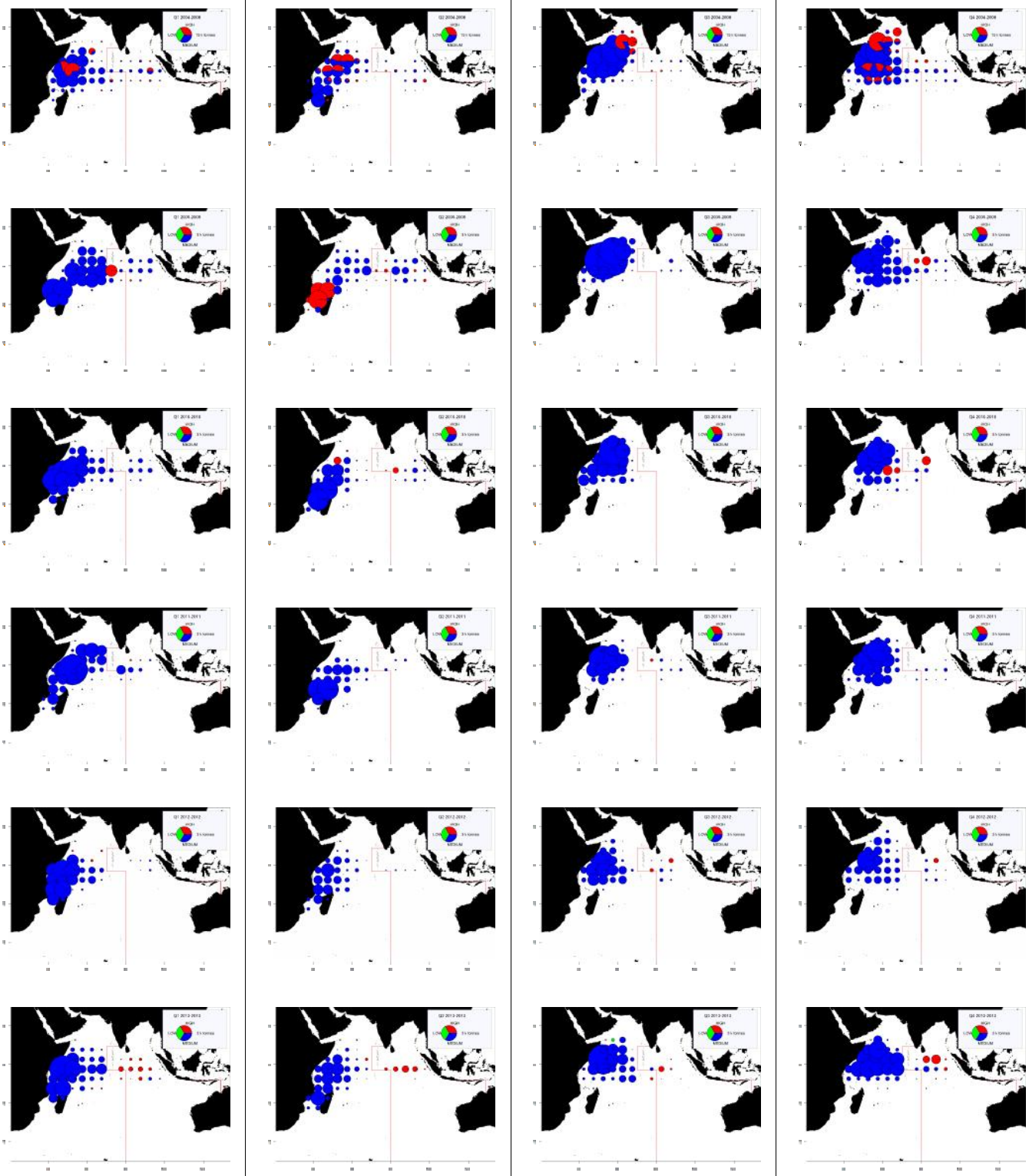
Catches of skipjack tuna (SKJ) taken by purse seine vessels on free swimming schools by year, quarter and 5 degree square grid, for the years 2004-13. The different colors show the proportion that the catches of yellowfin tuna on each quarter and 5 degrees square grid made out of the total catches of tropical tunas, albacore and swordfish over the same area and period:

- **High** (**Red**): Catches of SKJ represented 75% or more of the total catches of tunas and swordfish in the grid concerned
- **Medium** (**Blue**): Catches of SKJ represented 25-75% of the total catches of tunas and swordfish in the grid concerned
- **Low** (**Green**): Catches of SKJ represented less than 25% of the total catches of tunas and swordfish in the grid concerned



Catches of skipjack tuna (SKJ) taken by purse seine vessels on associated schools by year, quarter and 5 degree square grid, for the years 2004-13. The different colors show the proportion that the catches of yellowfin tuna on each quarter and 5 degrees square grid made out of the total catches of tropical tunas, albacore and swordfish over the same area and period:

- **High** (**Red**): Catches of SKJ represented 75% or more of the total catches of tunas and swordfish in the grid concerned
- **Medium** (**Blue**): Catches of SKJ represented 25-75% of the total catches of tunas and swordfish in the grid concerned
- **Low** (**Green**): Catches of SKJ represented less than 25% of the total catches of tunas and swordfish in the grid concerned

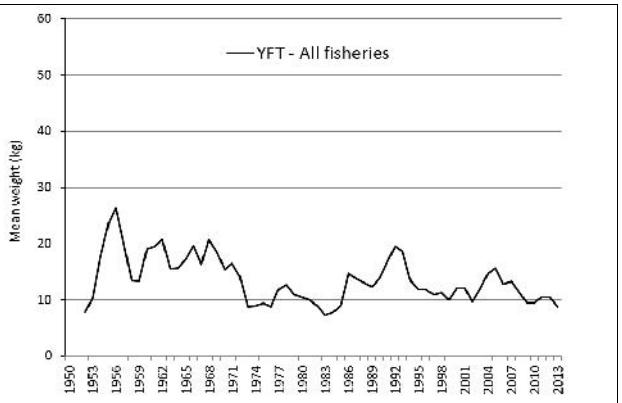


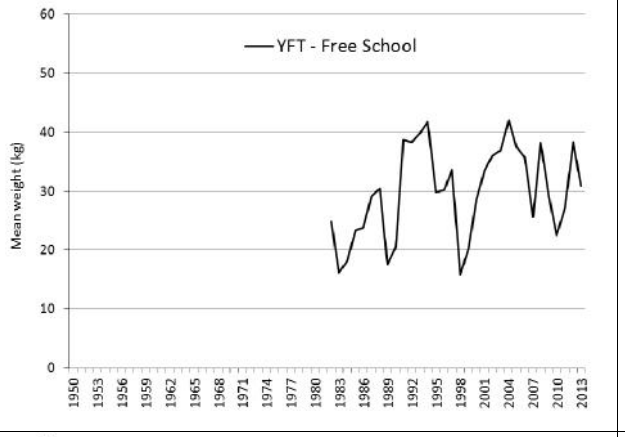
3. AVERAGE WEIGHT

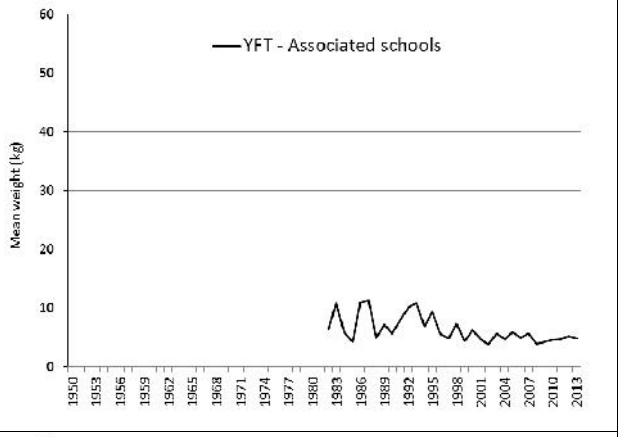
a. Yellowfin tuna (YFT)

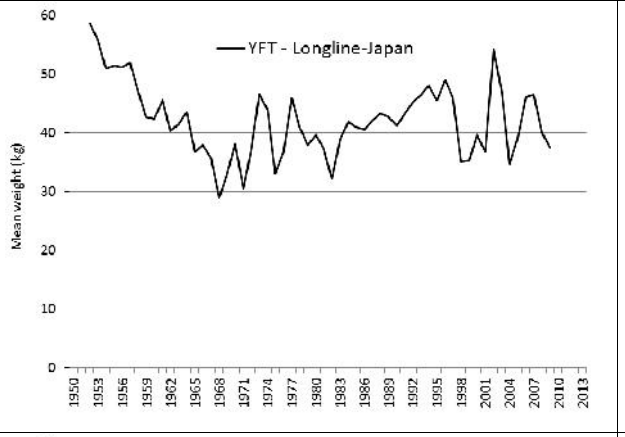
Average weight of yellowfin tuna (YFT) taken by:

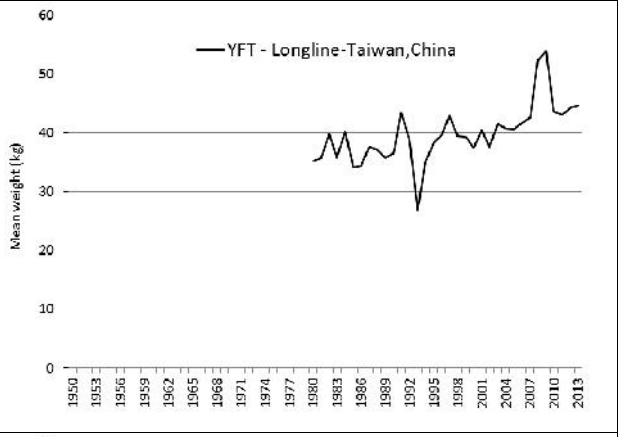
- All fisheries combined (right)
- Purse seine on free (top left) and associated (top right) schools,
- Longlines from Japan (mid left) and Taiwan,China (mid right)
- Pole-and-line from Maldives and India (bottom left)
- Gillnets from Sri Lanka, Iran, and other countries (bottom right)

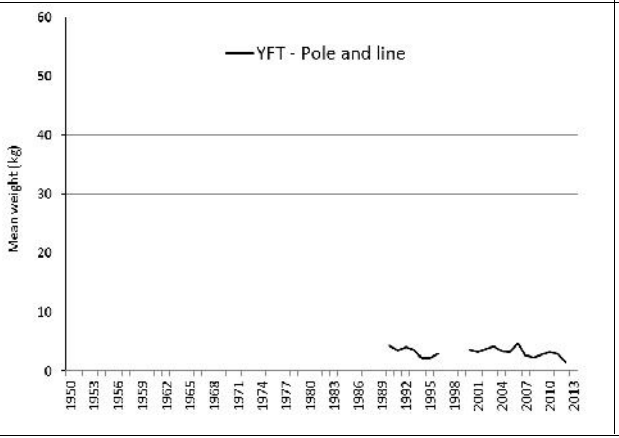


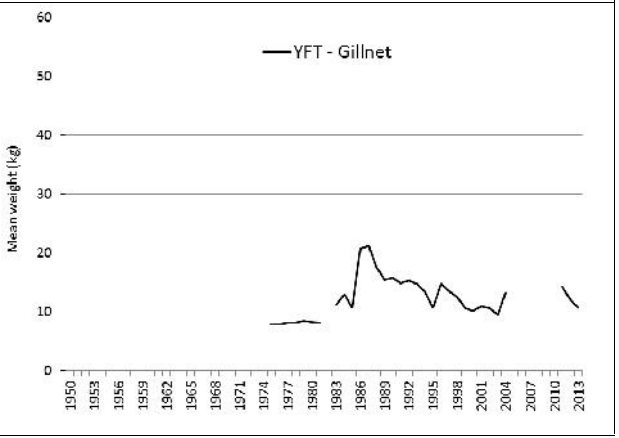




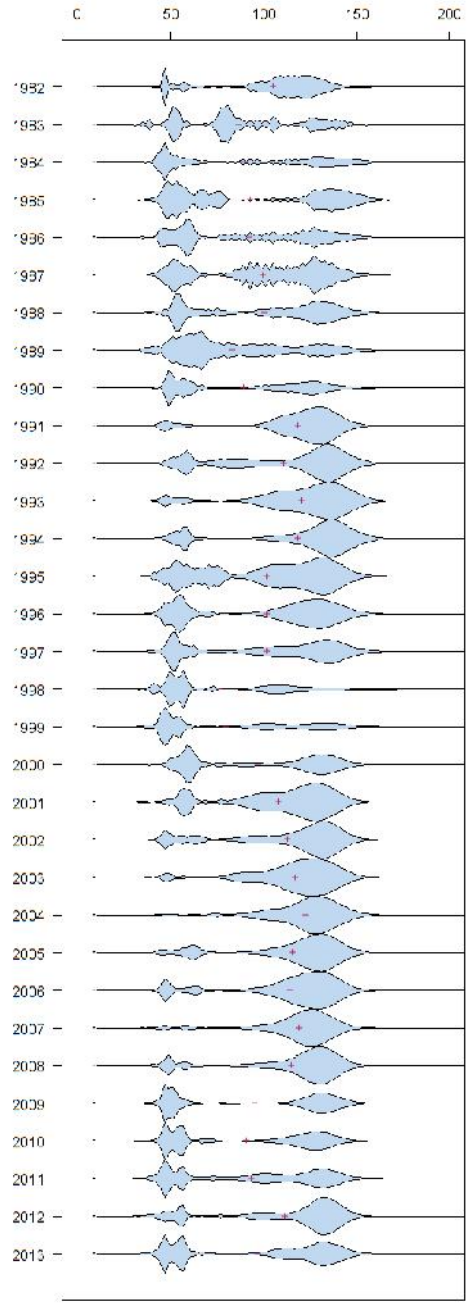




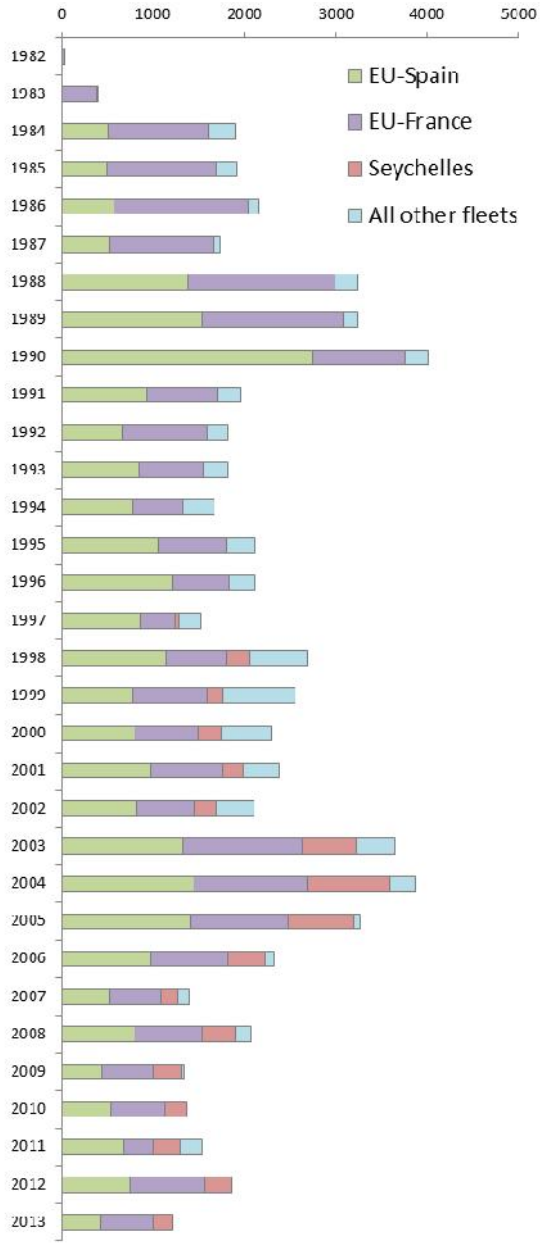




YFT (PS FS): size (in cm)

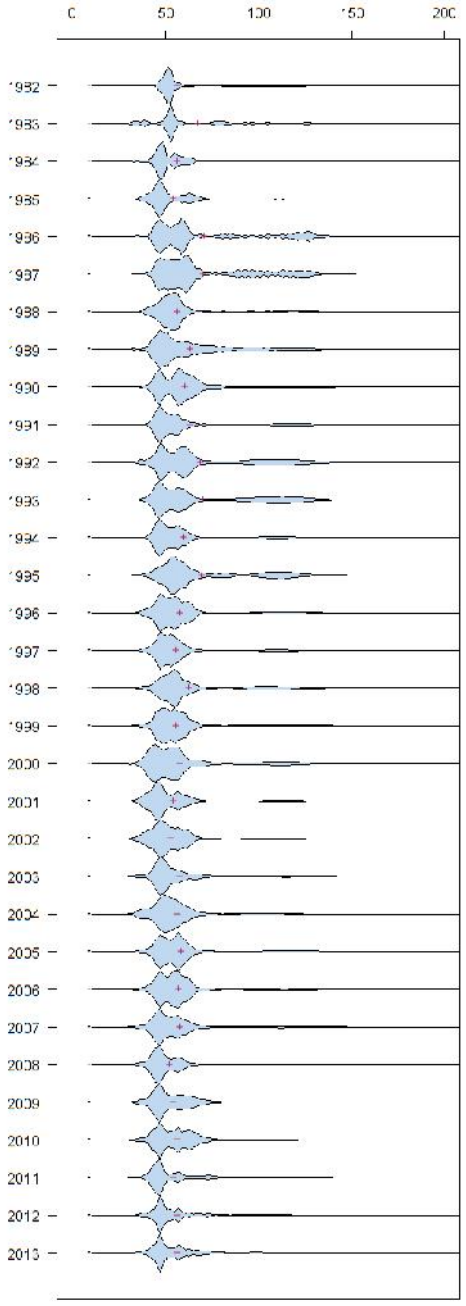


YFT (PS FS): no. of specimens ('000)
(raised to total catch)

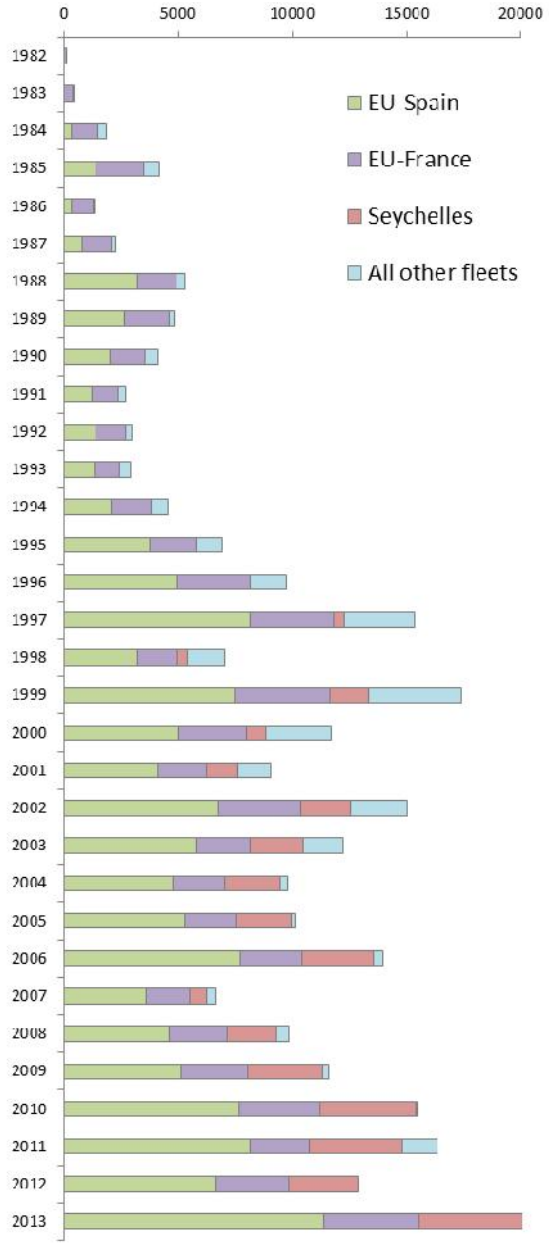


Yellowfin tuna (PS Free school): **Left:** length frequency distributions for PS Free school fisheries (total amount of fish measured by 2 cm length class) derived from data available at the IOTC Secretariat. **Right**: Number of yellowfin tuna specimens sampled for lengths (raised to total catch), by fleet (PS Free school only).

YFT (PS LS): size (in cm)

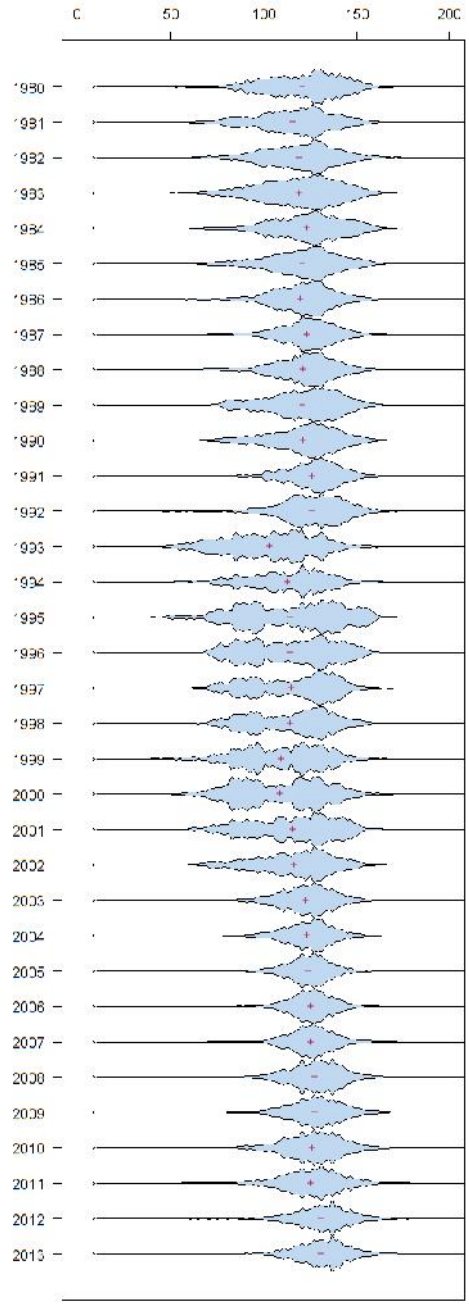


YFT (PS LS): no. of specimens ('000)
(raised to total catch)

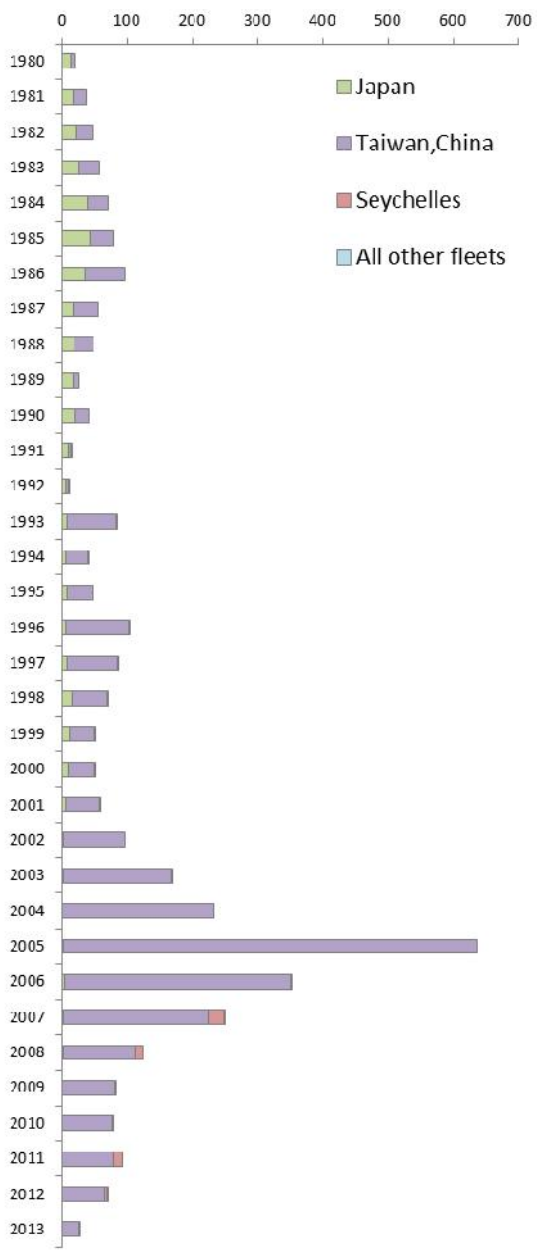


Yellowfin tuna (PS Associated school): **Left:** length frequency distributions for PS Associated school fisheries (total amount of fish measured by 2 cm length class) derived from data available at the IOTC Secretariat. **Right**: Number of yellowfin tuna specimens sampled for lengths (raised to total catch), by fleet (PS Associated school only).

YFT (LL samples): size (in cm)



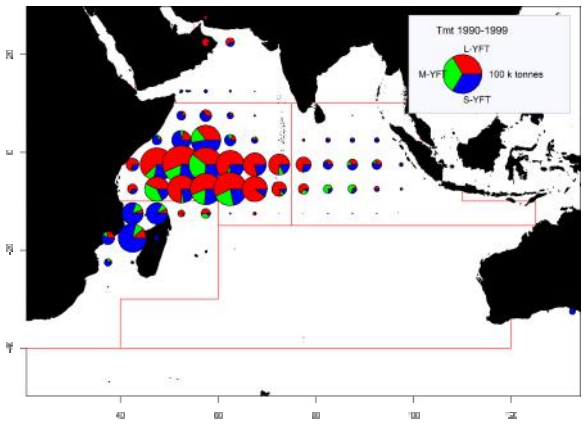
YFT (LL): no. of samples ('000)

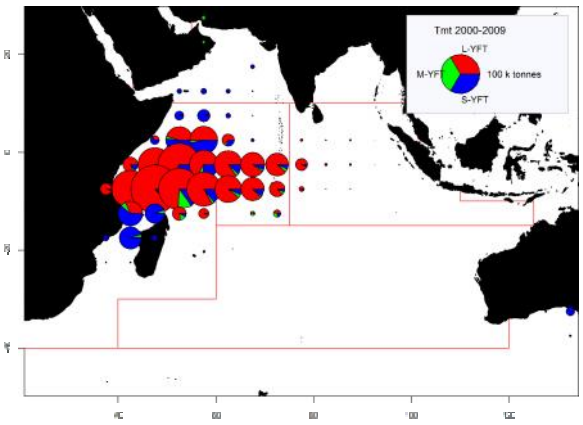


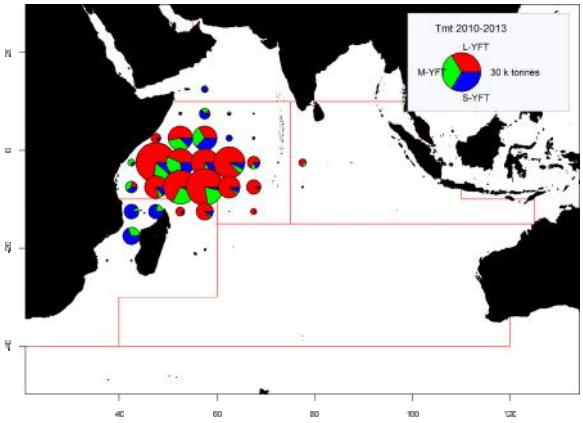
Yellowfin tuna (longline): **Left:** length frequency distributions for longline fisheries (total amount of fish measured by 2 cm length class) derived from data available at the IOTC Secretariat. **Right**: Number of yellowfin tuna specimens sampled for lengths, by fleet (longline only).

Catches (in metric tons) of yellowfin tuna (YFT) for the purse seine fishery on free-swimming schools for three different periods and types of weight:

- **S-YFT** (blue): Catches from strata in which the average weight estimated from the CAS is lower than 10kg
- **M-YFT** (green): Catches from strata in which the average weight estimated from the CAS is between 10kg and 30kg
- **L-YFT** (red): Catches from strata in which the average weight estimated from the CAS is 30kg or greater



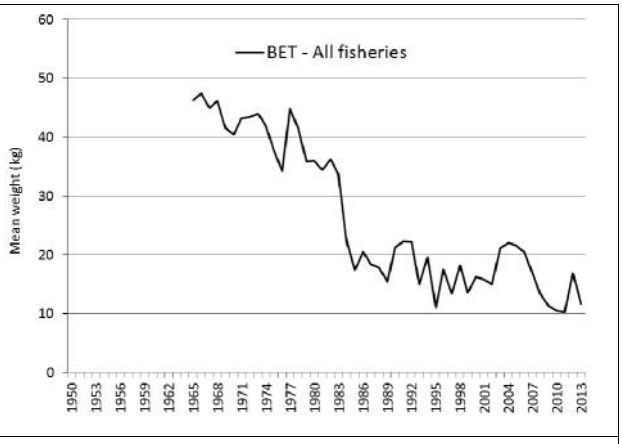


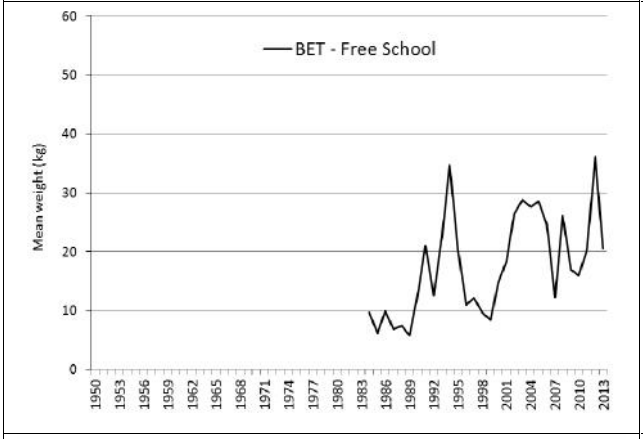


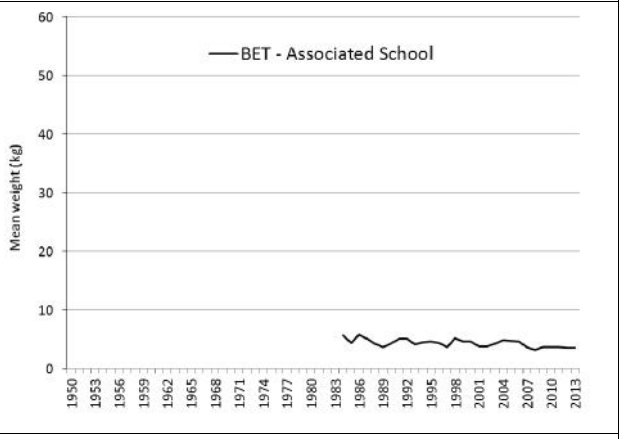
b. Bigeye tuna (BET)

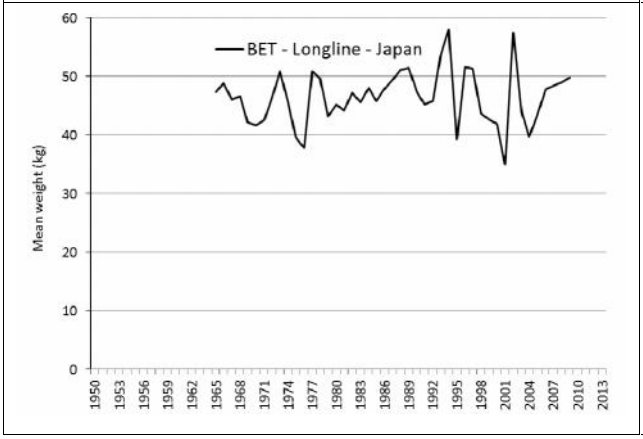
Average weight of bigeye tuna (BET) taken by:

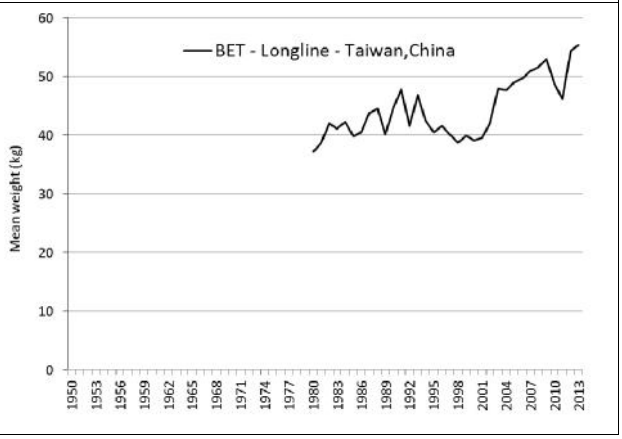
- All fisheries combined (right)
- Purse seine on free (top left) and associated (top right) schools,
- Longlines from Japan (botom left) and Taiwan,China (bottom right)



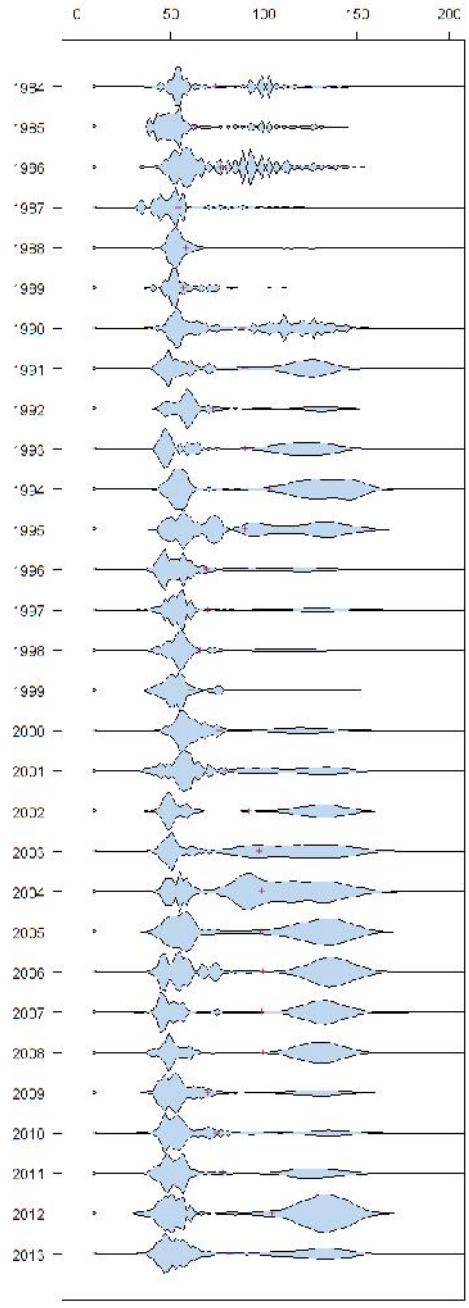




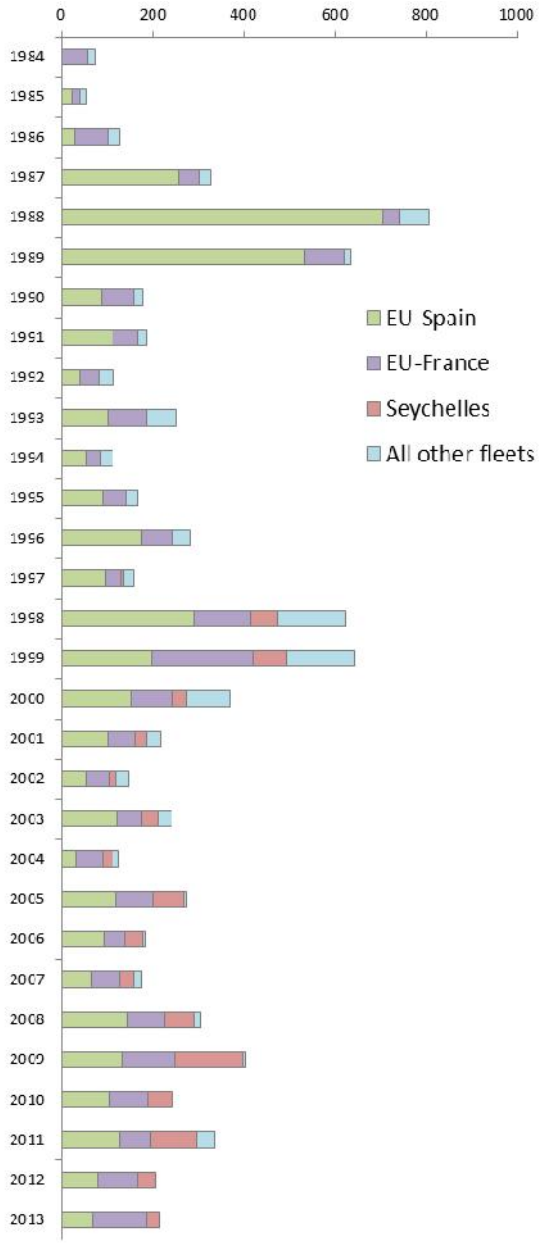




BET (PS FS): size (in cm)

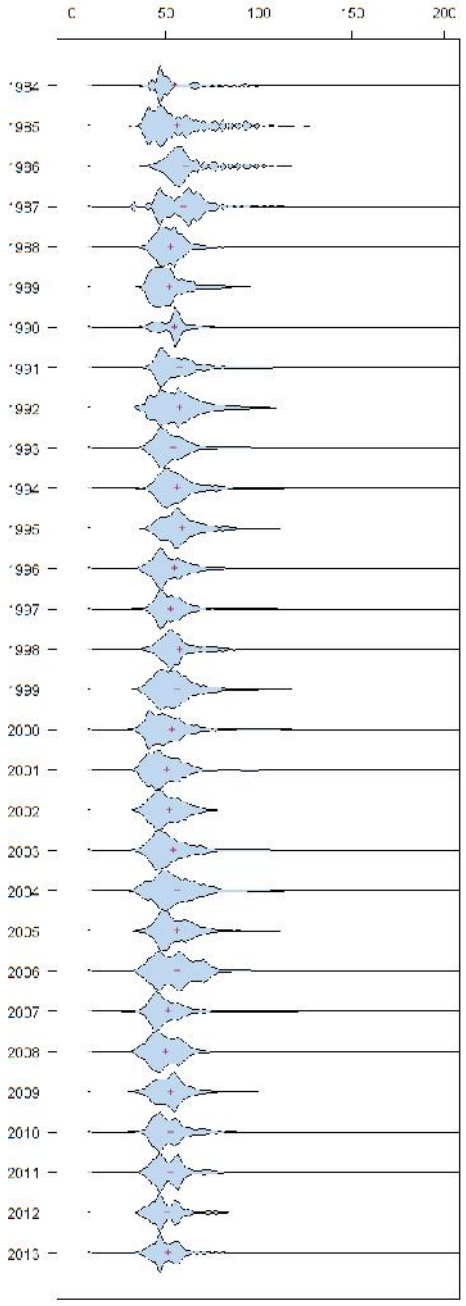


BET (PS FS): no. of specimens ('000)
(raised to total catch)

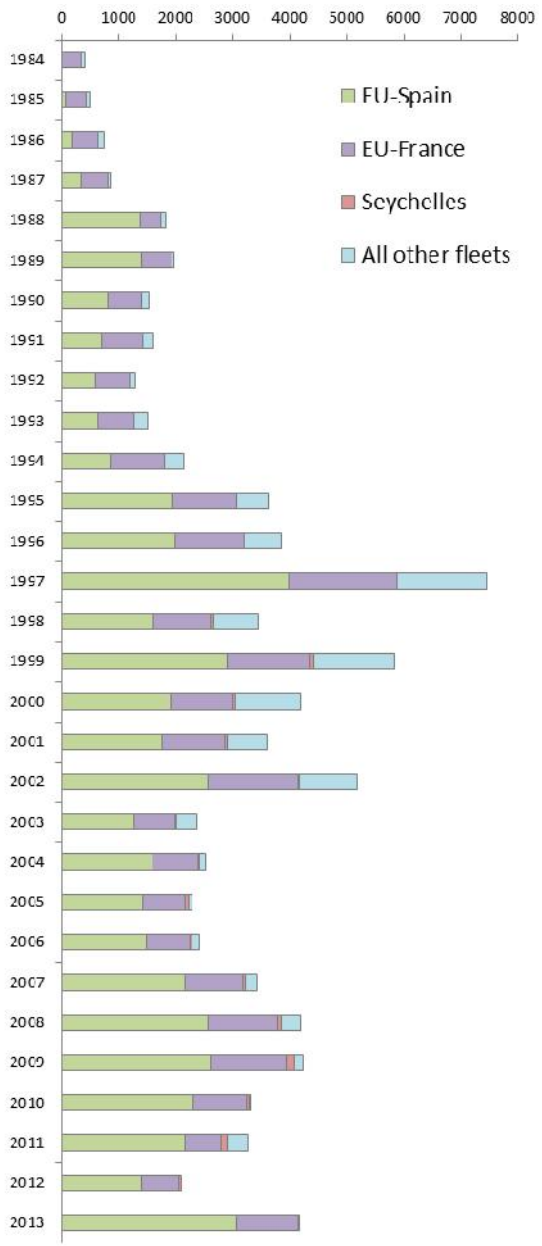


Bigeye tuna (PS Free school): **Left:** length frequency distributions for PS Free School fisheries (total amount of fish measured by 2 cm length class) derived from data available at the IOTC Secretariat. **Right**: Number of bigeye tuna specimens sampled for lengths (raised to total catch), by fleet (PS Free School only).

BET (PS LS): size (in cm)

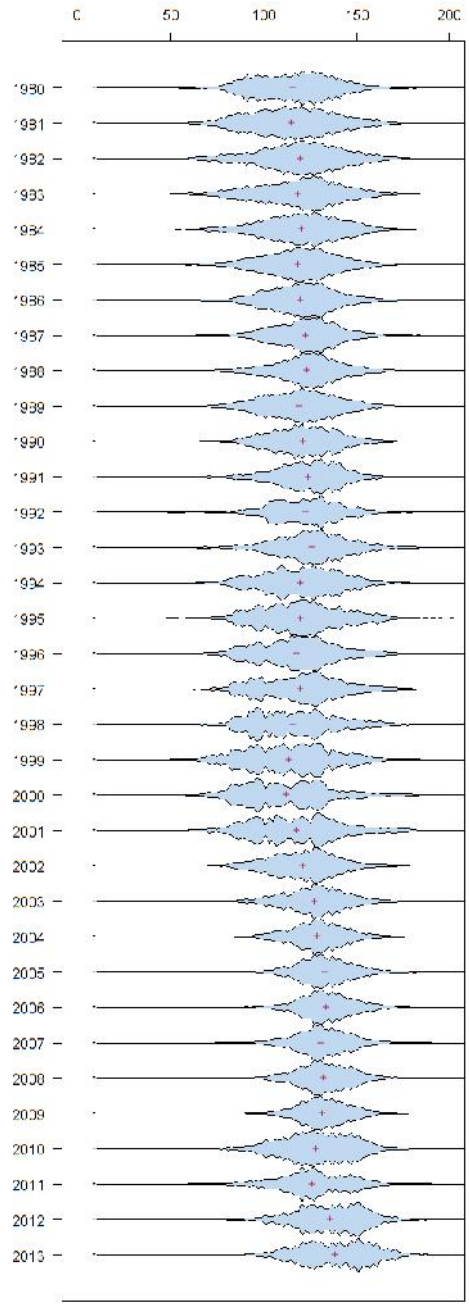


BET (PS LS): no. of specimens ('000) (raised to total catch)

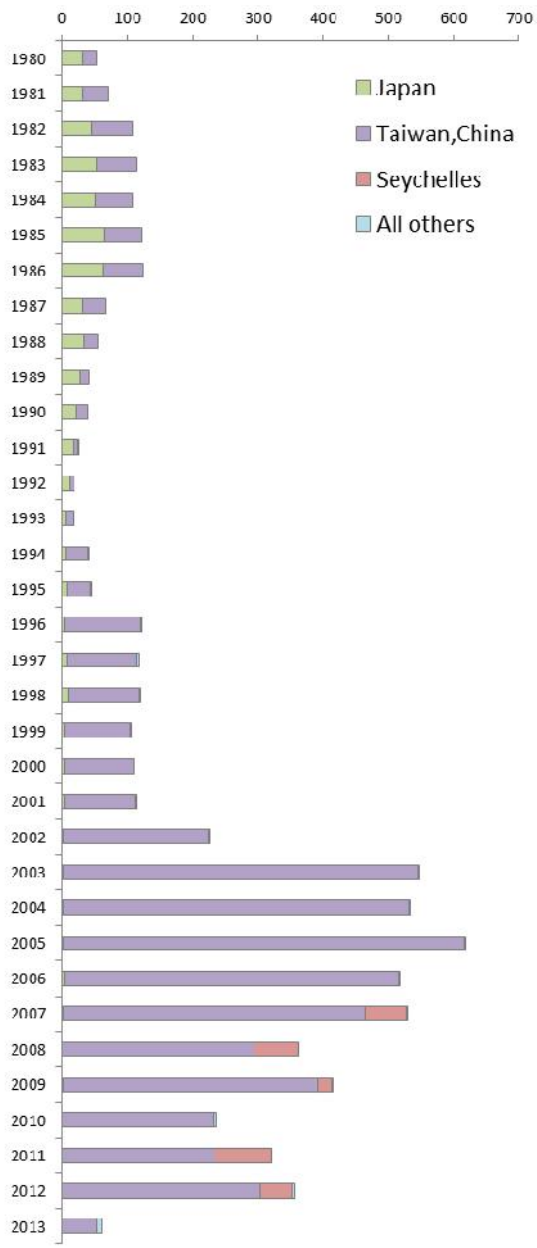


Bigeye tuna (PS Associated school): **Left:** length frequency distributions for PS Associated school fisheries (total amount of fish measured by 2 cm length class) derived from data available at the IOTC Secretariat. **Right**: Number of bigeye tuna specimens sampled for lengths (raised to total catch), by fleet (PS Associated school only).

BET (LL samples): size (in cm)



BET (LL): no. of samples ('000)

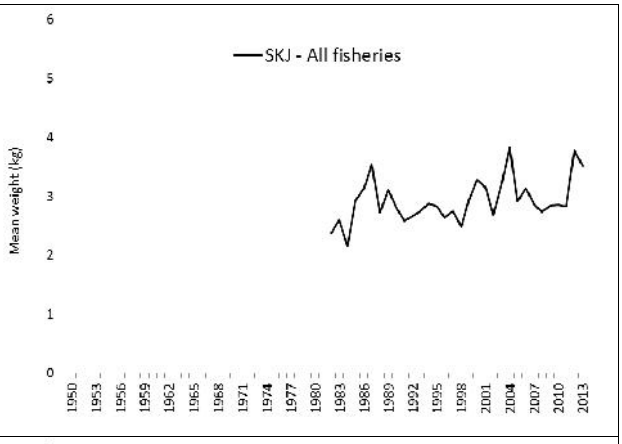


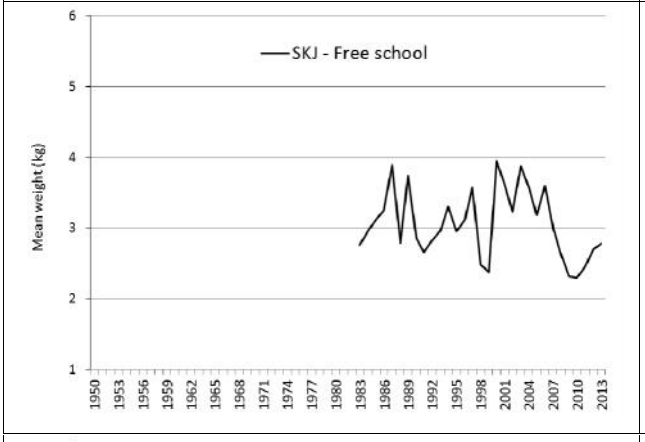
Bigeye tuna (longline): **Left:** length frequency distributions for longline fisheries (total amount of fish measured by 2 cm length class) derived from data available at the IOTC Secretariat. **Right**: Number of bigeye tuna specimens sampled for lengths, by fleet (longline only).

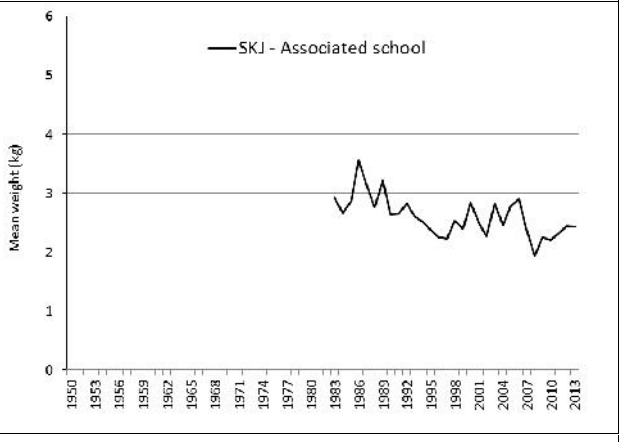
c. Skipjack tuna (SKJ)

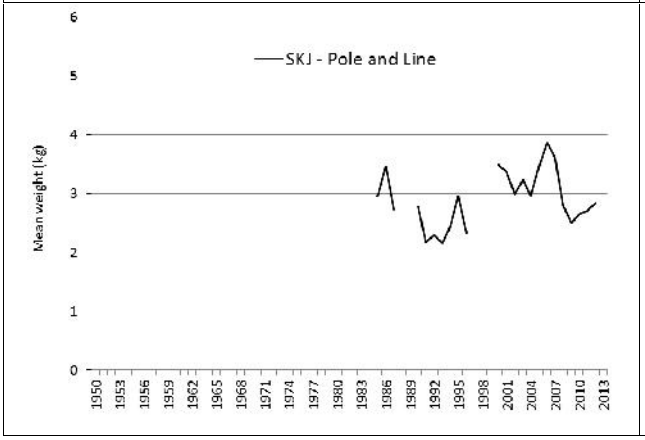
Average weight of skipjack tuna (SKJ) taken by:

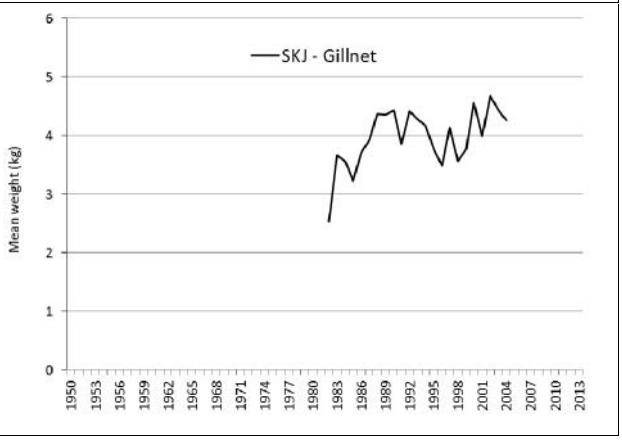
- All fleets combined (right)
- Purse seine on free (top left) and associated (top right) schools,
- Pole-and-line from Maldives and India (bottom left)
- Gillnets from Sri Lanka, Iran, and other countries (bottom right)



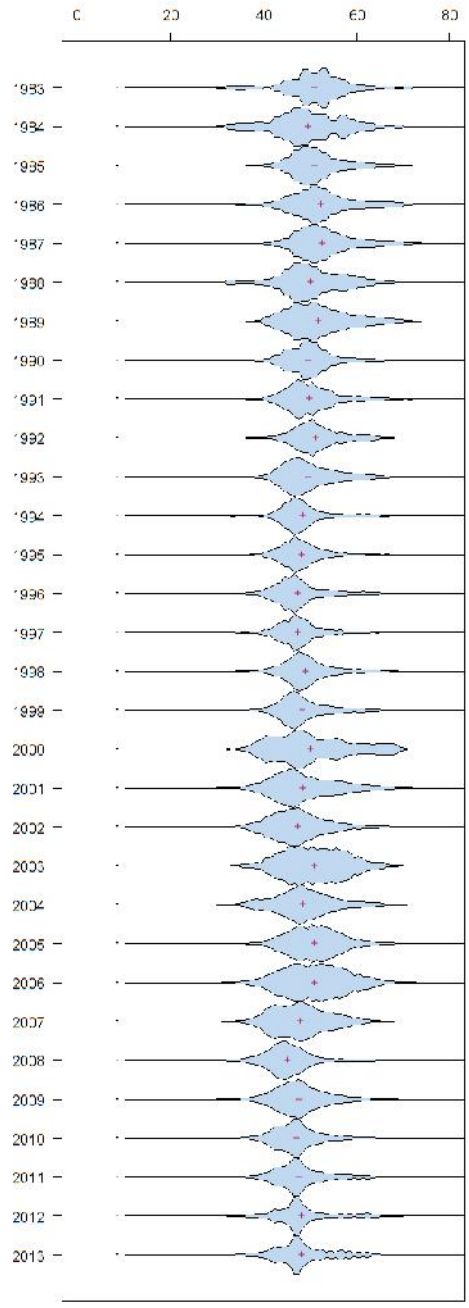




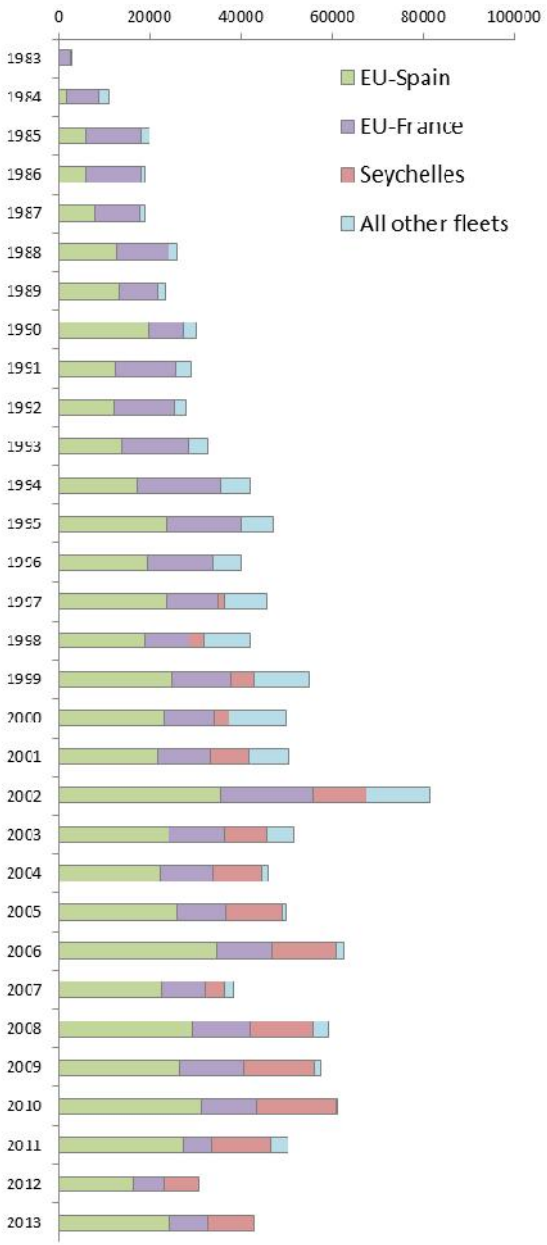




SKJ (PS LS): size (in cm)

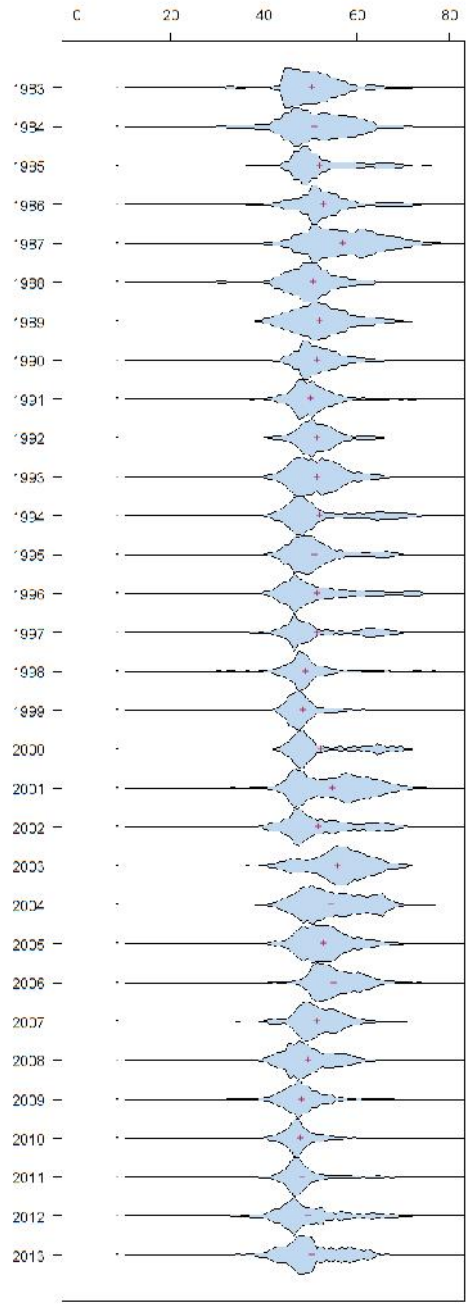


SKJ (PS LS): no. of specimens ('000)
(raised to total catch)

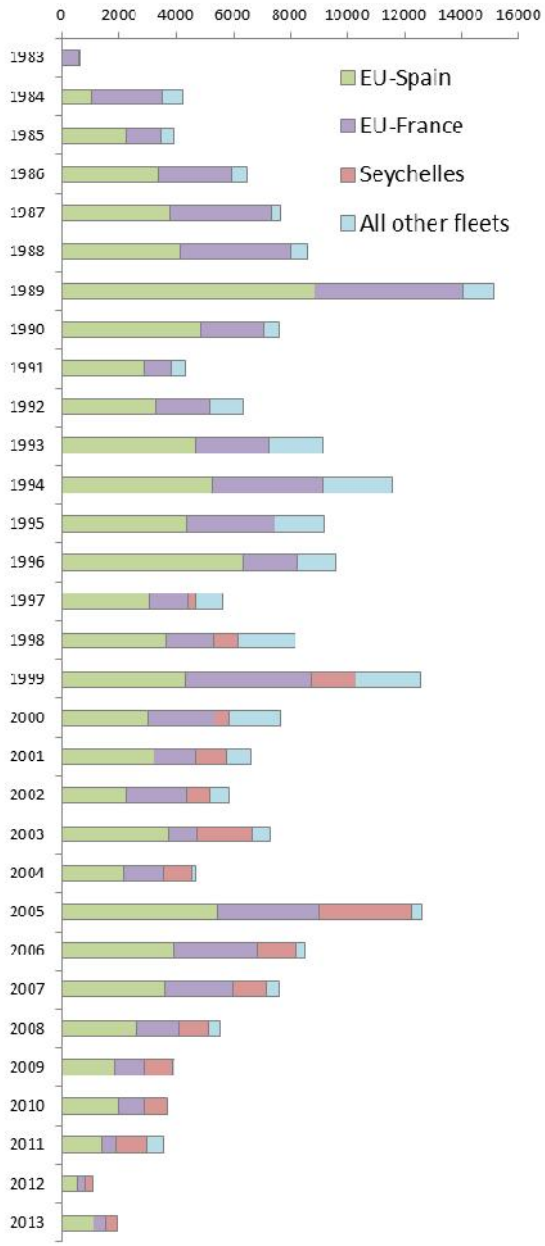


Skipjack tuna (PS Associated school): **Left:** length frequency distributions for PS Associated school fisheries (total amount of fish measured by 1 cm length class) derived from data available at the IOTC Secretariat. **Right**: Number of skipjack tuna specimens sampled for lengths (raised to total catch), by fleet (PS Associated school only).

SKJ (PS FS): size (in cm)



SKJ (PS FS): no. of specimens ('000)
(raised to total catch)



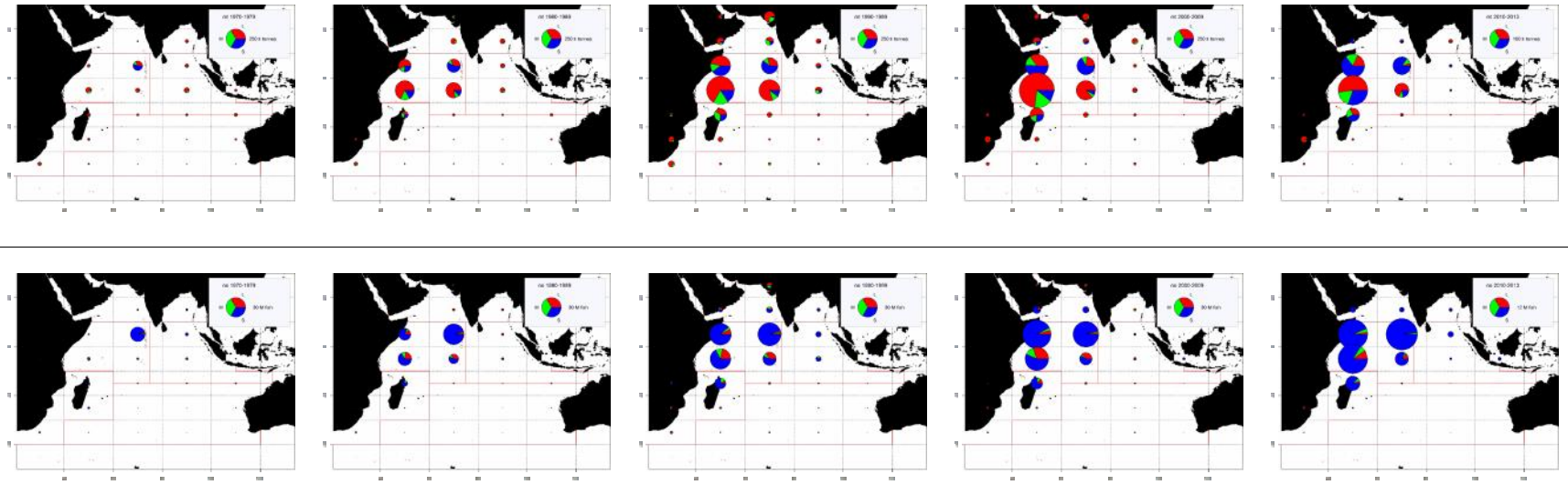
Skipjack tuna (PS Free school): **Left:** length frequency distributions for PS Free school fisheries (total amount of fish measured by 1 cm length class) derived from data available at the IOTC Secretariat. **Right**: Number of skipjack tuna specimens sampled for lengths (raised to total catch), by fleet (PS Free school only).

4. CATCH PER SIZE CLASS

a. Yellowfin tuna (YFT)

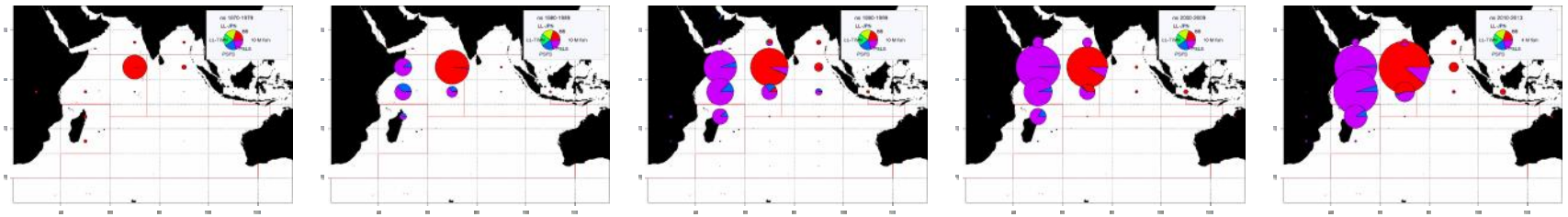
Total catches of YELLOWFIN TUNA (YFT) in weight (top) and number (bottom) derived from the catch-at-size of surface (purse seine and pole-and-line) and longline fisheries for 1970-2009, by decade, and 2010-13. Catches are presented by 10 latitude by 20 longitude area and size class, including:

- **Large size** (**Red**): Catches of YFT for which the weight estimated is 30kg or greater
- **Medium size** (**Green**): Catches of YFT for which the weight estimated is between 15kg and 30kg
- **Small size** (**Blue**): Catches of YFT for which the weight estimated is under 15kg



Total catches of yellowfin tuna (YFT) of very small size (under 5kg), in number, derived from the catch-at-size of surface (purse seine and pole-and-line) and longline fisheries for 1970-2009, by decade, and 2010-12. Catches are presented by 10 latitude by 20 longitude area and size class, including:

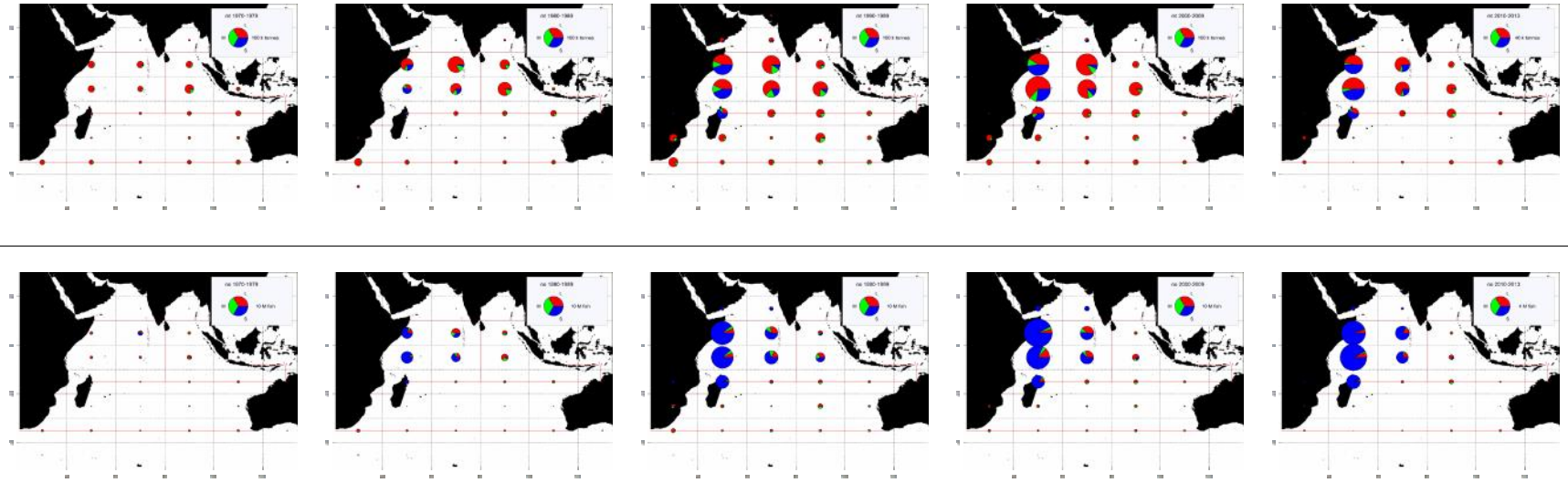
- **BB** (**Red**): Pole-and-line fisheries (Maldives and India)
- **PSLS** (**Purple**): Industrial purse seiners on associated schools (e.g. FAD)
- **PSFS** (**Light blue**): Industrial purse seiners on free-swimming schools
- **LL** (**Green**): Industrial longline fisheries



b. Bigeye tuna (BET)

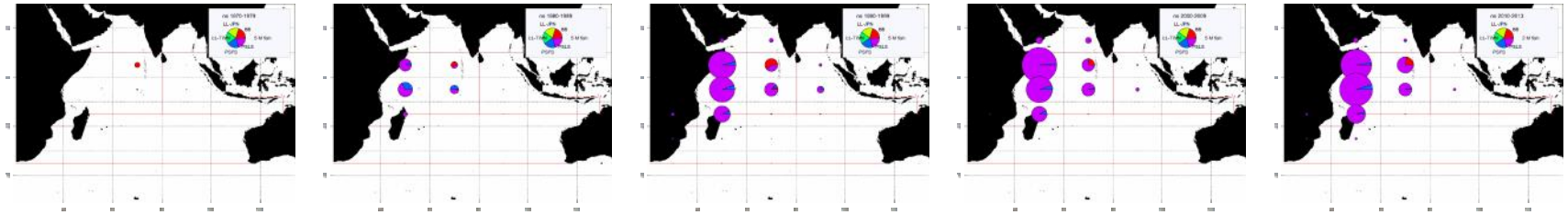
Total catches of BIGEYE TUNA (BET) in weight (top) and number (bottom) derived from the catch-at-size of surface (purse seine and pole-and-line) and longline fisheries for 1970-2009, by decade, and 2010-13. Catches are presented by 10 latitude by 20 longitude area and size class, including:

- **Large size** (**Red**): Catches of BET for which the weight estimated is 30kg or greater
- **Medium size** (**Green**): Catches of BET for which the weight estimated is between 15kg and 30kg
- **Small size** (**Blue**): Catches of BET for which the weight estimated is under 15kg



Total catches of bigeye tuna (BET) of very small size (under 5kg), in number, derived from the catch-at-size of surface (purse seine and pole-and-line) and longline fisheries for 1970-2009, by decade, and 2010-12. Catches are presented by 10 latitude by 20 longitude area and size class, including:

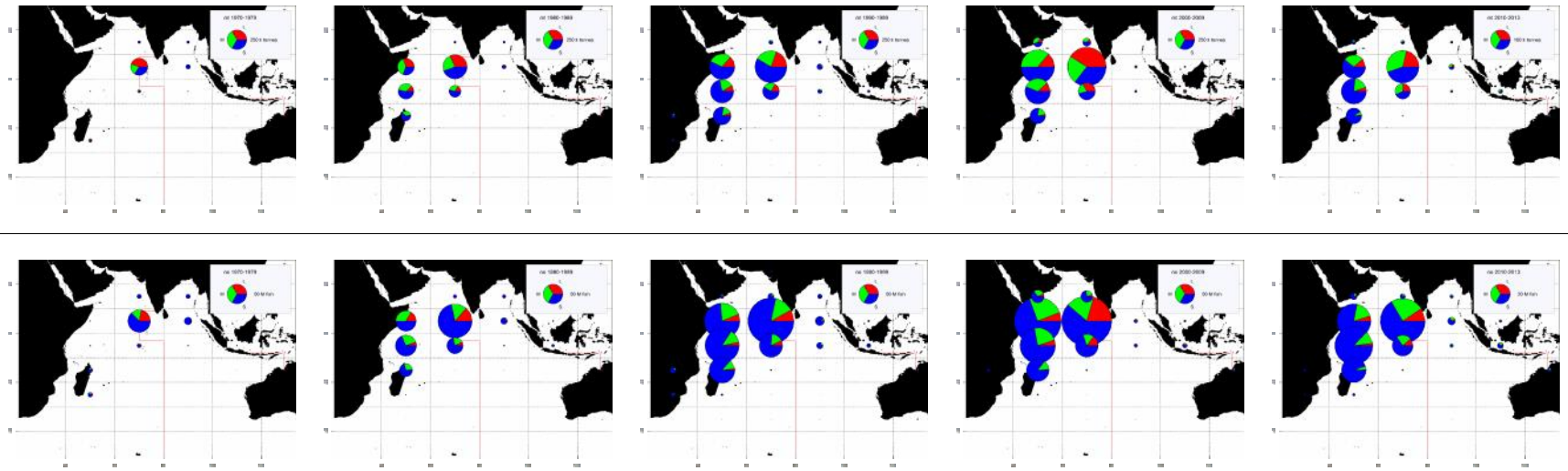
- **LL-TWN** (**Green**): Industrial longline fisheries
- **LL-JPN** (**Red**): Pole-and-line fisheries (Maldives and India)
- **PSLS** (**Purple**): Industrial purse seiners on associated schools (e.g. FAD)
- **PSFS** (**Light blue**): Industrial purse seiners on free-swimming schools



c. Skipjack tuna (SKJ)

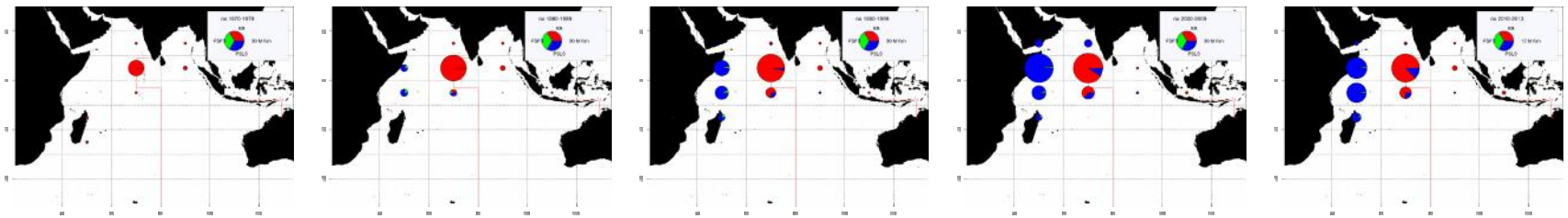
Total catches of SKIPJACK TUNA (SKJ) in weight (top) and number (bottom) derived from the catch-at-size of surface (purse seine and pole-and-line) and longline fisheries for 1970-2009, by decade, and 2010-13. Catches are presented by 10 latitude by 20 longitude area and size class, including:

- **Large size** (**Red**): Catches of SKJ for which the weight estimated is 5kg or greater
- **Medium size** (**Green**): Catches of SKJ for which the weight estimated is between 3kg and 5kg
- **Small size** (**Blue**): Catches of SKJ for which the weight estimated is under 3kg



Total catches of skipjack tuna (SKJ) of very small size (under 1.5kg), in number, derived from the catch-at-size of surface (purse seine and pole-and-line) and longline fisheries for 1970-2009, by decade, and 2010-12. Catches are presented by 10 latitude by 20 longitude area and size class, including:

- **BB** (**Red**): Pole-and-line fisheries (Maldives and India)
- **PSLS** (**Blue**): Industrial purse seiners on associated schools (e.g. FAD)
- **PSFS** (**Green**): Industrial purse seiners on free-swimming schools

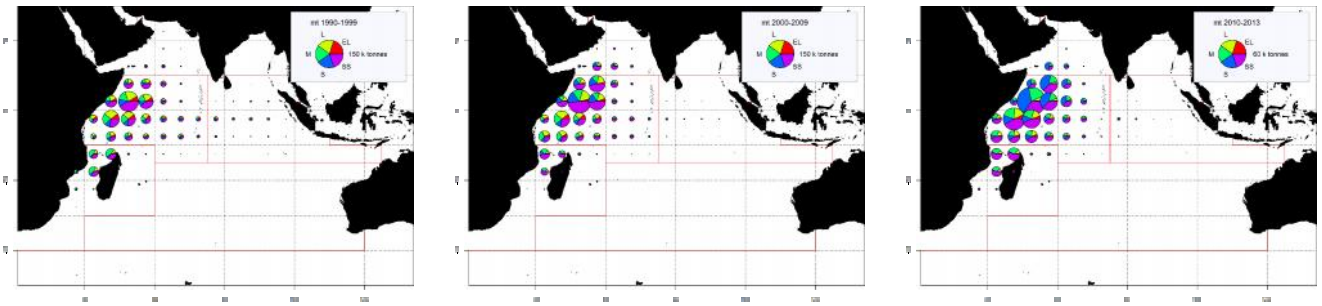


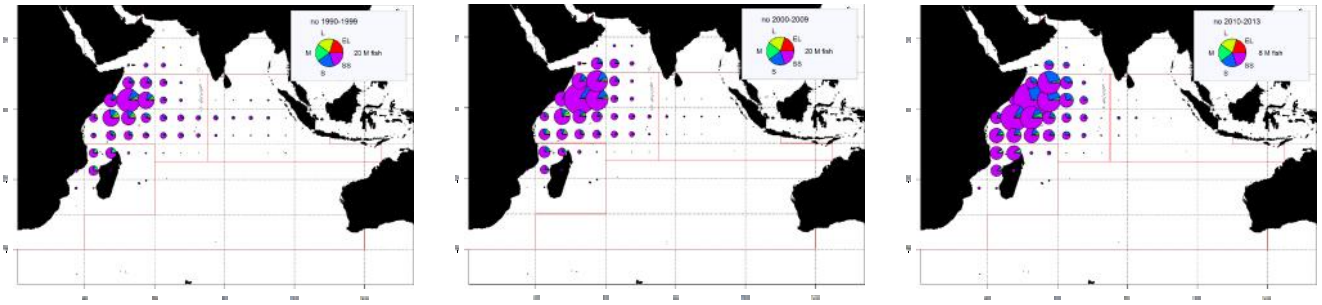
d. By fishery: Yellowfin tuna (YFT)

Total catches of YELLOWFIN TUNA (YFT) in weight (top) and number (bottom) derived from the catch-at-size of industrial purse seiners on free-swimming schools (top two rows; PSFS) and associated schools (bottom two rows; PSLS) for 1990-2009, by decade, and 2010-13. Catches are presented by 10 latitude by 20 longitude area and size class, including:

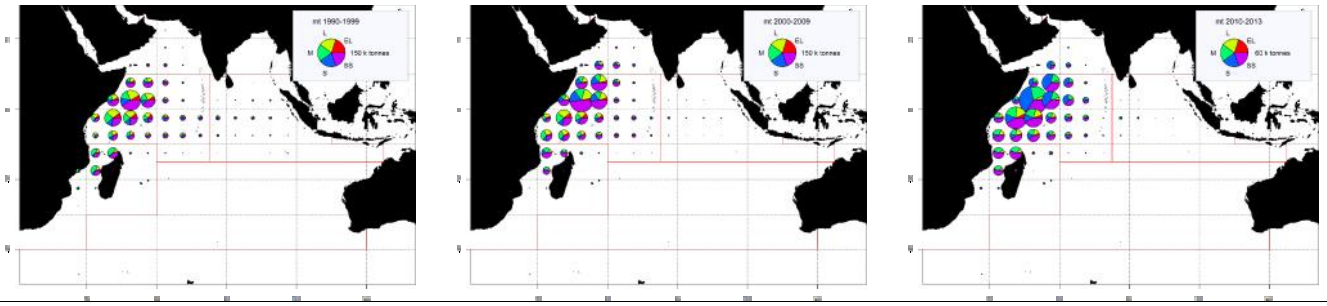
- **Very small size** (**SS; purple**): Catches of YFT for which the weight estimated is under 5kg
- **Small size** (**S**; **blue**): Catches of YFT for which the weight estimated is between 5 and 15kg
- **Medium size** (**M**; **green**): Catches of YFT for which the weight estimated is between 15kg and 30kg
- **Large size** (**L**; **yellow**): Catches of YFT for which the weight estimated is between 30kg and 45kg
- **Very large size** (**EL**; **red**): Catches of YFT for which the weight estimated is 45kg or greater

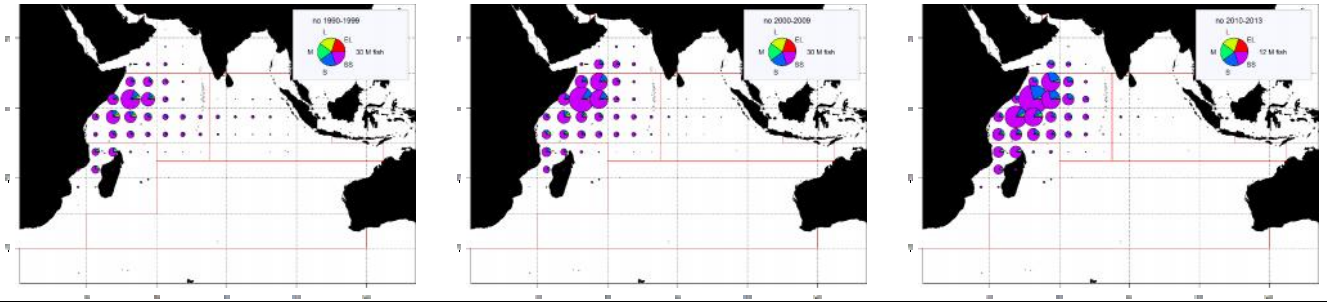
Free-swimming schools





Associated schools

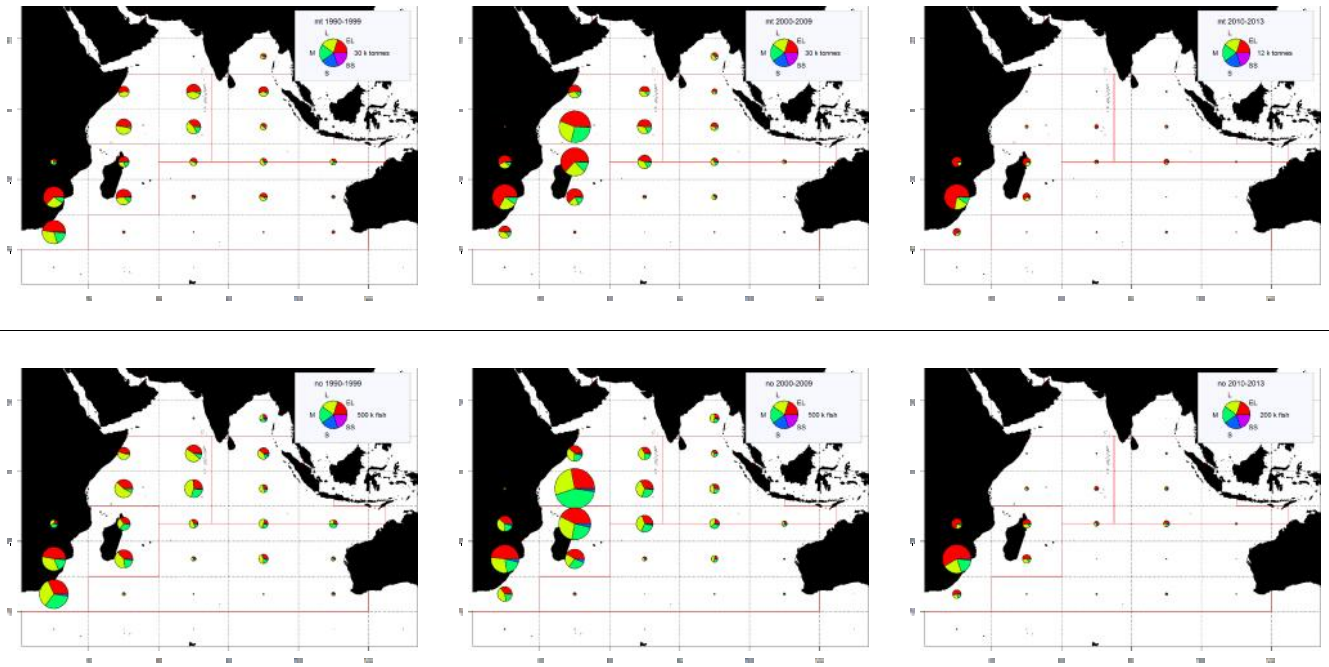




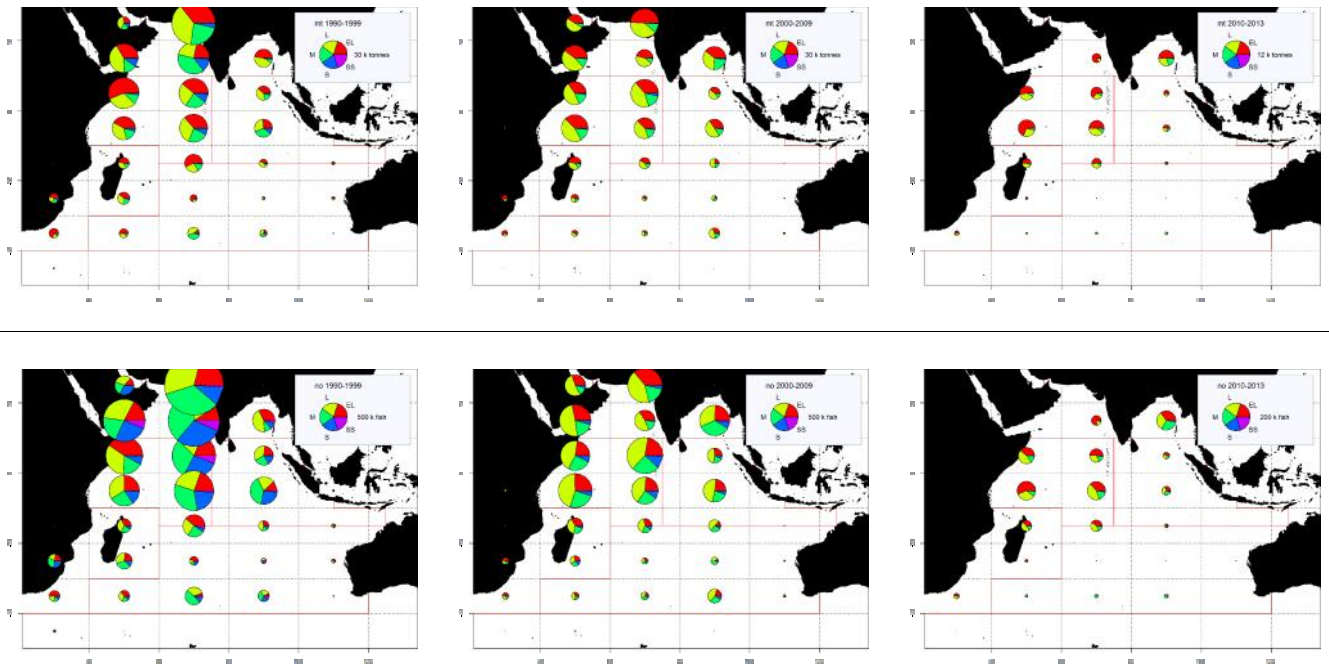
Total catches of YELLOWFIN TUNA (YFT) in weight (top) and number (bottom) derived from the catch-at-size of industrial longliners of Japan (top two rows) and Taiwan,China (bottom two rows) for 1990-2009, by decade, and 2010-13. Catches are presented by 10 latitude by 20 longitude area and size class, including:

- **Very small size** (**SS; purple**): Catches of YFT for which the weight estimated is under 5kg
- **Small size** (**S**; **blue**): Catches of YFT for which the weight estimated is between 5 and 15kg
- **Medium size** (**M**; **green**): Catches of YFT for which the weight estimated is between 15kg and 30kg
- **Large size** (**L**; **yellow**): Catches of YFT for which the weight estimated is between 30kg and 45kg
- **Very large size** (**EL**; **red**): Catches of YFT for which the weight estimated is 45kg or greater

Longline Japan



Longline Taiwan,China

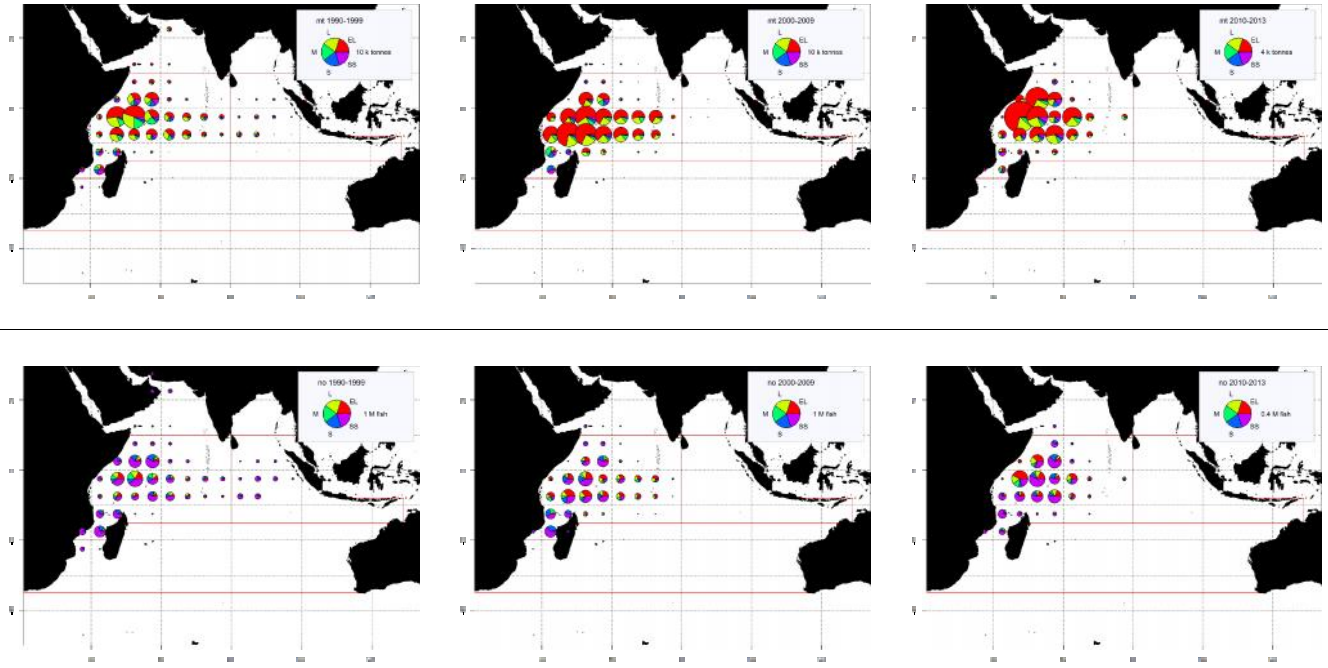


e. By fishery: Bigeye tuna (BET)

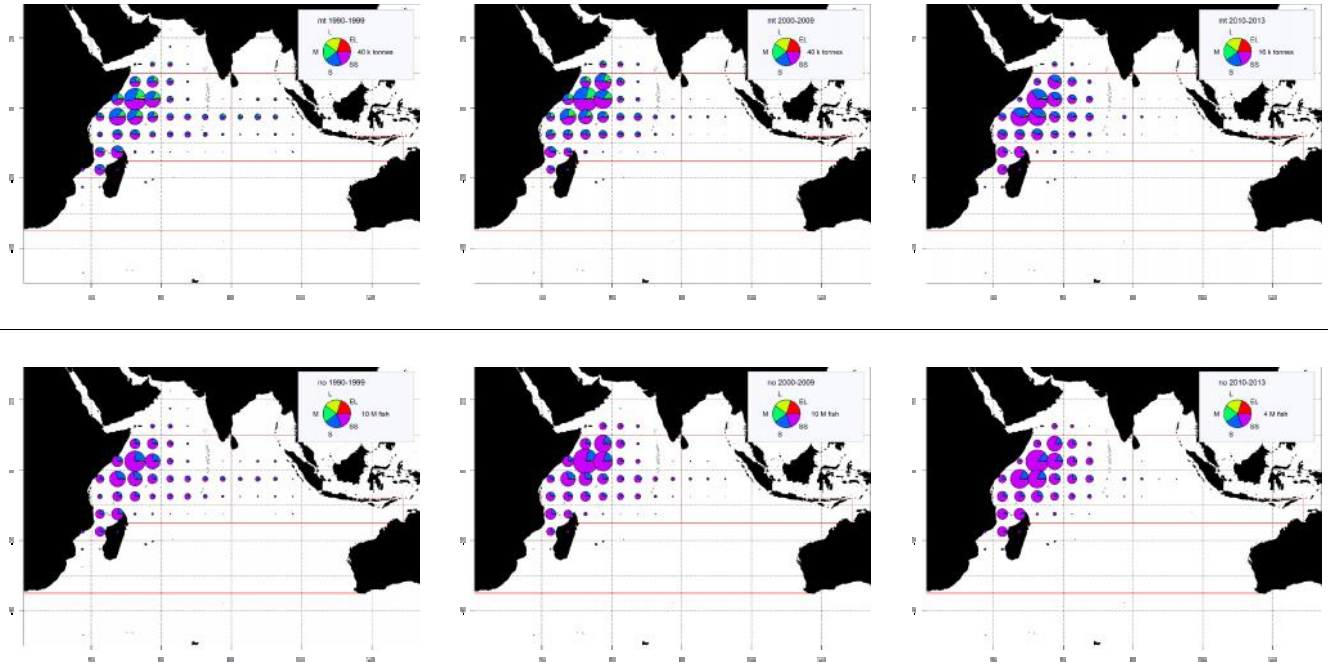
Total catches of BIGEYE TUNA (BET) in weight (top) and number (bottom) derived from the catch-at-size of industrial purse seiners on free-swimming schools (top two rows; PSFS) and associated schools (bottom two rows; PSLS) for 1990-2009, by decade, and 2010-13. Catches are presented by 10 latitude by 20 longitude area and size class, including:

- **Very small size** (**SS; purple**): Catches of BET for which the weight estimated is under 5kg
- **Small size** (**S**; **blue**): Catches of BET for which the weight estimated is between 5 and 15kg
- **Medium size** (**M**; **green**): Catches of BET for which the weight estimated is between 15kg and 30kg
- **Large size** (**L**; **yellow**): Catches of BET for which the weight estimated is between 30kg and 45kg
- **Very large size** (**EL**; **red**): Catches of BET for which the weight estimated is 45kg or greater

Free-swimming schools



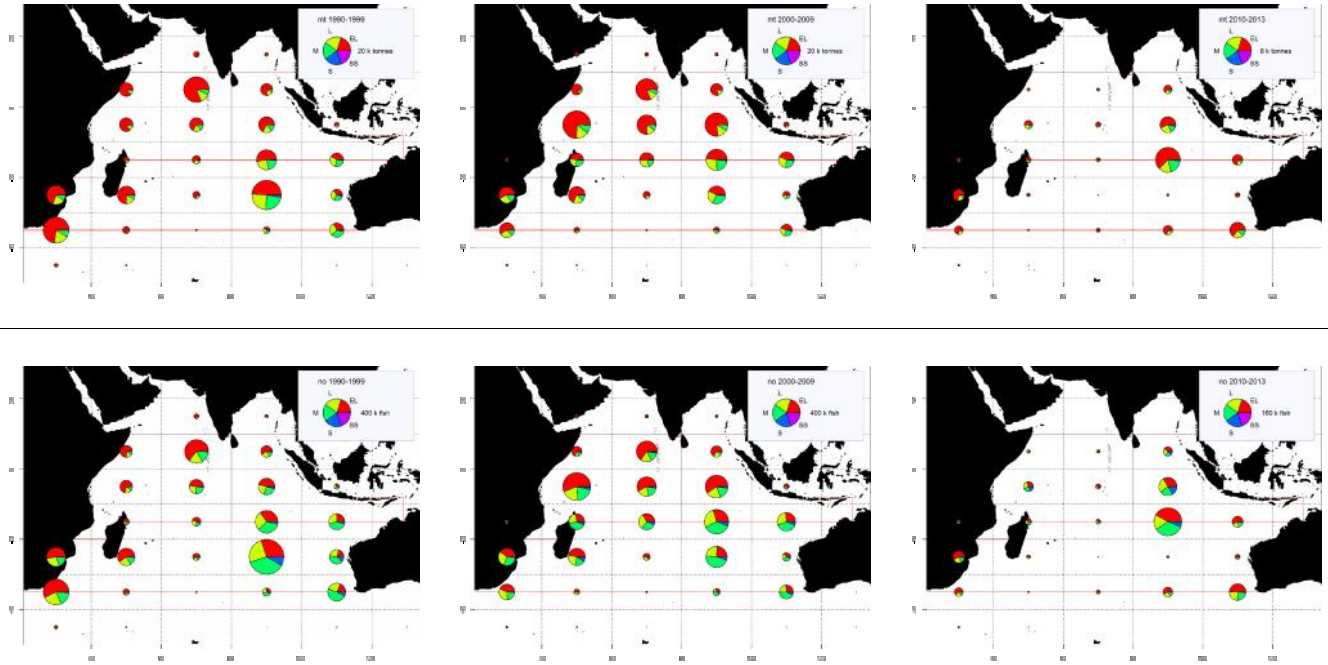
Associated schools



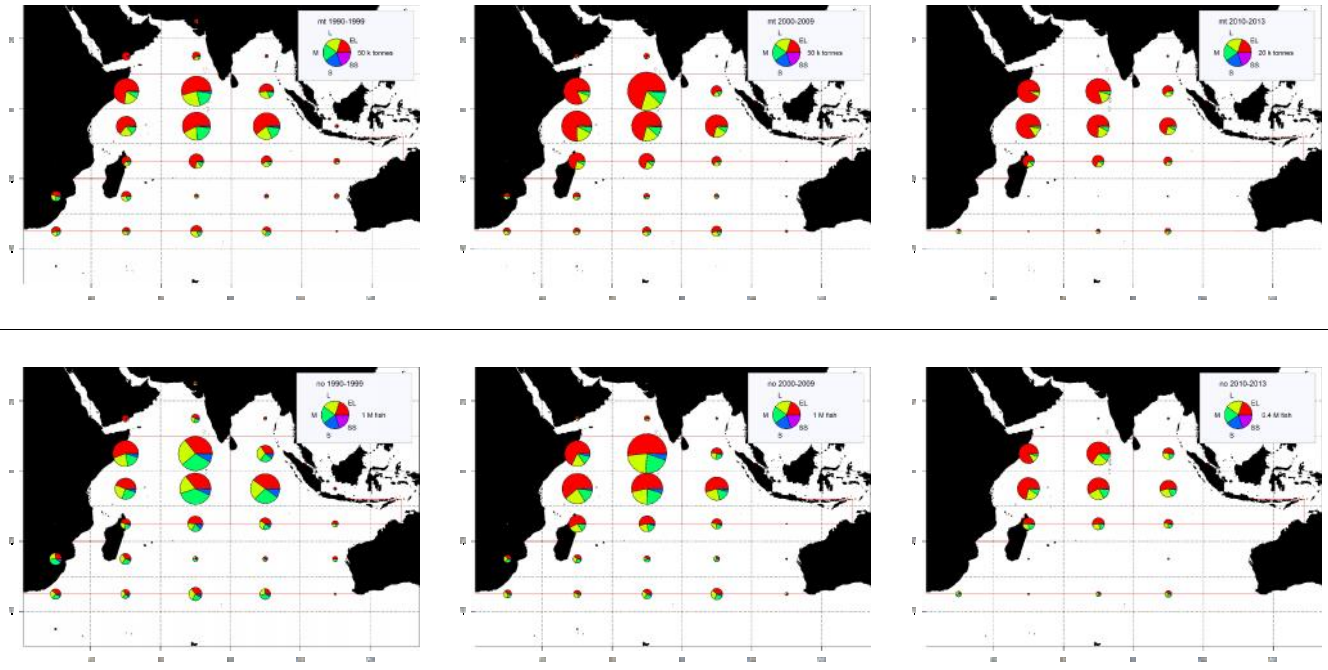
Total catches of BIGEYE TUNA (BET) in weight (top) and number (bottom) derived from the catch-at-size of industrial longliners of Japan (top two rows) and Taiwan,China (bottom two rows) for 1990-2009, by decade, and 2010-13. Catches are presented by 10 latitude by 20 longitude area and size class, including:

- **Very small size** (**SS; purple**): Catches of BET for which the weight estimated is under 5kg
- **Small size** (**S**; **blue**): Catches of BET for which the weight estimated is between 5 and 15kg
- **Medium size** (**M**; **green**): Catches of BET for which the weight estimated is between 15kg and 30kg
- **Large size** (**L**; **yellow**): Catches of BET for which the weight estimated is between 30kg and 45kg
- **Very large size** (**EL**; **red**): Catches of BET for which the weight estimated is 45kg or greater

Longline Japan



Longline Taiwan,China

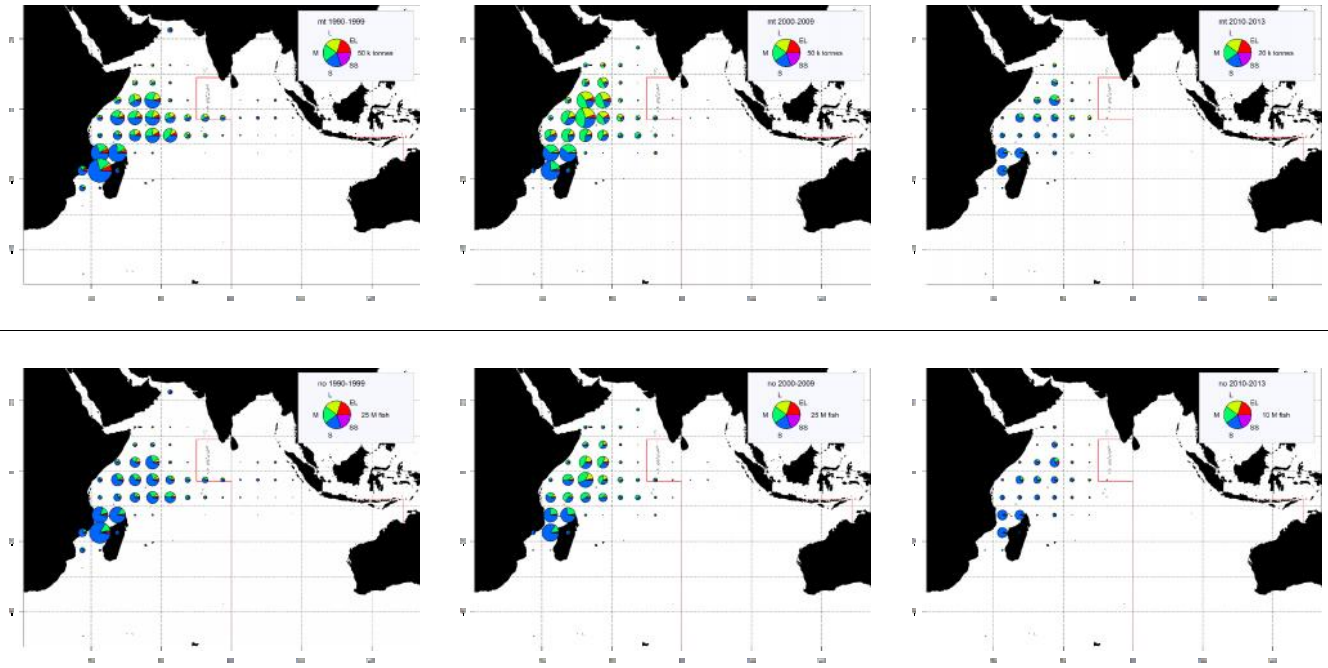


f. By fishery: Skipjack tuna (SKJ)

Total catches of SKIPJACK TUNA (SKJ) in weight (top) and number (bottom) derived from the catch-at-size of industrial purse seiners on free-swimming schools (top two rows; PSFS) and associated schools (bottom two rows; PSLS) for 1990-2009, by decade, and 2010-13. Catches are presented by 10 latitude by 20 longitude area and size class, including:

- **Very small size** (**SS; purple**): Catches of SKJ for which the weight estimated is under 1.5kg
- **Small size** (**S**; **blue**): Catches of SKJ for which the weight estimated is between 1.5 and 3kg
- **Medium size** (**M**; **green**): Catches of SKJ for which the weight estimated is between 3kg and 5kg
- **Large size** (**L**; **yellow**): Catches of SKJ for which the weight estimated is between 5kg and 7kg
- **Very large size** (**EL**; **red**): Catches of SKJ for which the weight estimated is 7kg or greater

Free-swimming schools



Associated schools