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# REVIEW OF THE STATISTICAL DATA AND FISHERY TRENDS FOR BILLFISH

**PREPARED BY: IOTC SECRETARIAT, 27 AUGUST 2013**
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## PURPOSE

To provide the Working Party on Billfish (WPB) with a review of the status of the information available on billfish species in the databases at the IOTC Secretariat as of **July 2013**, as well as a range of fishery indicators, including catch and effort trends, for fisheries catching billfish in the IOTC area of competence. It covers data on nominal catches, catch-and-effort, and size-frequency.

## BACKGROUND

Prior to each WPB 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 WPB 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 by the secretariat for billfish, in accordance with IOTC Resolution 10/02 *Mandatory statistical requirements for IOTC Members and Cooperating non-Contracting Parties (CPC's)*[4], for the period 1950–2011.

The document describes the progress achieved in relation to the collection and verification of data and identifies problem areas as assessed from the information available.

The document also provides a range of fishery indicators, including catch and effort trends, for fisheries catching billfish in the IOTC area of competence (**Appendix I**).

The report covers the following areas:

- Overview
- Main issues relating to the data available on billfish
- Overview of billfish fisheries in the Indian Ocean:
    - Catch trends
    - Status of fisheries statistics for billfish.

### *Major data categories covered by the report*

**Nominal catches** which are highly aggregated statistics for each species estimated per fleet, gear and year for a large area. If these data are not reported the Secretariat estimates a total catch from a range of sources (including: partial catch and effort data; data in the FAO FishStat database; catches estimated by the IOTC from data collected through port sampling; data published through web pages or other means; and data reported by other parties on the activity of vessels (IOTC Resolution 10/08; IOTC Resolution 05/03; IOTC Resolution 11/03; IOTC Resolution 12/05; IOTC Resolution 13/07)).

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[4] This Resolution superseded IOTC Resolutions 98/01, 05/01 and 08/01

**Catch and effort data** which refer to the fine-scale data – usually from logbooks, and reported per fleet, year, gear, fishing mode, month, grid and species. Information on the use of fish aggregating devices (FADs) and supply vessels is also collected.

**Length frequency data:** individual body lengths of IOTC species per fleet, year, gear, fishing mode, quarter and 5 degree square areas.

***Billfish species and main fisheries in the Indian Ocean***

Table 1 below shows the five species of billfish under IOTC management.

**Table 1.** Billfish tuna species under the IOTC mandate

| IOTC code | English name | Scientific name |
|---|---|---|
| BLM | Black marlin | *Makaira indica* |
| BUM | Blue marlin | *Makaira nigricans* |
| MLS | Striped marlin | *Tetrapturus audax* |
| SFA | Indo-Pacific sailfish | *Istiophorus platypterus* |
| SWO | Swordfish | *Xiphias gladius* |

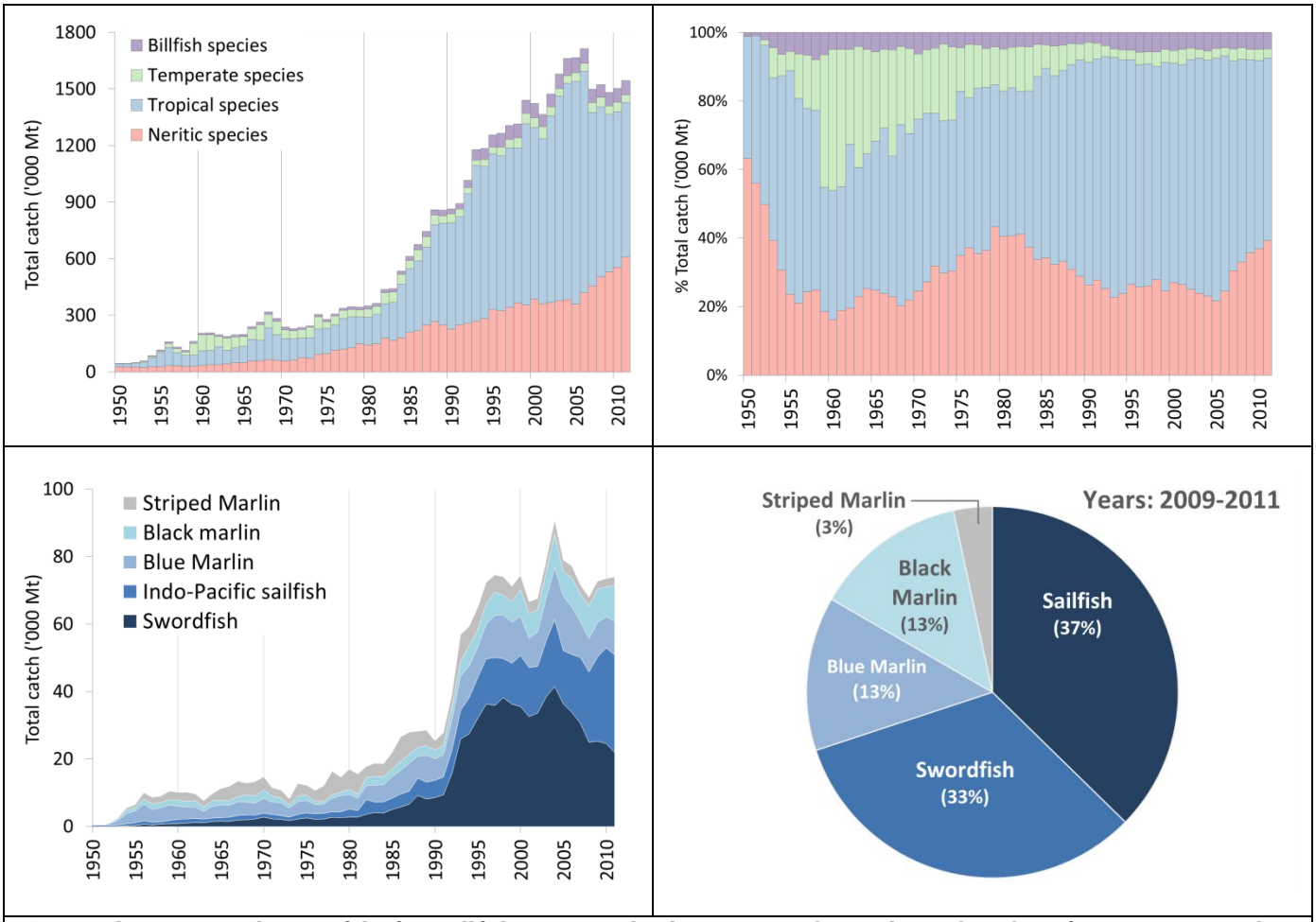
## DISCUSSION

The contribution of billfish to the total catches of IOTC species in the Indian Ocean has remained relatively constant over the years (Fig. 1a.b.), accounting for around 5% of the overall catch. Total catches of billfish species have generally increased in line with other species groups under the mandate of IOTC, increasing from around 25,000 t in the early 1990s to nearly 75,000 t in the mid-1990s. Since then, average catches per annum have remained relatively stable at between 70,000 t and 75,000 t, with the exception of 2003-2006 when catches of 91,000 t were reported (mostly attributed to increases in catches of Swordfish, Sailfish and Blue marlin) (Fig. 1c.).

Of the five billfish species, Sailfish and Swordfish account for 70% of the catch in recent years (2009-11; Fig. 1d.), followed by Blue Marlin and Black Marlin with 13% of the total catch each, and the remaining 3% accounted for by Striped Marlin. The importance of each species, in terms of share of total catch of billfish, has changed over time – mostly as a result of changes to the number of longline vessels. Catches of Swordfish in particular increased during the 1990s as a result of changes in targeting by Taiwan,China, and the arrival of European longline fleets operating in the area, increasing the share of total billfish catch from 20-30% in the early 1990s to as much as 50% by 2002. Catches of Swordfish over the last 10 years have since declined back to around a third of the total billfish catch, largely as a result of declining catches from Taiwan,China.

The majority of catches of billfish are caught by longline vessels. Up to the early 1980s longline vessels accounted for over 90% of the total billfish (largely as bycatch); in the last 20 years the proportion has fallen to between 50% to 70% as catches from gillnet fisheries have become increasingly important for a number of fleets such as Iran and Sri Lanka. In addition the number of longline vessels from Taiwan,China has also declined in recent years in response to the threat of Somali piracy in the western tropical Indian Ocean. Nevertheless, catches are still dominated by a number of longline fleets – namely Taiwan,China and European fleets.

While a number countries in the IOTC region have important fisheries for billfish (Fig. 2), in recent years five countries (Sri Lanka, India, Taiwan,China, Iran, and Indonesia), have reported as much as two thirds (from 2009-11; of the of the total catches of billfish species from all countries and species combined.




**Figs. 1a-d. Top:** Contribution of the five Billfish species under the IOTC mandate to the total catches of IOTC species in the Indian Ocean, over the period 1950-2011 (a. Top left: total catch; b. Top right percentage, same colour key as Fig. 1a).; **Bottom:** Contribution of each species of Billfish to the total combined catches of Billfish (a. Bottom left: nominal catch of each species, 1950-2011; b. Bottom right: share of Billfish catch by species, 2009-11)

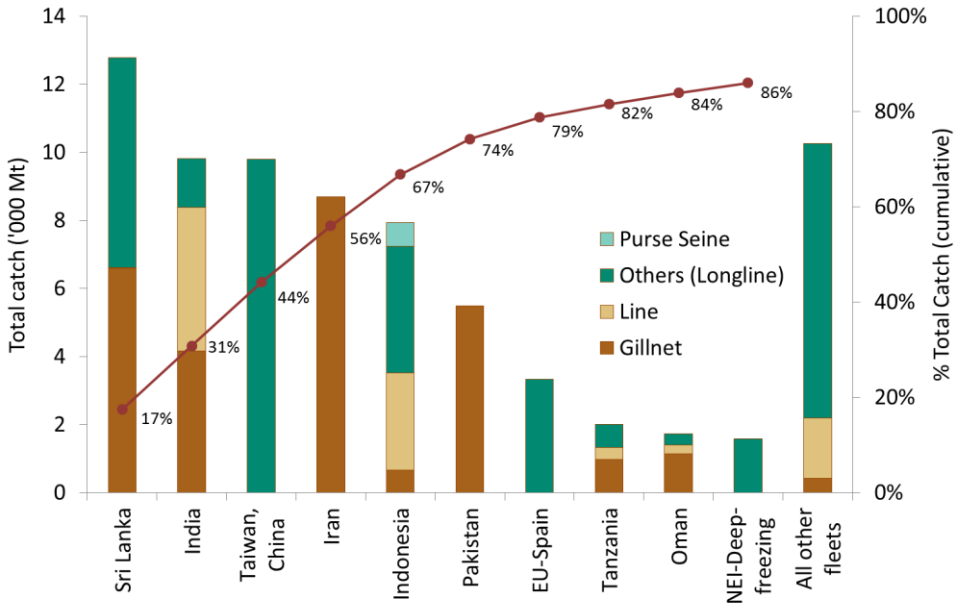



**Fig. 2:** Swordfish: average catches in the Indian Ocean over the period 2009–11, by country. Countries are ordered from left to right, according to the importance of catches of swordfish reported. The red line indicates the (cumulative) proportion of catches of swordfish for the countries concerned, over the total combined catches of this species reported from all countries and fisheries.

**MAIN ISSUES IDENTIFIED RELATING TO THE STATISTICS OF BILLFISH**

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

**1. Catch-and-Effort data from Artisanal Fisheries:**

- **Drifting gillnet** fisheries of **Iran** and **Pakistan**: To date, Iran has not reported catches of swordfish and marlins for its gillnet fishery. Although Pakistan has reported catches of swordfish and black marlin, they are considered to be too low for a driftnet fishery and the catches of black marlin are thought to contain other marlins (misidentification); estimates have been partially revised based on information from recent sampling conducted from 2006 onwards. Although very significant catches of marlins are likely to be taken on driftnet fisheries, the paucity of the data available makes it difficult to assess catch levels for driftnet fleets.
- **Gillnet/longline** fishery of **Sri Lanka**: In recent years Sri Lanka has caught over 20% of the catches of marlins in the Indian Ocean. Although Sri Lanka has reported catches of marlins by species for its gillnet/longline fishery, the catch ratio of blue marlin to black marlin has changed dramatically over time. This is thought to be a sign of frequent misidentification rather than the effect of changes in catch rates for this fishery. Although the IOTC Secretariat adjusted the catches of marlins using proportions derived from years with good monitoring of catches by species, the catches estimated remain uncertain.
- **Artisanal** fisheries of **Indonesia**: The catches of billfish reported by Indonesia for its artisanal fisheries in recent years are considerably higher than those reported in the past, and represent around 9% of the total catches of billfish in the Indian Ocean. In 2011 the Secretariat revised the complete nominal catch dataset for Indonesia, using information from various sources, including official reports. However, the quality of the dataset for the artisanal fisheries of Indonesia is thought to be poor, with a likely underestimation of catches of billfish in recent years.
- **Artisanal** fisheries of **India**: In early 2012 the Secretariat revised the complete nominal catch dataset for India, using new information available. The catches of billfish estimated in recent years represent around 20% of the total catches in the Indian Ocean, and refer mainly to Indo-Pacific sailfish. To date, India has not reported catch-and-effort data for its artisanal fisheries.

**2. Catch-and-Effort data from Sport Fisheries:**

- **Sport** fisheries of **Australia, France(Reunion)**, **India**, **Indonesia**, **Madagascar**, **Mauritius**, **Oman, Seychelles**, **Sri Lanka**, **Tanzania**, **Thailand** and **UAE**: To date, no data have been received from any of the referred sport fisheries. Sport fisheries are known to catch billfish species, in particular blue marlin, black marlin and Indo-Pacific sailfish. Although data are available from other sport fisheries in the region (Kenya, Mauritius, Mozambique, South Africa), this information cannot be used to estimate levels of catch for other fisheries.

**3. Catch-and-Effort data from Industrial Fisheries:**

- **Longline** fishery of **Indonesia**: The catches of swordfish and marlins estimated for the fresh tuna longline fishery of Indonesia may have been underestimated in recent years due to them not being sampled sufficiently in port and to the lack of logbook data from which to derive estimates. The catches of billfish estimated in recent years (all species combined) represent around 10% of the total catches in the Indian Ocean, especially swordfish and blue marlin.
- **Longline** fishery of **India**: In recent years, India has reported very incomplete catches and catch-and-effort data for its commercial longline fishery The Secretariat has estimated total catches for this period using alternative sources, the final catches estimated considerably higher than those reported (representing 3.5% of the total catches of billfish in recent years).
- **Longline** fishery of the Republic of **Korea**: The nominal catches and catch-and-effort data series for billfish for the longline fishery of Korea are conflicting, with nominal catches of swordfish and marlins lower than the catches reported as catch-and-effort for some years. Although in 2010 the IOTC Secretariat revised the nominal catch dataset to account for catches reported as catch-and-effort, the quality of the estimates remains unknown. However, the catches of longliners of the Rep. of Korea in recent years are very small.

- **Longline** fishery of **EU-Spain:** To date, the Secretariat has not received catch-and-effort data for marlins and sailfish for the longline fishery of EU-Spain.
- **Purse seine** fisheries of **Seychelles**, **Thailand**, **Iran** and **Japan**: To date, the referred countries have not reported catches of billfish from purse seiners, although they are thought to be very low.

**4. Size data from All Fisheries:**

- Size data for all billfish species is generally considered unreliable and insufficient to be of use for stock assessment purpose, as sampling numbers for all species are below the minimum sampling coverage one fish per tonne of catch recommended by IOTC.
- **Longline** fishery of **Taiwan,China**: Size data have been available for the longline fishery of Taiwan,China since 1980; however, the length frequency distributions of striped marlin and blue marlin differ from those reported by Japan for its longline fishery, with average weights of striped marlin likely to be too large for a longline fishery. Therefore, it is likely that there has been overspread mis-identification of striped marlin and blue marlin on board longliners flagged in Taiwan,China.
- **Gillnet** fisheries of **Iran** and **Pakistan:** To date, Iran and Pakistan have not reported size frequency data for their gillnet fisheries.
- **Gillnet/longline** fishery of **Sri Lanka:** Although Sri Lanka has reported length frequency data for swordfish and marlins in recent years, the lengths reported are considered highly uncertain, due to misidentification of marlins and likely sampling bias (large specimens of swordfish and marlins are highly processed and not sampled for length).
- **Longline** fisheries of **India** and **Oman:** To date, India and Oman have not reported size frequency data for their longline fisheries.
- **Longline** fishery of **Indonesia**: Indonesia has reported size frequency data for its fresh-tuna longline fishery in recent years. However, the samples cannot be fully disaggregated by month and fishing area (5x5 grid) and refer mostly to the component of the catch that is unloaded fresh. The quality of the samples in the IOTC database is for this reason uncertain.
- **Fresh-tuna longline** fishery of **Taiwan,China**[5]**:** Data are only available for striped marlin and swordfish for the year 2010, with no size data available for other species or years.
- **Longline** fishery of **Japan:** The number of samples reported and total number of fish sampled for the longline fishery of Japan since 2000 has been very low.
- **Artisanal** fisheries of **India** and **Indonesia**: To date, India and Indonesia have not reported size frequency data for their artisanal fisheries.

**5. Biological data for all billfish species:**

- Industrial **longline** fisheries, in particular **Taiwan,China**, **Indonesia**, **EU**, **China** and the **Republic** of **Korea**: The Secretariat had to use length-age keys, length-weight keys, and processed weight-live weight keys for billfish species from other oceans due to the general paucity of biological data available from the fisheries indicated.
- Industrial **longline** fisheries, in particular **Taiwan,China**, **Indonesia**, **EU**, **China** and the **Republic** of **Korea**: There has not been regular reporting of length frequency data by sex from any of the referred fisheries.

[5] Refers to Taiwan Province of China.

## 2. STATUS OF FISHERIES STATISTICS FOR BILLFISH SPECIES

***Swordfish (SWO)***

- **Catch trends**

Over 90% of Swordfish are caught mainly using drifting longlines (>95%), on longline fisheries directed to tunas (**Table 1,** LL) or swordfish (**Table 1,** ELL), while the remaining the catches are taken by other fisheries, in particular drifting gillnets. Between 1950 and 1980, catches of swordfish in the Indian Ocean slowly increased in tandem with the level of coastal state and distant water fishing nation longline effort targeting tunas (**Fig. 3**). Swordfish were mainly a bycatch of industrial longline fisheries before the early 1990's with catches slightly increasing from 1950 to 1990 proportionally to the increase in the catches of target species (tropical and temperate tunas).

The catches of swordfish markedly increased after 1990, from around 9,000 t in 1991 to a peak of 38,000 t in 1998 and 41,000 t in 2004. The change in target species from tunas to swordfish by part of the fleet of Taiwan,China along with the development of longline fisheries in Australia, Reunion island, Seychelles and Mauritius and the arrival of longline fleets from the Atlantic Ocean (Portugal, Spain the UK and other fleets operating under various flags[6]), all targeting swordfish, are the main reasons for this significant increase.

Since 2004, annual catches have declined steadily, largely due to the continued decline in the number of active Taiwan,China longliners in the Indian Ocean (**Fig. 3**). Annual catches since 2004 have been dominated by the Taiwan,China and EU fleets (Spain, UK, France and Portugal), with the fishery extending eastward due to the effects of piracy actions (**Fig. 6**).

**TABLE 1**. Best scientific estimates of the catches of swordfish by type of fishery for the period 1950–2011 (in metric tons). Data as of July 2013.

| Fishery | By decade (average) | | | | | | By year (last ten years) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1950s | 1960s | 1970s | 1980s | 1990s | 2000s | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
| ELL | 0 | 0 | 0 | 9 | 1841 | 9998 | 8903 | 9470 | 12740 | 14965 | 12999 | 11535 | 8197 | 8155 | 9516 | 7790 |
| LL | 282 | 1425 | 2135 | 4337 | 21582 | 17752 | 20448 | 24262 | 21940 | 15504 | 15007 | 13452 | 10757 | 11377 | 9492 | 7696 |
| OT | 37 | 39 | 186 | 842 | 3133 | 5500 | 4249 | 4693 | 6809 | 5849 | 5793 | 5574 | 6002 | 5727 | 5602 | 6430 |
| **Total** | **320** | **1,464** | **2,320** | **5,188** | **26,556** | **33,250** | **33,599** | **38,424** | **41,489** | **36,318** | **33,799** | **30,561** | **24,957** | **25,259** | **24,610** | **21,916** |

**Fisheries:** Swordfish longline (**ELL**); Longline (**LL**)**;** Other gears (**OT**)

**TABLE 2**. Best scientific estimates of the catches of swordfish by fishing area for the period 1950–2010 (in metric tons). Data as of July 2013

| Area | By decade (average) | | | | | | By year (last ten years) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1950s | 1960s | 1970s | 1980s | 1990s | 2000s | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
| NW | 81 | 530 | 776 | 1,967 | 9,232 | 12,694 | 13,753 | 16,622 | 16,413 | 15,113 | 13,482 | 12,029 | 9,928 | 8,071 | 5,308 | 3,545 |
| SW | 18 | 272 | 438 | 673 | 8,956 | 9,008 | 9,034 | 5,043 | 8,109 | 11,645 | 10,278 | 9,285 | 7,402 | 7,924 | 9,320 | 7,566 |
| NE | 152 | 408 | 729 | 2,082 | 5,649 | 6,725 | 5,976 | 8,250 | 8,367 | 5,142 | 6,851 | 5,864 | 5,050 | 7,409 | 7,317 | 8,327 |
| SE | 23 | 151 | 236 | 280 | 2,585 | 4,665 | 4,643 | 8,424 | 8,527 | 4,368 | 3,113 | 3,314 | 2,353 | 1,708 | 2,522 | 2,322 |
| OT | 45 | 104 | 141 | 186 | 134 | 158 | 194 | 85 | 73 | 50 | 76 | 68 | 223 | 146 | 143 | 157 |
| **Total** | **320** | **1,464** | **2,320** | **5,188** | **26,556** | **33,250** | **33,599** | **38,424** | **41,489** | **36,318** | **33,799** | **30,561** | **24,957** | **25,259** | **24,610** | **21,916** |

**Areas**: Northwest Indian Ocean (**NW**); Southwest Indian Ocean (**SW**); Northeast Indian Ocean (**NE**); Southeast Indian Ocean (**SE**); Southern Indian Ocean (**OT**)

Longliners from **Taiwan,China** have been operating in the Indian Ocean since 1954, with catches of swordfish rarely higher than 1,000 t until 1979. Swordfish catches increased gradually from 1,000 in 1979 to 5,500 t in 1988. The catches by the Taiwanese fleet increased dramatically during the 1990's to over 12,000 t per year as the species was increasingly targeted by the fleet. After a peak of 18,000 t recorded in 1995, catches dropped to 12,000 t in 2004, and again in the following years, with catches in 2010 amounting to around 4,500 tons (**Fig. 4**).

[6] Senegal, Guinea, etc.

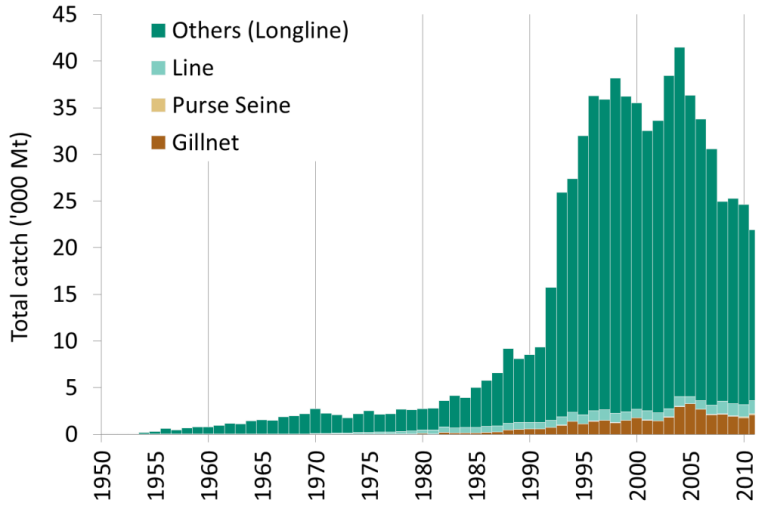



**Fig. 3.** Catches of swordfish by gear and year recorded in the IOTC Database (1960–2011).

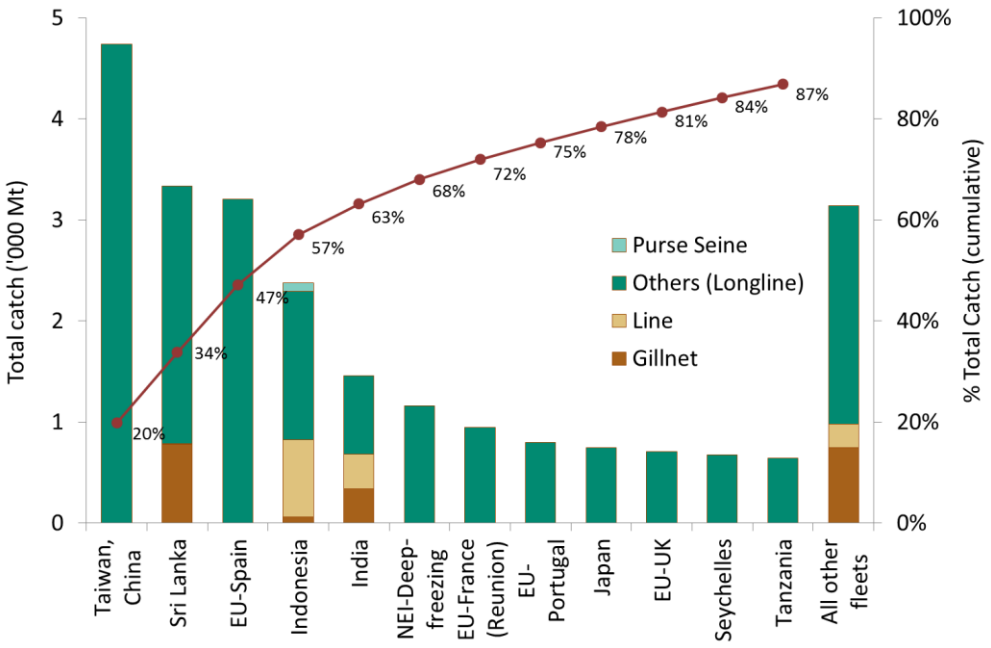



**Fig. 4.** Swordfish: average catches in the Indian Ocean over the period 2009–11, by country. Countries are ordered from left to right, according to the importance of catches of swordfish reported. The red line indicates the (cumulative) proportion of catches of swordfish for the countries concerned, over the total combined catches of this species reported from all countries and fisheries.

Catches of swordfish of up to 6,000 t have been recorded in recent years for a fleet of deep-freezing and fresh tuna longliners operating under flags of non-reporting countries (**NEI**). The catches have been low since 2006, at just over 1,000 t (**Fig. 4**).

The catches of Swordfish of industrial longliners from **Japan** have increased proportionally to those of yellowfin tuna, the target species of this fleet during the first years of the fishery, and have remained stable until the early 1990's. The average annual catches over the last two decades have amounted to around 1,600 t, rising to over 2,500 t in 1994 and 1997, although most recently in 2010 and 2011 catches of between 500 t to 600 t have been reported.

In **Sri Lanka**, swordfish catches have ranged between 2,400 and 3,600 t over the last decade. These are taken mostly by boats that use a combination of drifting gillnets and longlines. Results from the sampling conducted by NARA[7] during 2005 and 2006 with the support of the IOTC-OFCF[8] Project in different locations in Sri Lanka led to a re-estimation of the historical catch series, in 2012[9].

The catches of **Indonesian** fresh-tuna longliners operating in Indian Ocean waters increased steadily until 2003 (3,400 t), and have decreased since then. It is, however, likely that the catches recorded for the swordfish are incomplete, as the statistics for years before 2003 are thought to be more uncertain (as port sampling was only initiated in 2003), and coverage of the frozen component of catches from port sampling, which is likely to contain significant amounts of swordfish, was not sufficient.

During the last two decades, several domestic longline fisheries targeting swordfish started to operate in Reunion (EU-**France**), **Australia**, **Seychelles, South Africa** and, more recently, **Mauritius**, with total accumulated catches estimated to be between 2,000 t and 3,000 t in recent years (see 'All other fleets, **Fig. 4**).

Spanish, Portuguese and UK longliners coming from the Atlantic Ocean have been operating in the Indian Ocean since the early 90s with current accumulated catches around 5,000 t. Around 25% of the catches of swordfish in the Indian Ocean have been taken by vessels operating under EU flags in recent years.

The annual catches of swordfish by longliners from the **Republic of Korea**, recorded since 1965, have rarely exceeded 1,000 t. The highest catch, 1,100 t, was recorded in 1994. In 2010 the Secretariat revised the catches of swordfish for Korea over the time-series using catches reported as nominal catches and catch-and-effort.

Swordfish is mostly exploited in the western Indian Ocean (**Fig. 5a-f**), in waters off Somalia, and in the southwest Indian Ocean. Other important fisheries operate in waters off Sri Lanka, Western Australia and Indonesia. In recent years (**Fig. 6a-f**) the catches of swordfish in the western tropical Indian Ocean have dropped considerably, especially in areas off Somalia, Kenya and Tanzania, from around 25,000 t in 2005 to 15,000 t in 2008, and in particular 11,000 t in 2011. The drop in catches is the consequence of a drop in fishing effort in the area by longline fisheries, due to either piracy or decreased fish abundance, or a combination of both.

[7] National Aquatic Resources and Development Agency of Sri Lanka

[8] Overseas Fisheries Cooperation Foundation of Japan

[9] Moreno et al. (2012). Pilot project to improve data collection for tuna, sharks and billfish from artisanal fisheries in the Indian Ocean. Part II: Revision of catch statistics for India, Indonesia and Sri Lanka (1950-2011). Assignment of species and gears to the total catch and issues on data quality. Document presented at the 15th Session of the IOTC Scientific Committee, Seychelles, 10-15 December 2012. IOTC–2012–SC15–38

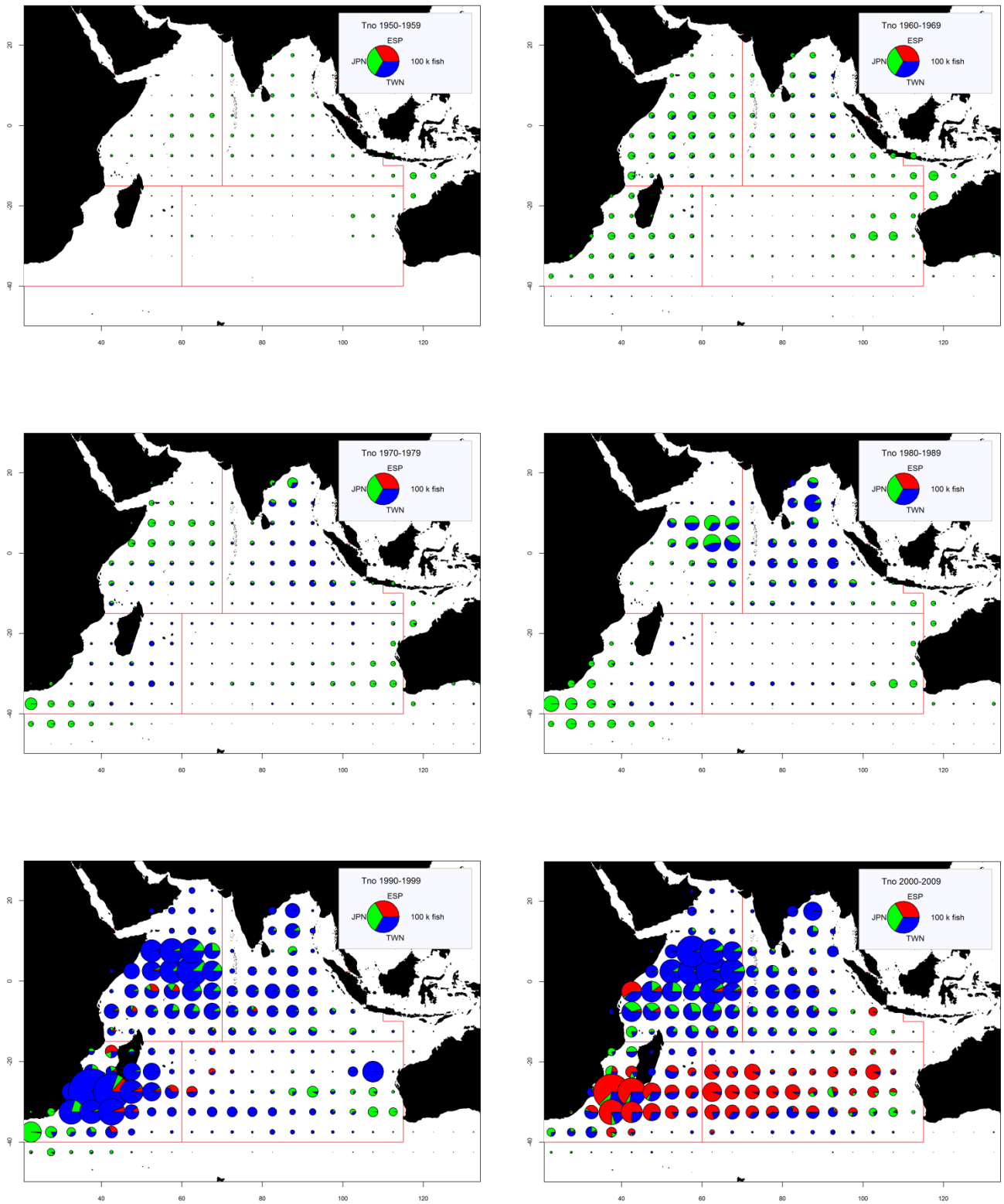



**Fig. 5a-f:** Time-area catches (total combined in tonnes) of swordfish as reported for the longline fleets of Japan (**JPN**), Taiwan,China (**TWN**), and EU-Spain (**ESP**), the latter directed at swordfish, for the period 1950-2009, by decade and type of gear. Red lines represent the boundaries of the areas used for the assessments of swordfish.

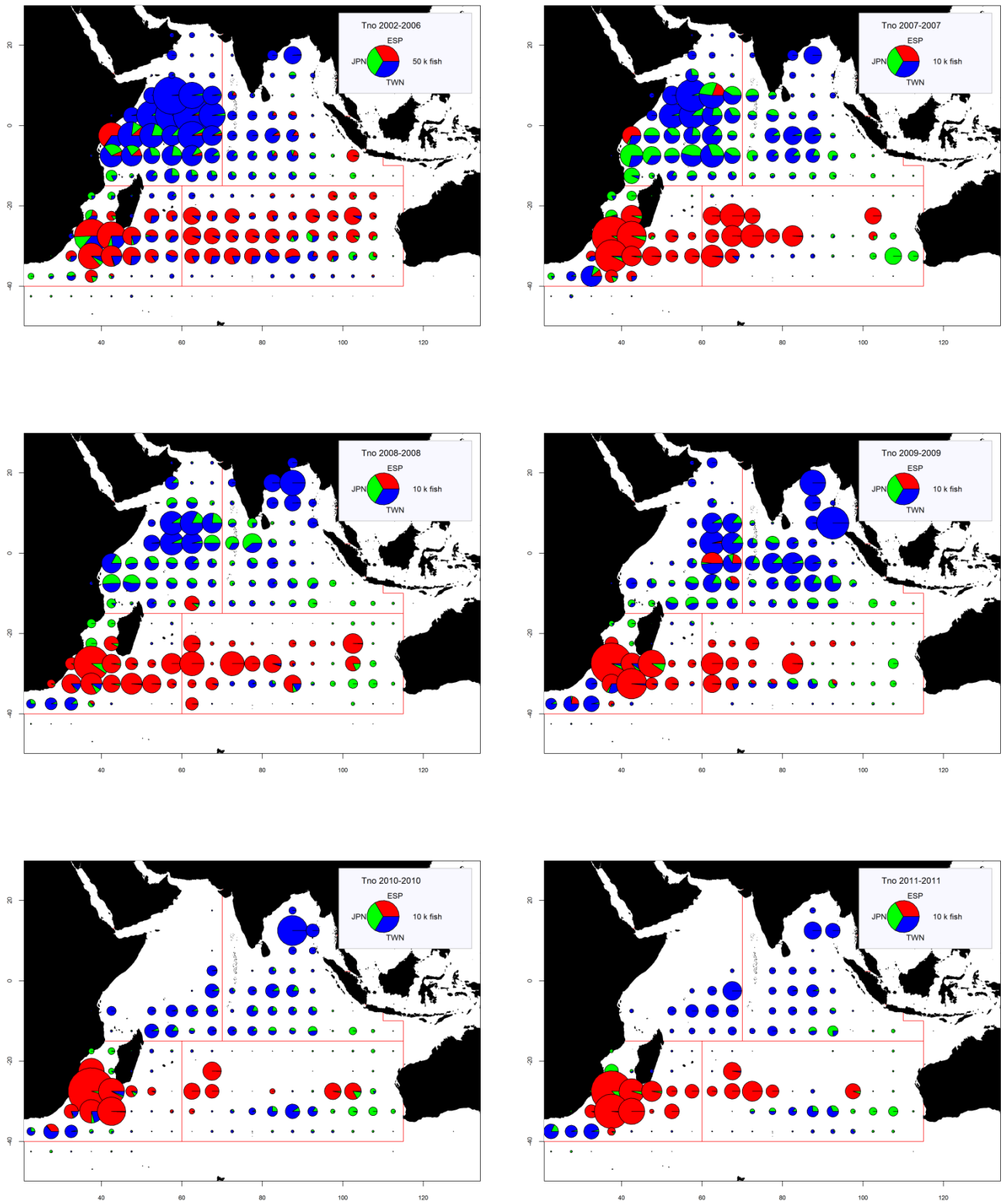



**Fig. 6a-f:** Time-area catches (total combined in tonnes) of swordfish as reported for the longline fleets of Japan (**JPN**), Taiwan,China (**TWN**), and EU-Spain (**ESP**), the latter directed at swordfish, for the period 2002-2006 by type of gear and for 2007-11, by year and type of gear. Red lines represent the boundaries of the areas used for the assessments of swordfish.

- **Status of Fisheries Statistics at the IOTC**

**Retained catches** are fairly well known (**Fig. 7**); however catches are uncertain for:

- **Drifting gillnet** fisheries of **Iran** and **Pakistan**: To date, Iran has not reported catches of swordfish for its gillnet fishery. Although Pakistan has reported catches of swordfish they are considered to be too low for a driftnet fishery (catches of swordfish in recent years represent less than 2% of the total catches of swordfish in the Indian Ocean).
- **Longline** fishery of **Indonesia**: The catches of swordfish for the fresh tuna longline fishery of Indonesia may have been underestimated in recent years due to insufficient sampling coverage. Although the new catches estimated by the Secretariat are thought to be more accurate, swordfish catches remain uncertain, especially in recent years (where they represent around 6% of the total catches of swordfish in the Indian Ocean).
- **Longline** fishery of **India: India** has reported very incomplete catches and catch-and-effort data for its longline fishery. Although the new catches estimated by the Secretariat are thought to be more accurate, catches of swordfish remain uncertain (catches of swordfish in recent years represent less than 3% of the total catches of swordfish in the Indian Ocean).
- **Longline** fleets from **non-reporting** countries (NEI): The Secretariat had to estimate catches of swordfish for a fleet of longliners targeting tunas or swordfish and operating under flags of various non-reporting countries. The catches estimated since 2006 are, however, low (they represent around 4% of the total catches of swordfish in the Indian Ocean).

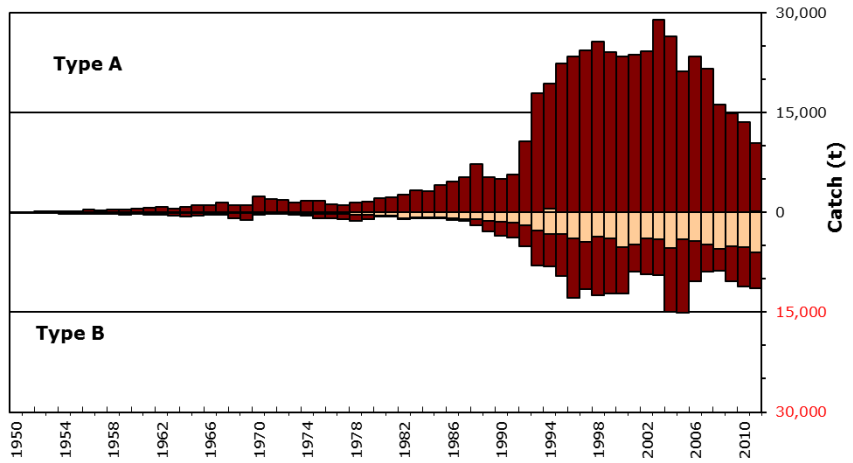



**Fig. 7**. Uncertainty of annual catch estimates for swordfish (Data as of July 2013).

*Catches below the zero-line (**Type B**) refer to fleets that do not report catch data to the IOTC (estimated by the IOTC Secretariat), do not report catch data by gear and/or species (broken by gear and species by the IOTC Secretariat) or any of the other reasons provided in the document. Catches over the zero-line (**Type A**) refer to fleets for which no major inconsistencies have been found to exist. Light bars represent data for artisanal fleets and dark bars represent data for industrial fleets.*

**Discards** are believed to be low although they are unknown for most industrial fisheries, mainly longliners. Discards of swordfish may also occur in the driftnet fishery of Iran, as this species has no commercial value in this country.

**Changes to the catch series:** There have been changes to the catches of swordfish since the WPB meeting in 2012 (**Fig. 8a**). Most changes that have been made to the data series since the last WPB are relatively small increases to the nominal catch as a result of reallocation of catch reported as other billfish species or as aggregated species groups reported by Sri Lanka, Iran, and Pakistan to a lesser extent. These changes, however, did not lead to very significant changes in the total catch estimates (**Fig. 8b**).

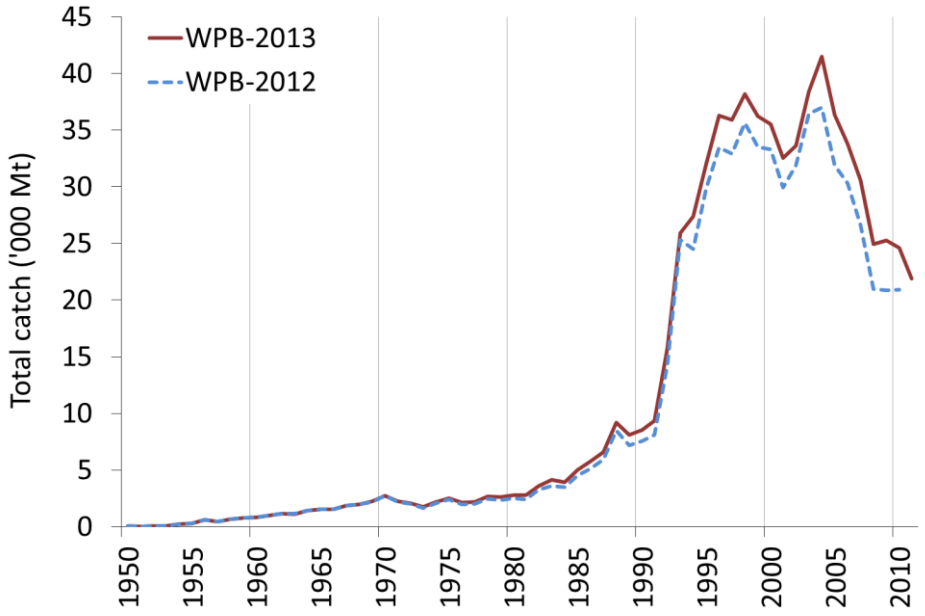



**Fig. 8a.** Swordfish: catches used by the WPB in 2012 *versus* those estimated for the WPB12 (1950–2010).

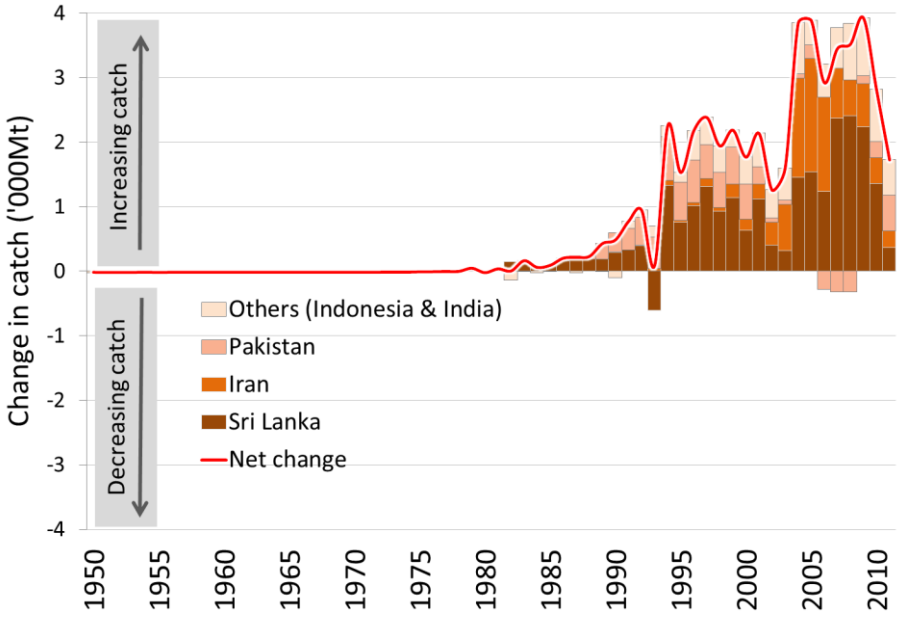



**Fig. 8b.** Swordfish: revisions to catch estimates (WPB13 – WPB12) by fleet, (1950-2010).

**Catch–per–unit–effort (CPUE) Series (Fig. 9)**: Catch and effort series are available from some industrial longline fisheries. Nevertheless, catch and effort are not available from some fisheries or they are considered poor quality,

especially since the early 90s (**Indonesia**, fresh-tuna longliners from **Taiwan,China**[10], Non-reporting longliners (**NEI**)).

In addition, catch-and-effort data are not available for the drifting gillnet fisheries of **Iran** and **Pakistan**.

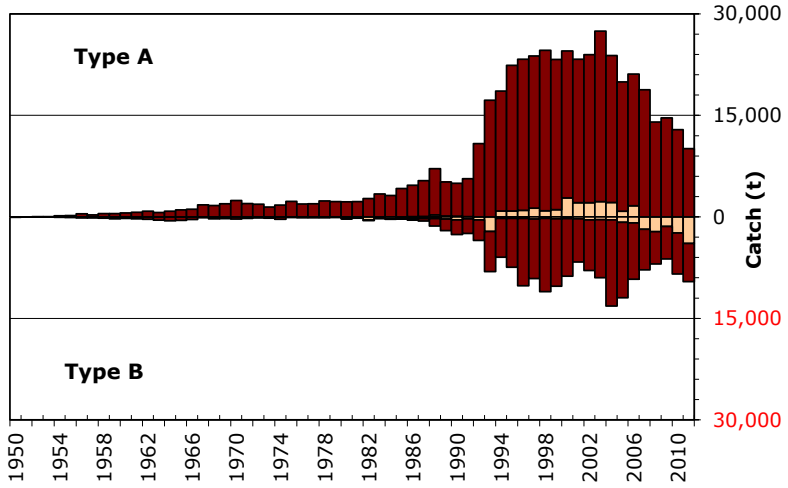



**Fig. 9.** Uncertainty of time-area catches for swordfish (Data as of July 2013)

*Catches below the zero-line (**Type B**) refer to fleets that do not report catch-and-effort data to the IOTC, do not report catch-and-effort data by gear and/or species or any of the other reasons provided in the document. Catches over the zero-line (**Type A**) refer to fleets for which no major inconsistencies have been found to exist. Light bars represent data for artisanal fleets and dark bars represent data for industrial fleets.*

**Fish size or age trends (e.g. by length, weight, sex and/or maturity):** In general, the amount of catch for which size data for the species are available before 2005 is still very low and the number of specimens measured per stratum has been decreasing in recent years (**Fig. 10**).

- **Average fish weight** (**Appendix 1**) can be assessed for several industrial fisheries although they are incomplete or poor quality for most fisheries before the early-80s and in recent years (low sampling coverage and time-area coverage of longliners from Japan). The average weights of swordfish are variable but show no clear trend. It is considered encouraging that there are no clear signals of declines in the size-based indices, but these indices should be carefully monitored, as females mature at a relatively large size, therefore, a reduction in the biomass of large animals could potentially have a strong effect on the spawning biomass.
- **Catch-at-Size(Age)** data are available but the estimates are thought to have been compromised for some years and fisheries due to:
    - the uncertainty in the length frequency data recorded for longliners of **Japan** and **Taiwan,China**, for which average weights of swordfish derived from length frequency data and catch-and-effort data are very different.
    - the uncertainty in the catches of swordfish for the drifting gillnet fisheries of **Iran** and the fresh-tuna longline fishery of **Indonesia**.
    - the total lack of size data before the early-70s and poor coverage before the early-80s and for most artisanal fisheries (**Pakistan**, **India**, **Indonesia**).
    - the paucity of size data available from industrial longliners since the early-1990s (**Japan**, **Philippines**, **India** and **China**).
    - the lack of time-area catches for some industrial fleets (**Indonesia**, **India**, NEI).

[10] Catch-and-effort statistics for the fresh-tuna longline fishery of Taiwan,China are available since 2007, although logbook coverage levels are still low.

- the paucity of biological data available, notably sex-ratio and sex-length-age keys.

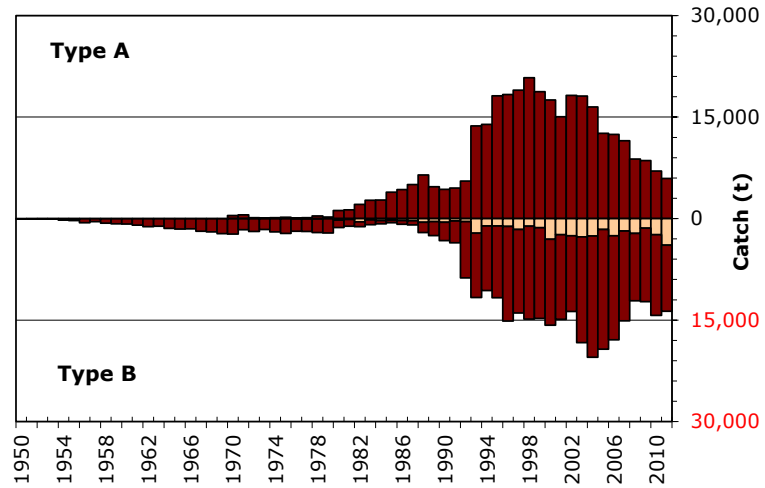



**Fig. 10**. Uncertainty of catch-at-size data for swordfish (Data as of July 2013)

*Catches below the zero-line (**Type B**) refer to fleets that do not report length data to the IOTC, do not report length data by gear, species, month, fishing area or any of the other reasons given in the document. Catches over the zero-line (**Type A**) refer to fleets for which no major inconsistencies have been found to exist. Light bars represent data for artisanal fleets and dark bars represent data for industrial fleets.*

***Blue Marlin (BUM)***

- **Catch trends**

Blue marlin are caught mainly under drifting longlines (65%) and gillnets (30%) with remaining catches recorded under troll and hand lines (**Table 3**, **Fig. 11**). Blue marlins are considered to be a bycatch of industrial and artisanal fisheries. The catches of Blue marlin are typically higher than those of black marlin and striped marlin combined. In recent years, the fleets of Taiwan,China (longline), Indonesia (longline and handline), Iran, (gillnet) Sri Lanka (longline gillnet) account for around 75% of the total catch of blue marlin (**Fig. 12**). The distribution of blue marlin catches has changed since the 1980's with most of the catch now taken in the western areas of the Indian Ocean (**Figs. 13 & 14**).

Catch trends for blue marlin are variable; however, this may reflect the level of reporting. The catches of blue marlin under drifting longlines were more or less stable until the mid-80's, at around 3,000 t to 4,000 t, and have steadily increased since then to between 6,000 t to 8,000 t. The largest catches reported by longlines were recorded in 1998 (~11,000 t). Catches under drifting longlines have been recorded under **Taiwan,China** and **Japan** fleets and, recently, **Indonesia**, **India**, **Sri Lanka** and several **NEI** fleets (**Fig. 12**). In recent years, the deep-freezing longliners from **Taiwan,China** and **Japan** have reported most of the catches of blue marlin in waters of the western and central tropical Indian Ocean and, to a lesser extent, the Mozambique Channel and the Arabian Sea (**Fig. 13 & 14**).

**TABLE 3**: Best scientific estimates of the catches of blue marlin by type of fishery for the period 1950–2011 (in metric tons). Data as of July 2013.

| Fishery | By decade (average) | | | | | | By year (last ten years) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1950s | 1960s | 1970s | 1980s | 1990s | 2000s | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
| LL | 2,563 | 3,513 | 3,482 | 4,969 | 7,194 | 7,338 | 7,458 | 8,799 | 8,806 | 7,630 | 7,794 | 6,153 | 6,069 | 6,520 | 6,039 | 6,327 |
| GN | 1 | 2 | 124 | 764 | 2,495 | 4,469 | 2,654 | 3,757 | 6,511 | 8,370 | 6,158 | 4,231 | 3,603 | 3,446 | 3,077 | 3,730 |
| HL | 5 | 9 | 18 | 105 | 149 | 120 | 76 | 81 | 95 | 85 | 121 | 122 | 201 | 250 | 271 | 268 |
| OT | 0 | 0 | 0 | 2 | 4 | 7 | 4 | 5 | 5 | 5 | 7 | 7 | 12 | 15 | 15 | 16 |
| Total | 2,570 | 3,525 | 3,623 | 5,840 | 9,842 | 11,934 | 10,193 | 12,642 | 15,417 | 16,090 | 14,080 | 10,514 | 9,884 | 10,230 | 9,402 | 10,340 |

**Fisheries:** Gillnet (**GN**); Longline (**LL**); Hook-and-Line (**HL**), including handline, trolling, baitboat, and sport fisheries; Other gears (**OT**)

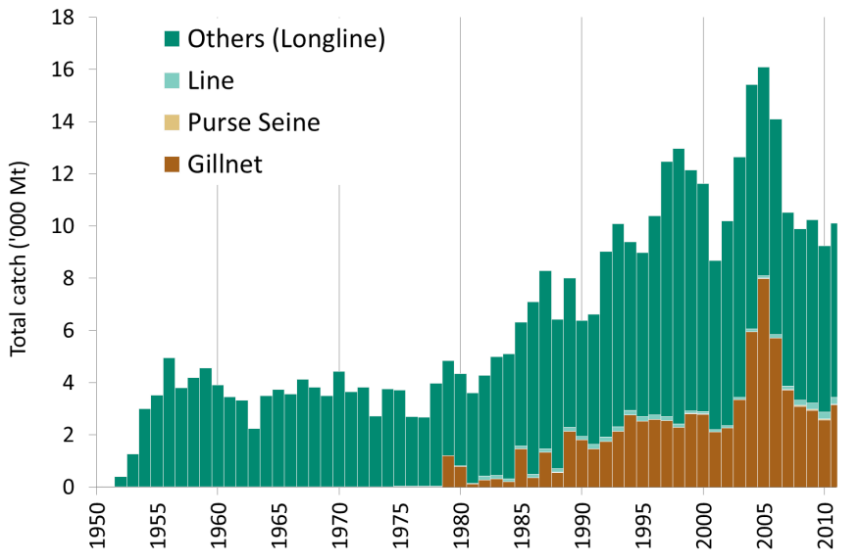



**Fig. 11.** Catches of blue marlin by gear and year recorded in the IOTC Database (1960–2011).

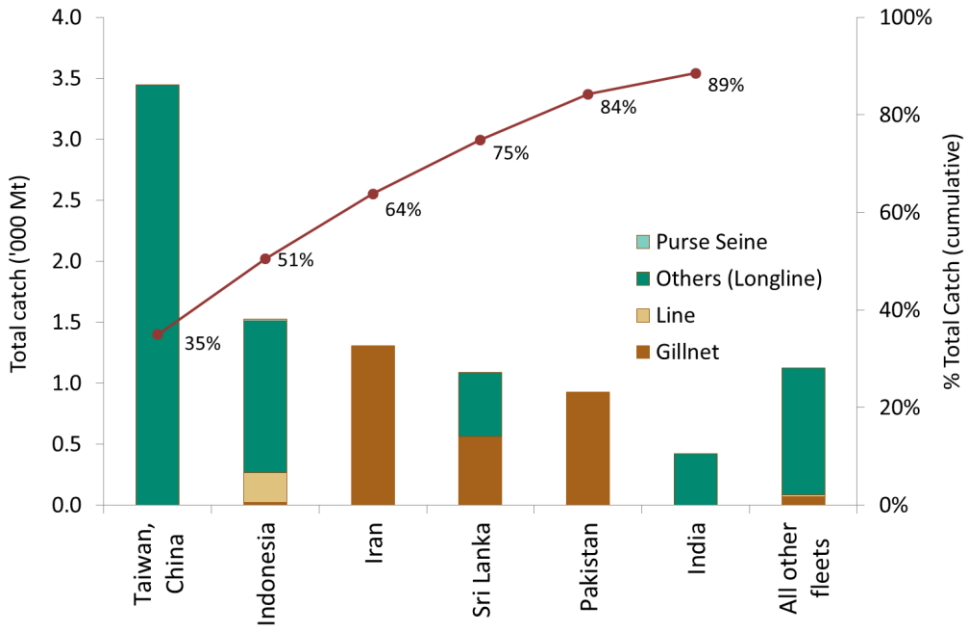



**Fig. 12:** Blue marlin: average catches in the Indian Ocean over the period 2009–11, by country. Countries are ordered from left to right, according to the importance of catches of blue marlin reported. The red line indicates the (cumulative) proportion of catches of blue marlin for the countries concerned, over the total combined catches of this species reported from all countries and fisheries.

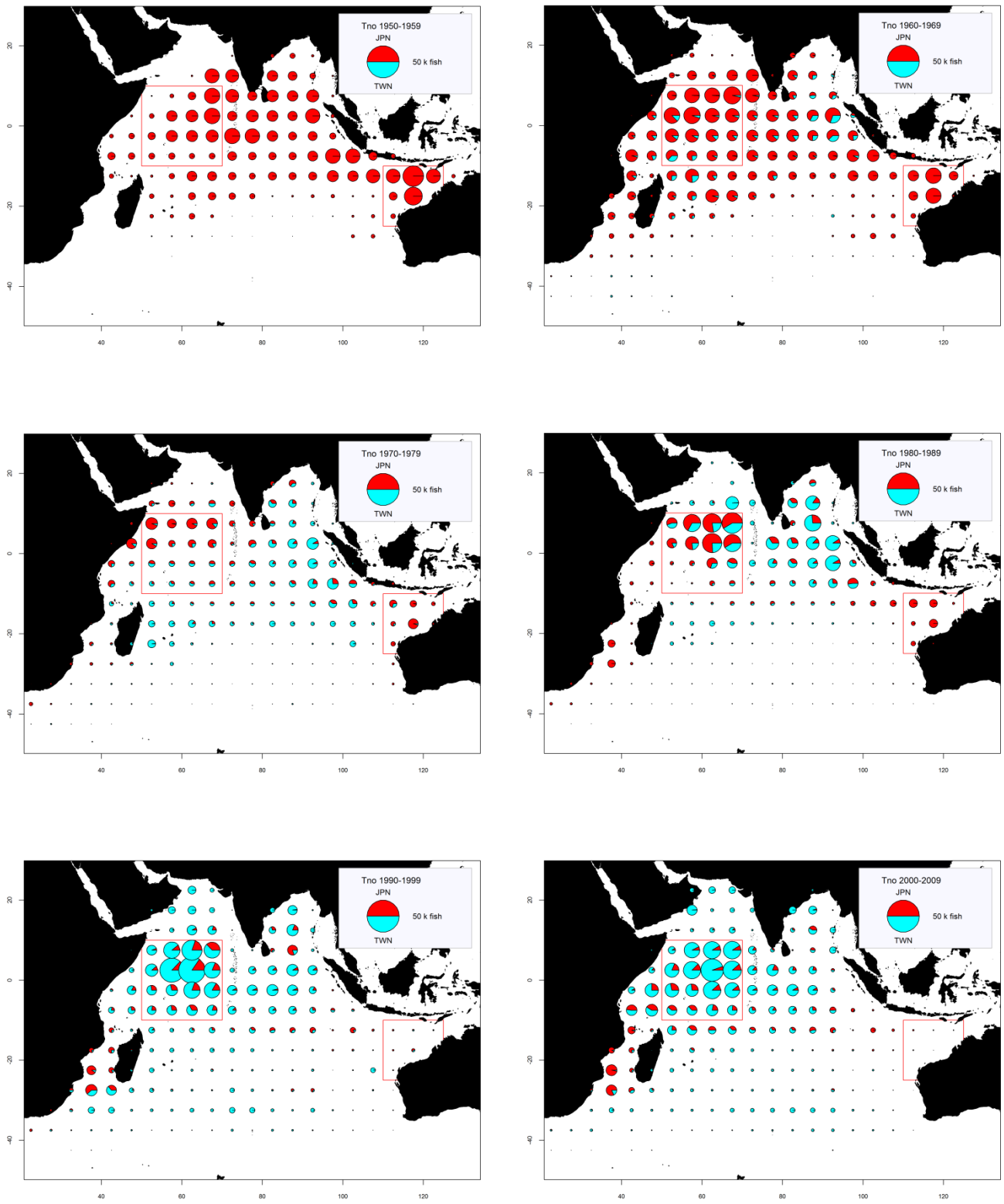



**Fig. 13a-f.** Time-area catches (in number of fish) of blue marlin as reported for the longline fisheries of Japan (JPN) and Taiwan,China (TWN) for the period 1950-2009, by decade and fleet. Red lines represent the boundaries of the marlin hot spots identified by the WPB.

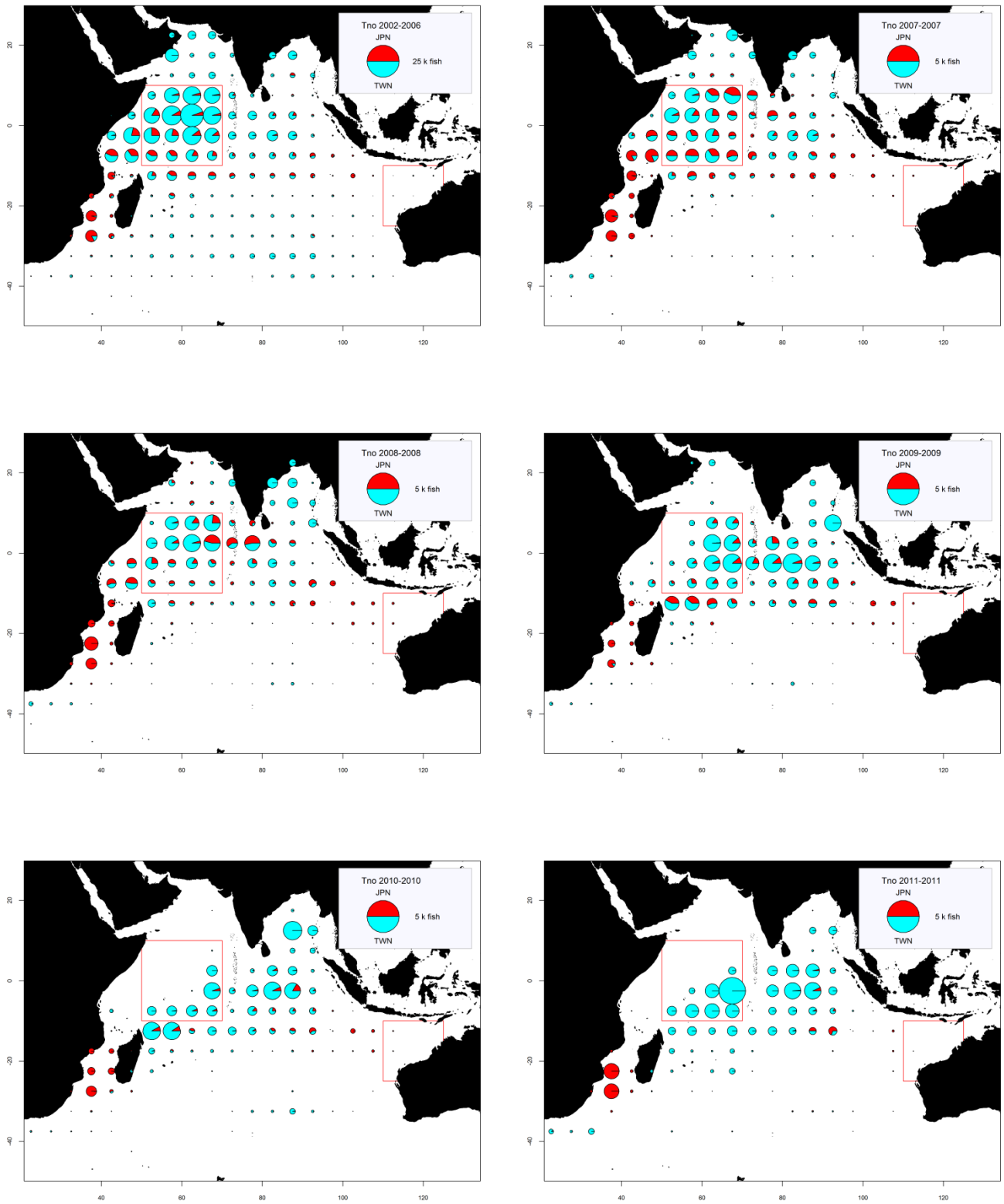



**Fig. 14a-f.** Time-area catches (in number of fish) of blue marlin as reported for the longline fisheries of Japan (JPN) and Taiwan,China (TWN) for the period 2002–06 by fleet and for 2007–11, by year and fleet. Red lines represent the boundaries of the marlin hot spots identified by the WPB.

- **Status of Fisheries Statistics at the IOTC**

Minimum catch estimates have been derived from very small amounts of information and are therefore highly uncertain. Difficulties in the identification of marlins also contribute to the uncertainties of the information available to the Secretariat.

Retained catches are poorly known for most fisheries (**Fig. 15**) due to:

- catch reports often refer to total catches of all three marlin species combined or as an aggregate of all billfish species; catches by species are estimated by the Secretariat for some artisanal (gillnet/longline fishery of **Sri Lanka** and artisanal fisheries of **India**, **Iran** and **Pakistan**) and industrial (longliners of **Indonesia** and **Philippines**) fisheries
- catches of non-reporting industrial longliners (**India**, **NEI**) and the gillnet fishery of **Indonesia** are estimated by the Secretariat using alternative information
- catches are likely to be incomplete for industrial fisheries for which the blue marlin is not a target species
- conflicting catch reports: Longline catches from the **Republic of Korea** are reported as nominal catches, and catch and effort reports are conflicting, with higher catches recorded in the catch and effort table. For this reason, the Secretariat revised the catches of blue marlin for the Republic of Korea over the time-series using both datasets. Although the new catches estimated by the Secretariat are thought to be more accurate, catches of blue marlin remain uncertain for this fleet.
- a lack of catch data for most sport fisheries.

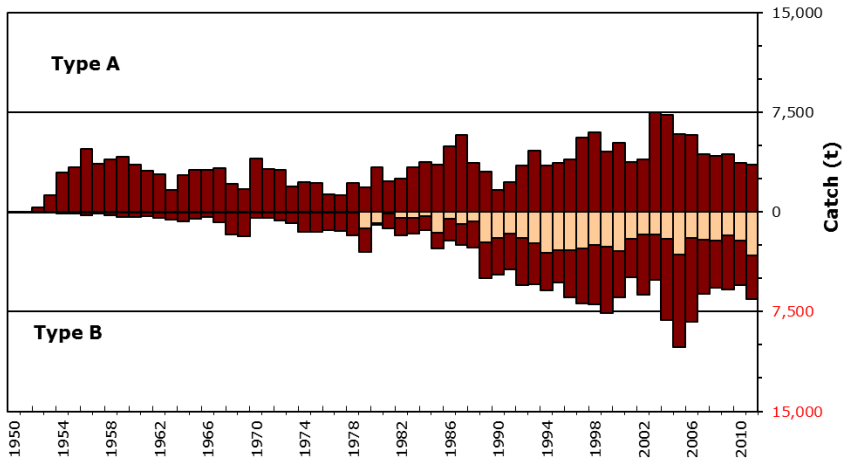



**Fig. 15**. Uncertainty of annual catch estimates for blue marlin (data as of July 2013).

*Catches below the zero-line (**Type B**) refer to fleets that do not report catch data to the IOTC (estimated by the IOTC Secretariat), do not report catch data by gear and/or species (broken by gear and species by the IOTC Secretariat) or any of the other reasons provided in the document. Catches over the zero-line (**Type A**) refer to fleets for which no major inconsistencies have been found to exist. Light bars represent data for artisanal fleets and dark bars represent data for industrial fleets.*

**Discards** are unknown for most industrial fisheries, mainly longliners. Discards of blue marlin may also occur in the driftnet fishery of I.R. Iran, as this species has no commercial value in this country.

**Changes to the catch series:** There have been relatively large changes to the catches of blue marlin since the WPB meeting in 2012 (**Fig. 16a**) mainly for the mid-2000s. Catches for Iran and Pakistan have been revised upwards

following improvements by IOTC in the disaggregation by species of catches reported as (aggregated) billfish catches; while some of the catches for Sri Lanka have been reassigned as black marlin in response to large fluctuations in the reported catch estimates due to misidentification of the two species (**Fig. 16b**).

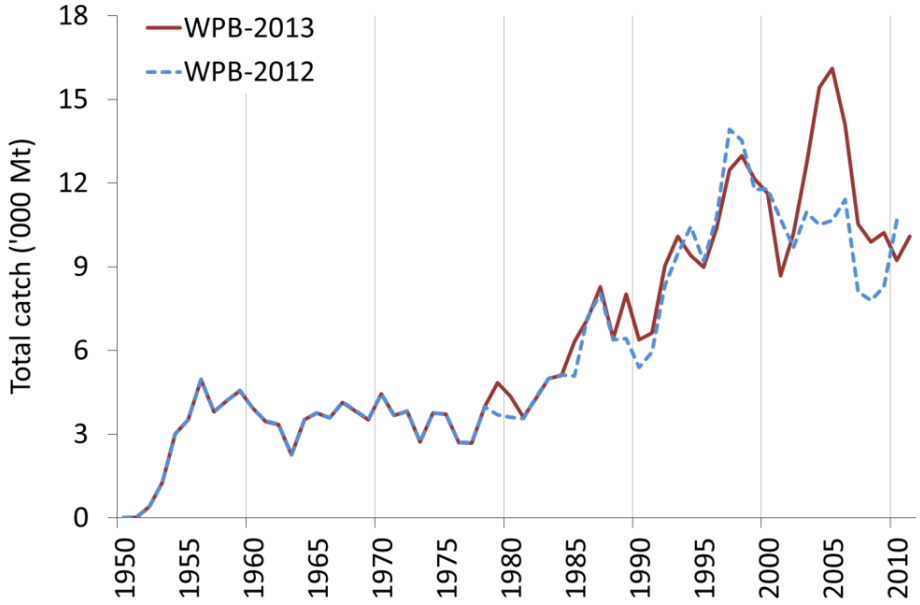



**Fig. 16a.** Blue marlin: catches used by the WPB in 2013 *versus* those estimated for the WPB13 (1950–2010).

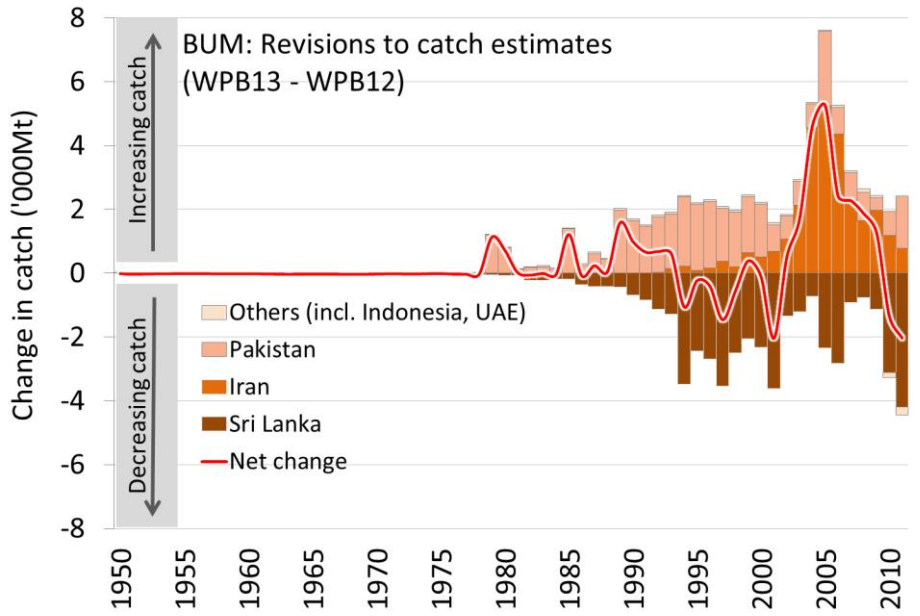



**Fig. 16b.** Blue marlin: revisions to catch estimates (WPB13 – WPB12) by fleet, (1950-2010).

**Catch–per–unit–effort (CPUE) Series**: Nominal CPUE series are available from some industrial longline fisheries (primarily the Japanese longline fleet; **Appendix 1**) although catches are thought to be incomplete (catches of non-target species are not always recorded in logbooks). No catch and effort data are available from sports fisheries, other than for partial data from the sports fisheries of Kenya; or other artisanal (gillnet fisheries of Iran and Pakistan, gillnet/longlines of Sri Lanka, gillnets of Indonesia) or industrial fisheries (NEI longliners and all purse seiners).

**Fish size or age trends (e.g. by length, weight, sex and/or maturity): Average fish weight** can only be assessed for the longline fishery of **Japan** since 1970 and **Taiwan,China** since 1980. However, the number of specimens measured on Japanese longliners in recent years is very low and miss-identification of striped and blue marlin may be occurring in the Taiwanese longline fishery; the length frequency distributions derived from samples collected on Taiwanese longliners differ greatly from those collected on longliners flagged in Japan (**Appendix 1**).

**Catch-at-Size(Age)** tables have not been built for blue marlin due to a lack of information reported by CPCs. Fish size is derived from various length and weight information, however the reliability of the size data is reduced when relatively few fish out of the total catch are measured.

**Sex ratio** data have not been provided to the Secretariat by CPCs.

***Black Marlin (BLM)***

- **Catch trends –**

Black marlin are caught mainly under drifting longlines (37%) and gillnets (38%) with remaining catches recorded under troll and hand lines (**Table 4, Fig. 17**). Black marlin are the bycatch of industrial and artisanal fisheries. In recent years, the fleets of **Sri Lanka** (longline and gillnet), **Indonesia** (troll and hand lines) and **India** (gillnet and troll) account for around 77% of the catch of black marlin (**Fig. 18**). Catches of black marlin have increased steadily since the 1990s, from 2,700 t in 1991 to over 10,000 t in 2011. Current annual catches are estimated at between 9,000 t to 10,000 t (**Table 4**).

**TABLE 4.** Best scientific estimates of the catches of black marlin by type of fishery for the period 1950–2010 (in metric tons). Data as of July 2013.

| Fishery | By decade (average) | | | | | | By year (last ten years) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1950s | 1960s | 1970s | 1980s | 1990s | 2000s | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
| LL | 846 | 1,633 | 1,287 | 1,370 | 1,487 | 1,918 | 1,431 | 2,285 | 2,076 | 2,043 | 2,136 | 1,865 | 2,657 | 1,824 | 1,419 | 1,456 |
| GN | 26 | 31 | 44 | 439 | 2,633 | 5,153 | 4,210 | 4,535 | 6,582 | 4,602 | 5,320 | 5,082 | 5,042 | 5,490 | 5,218 | 6,442 |
| HL | 24 | 27 | 42 | 446 | 727 | 1,020 | 714 | 775 | 1,008 | 652 | 913 | 1,018 | 1,479 | 2,159 | 1,669 | 1,892 |
| OT | 0 | 0 | 4 | 65 | 112 | 216 | 135 | 142 | 170 | 155 | 216 | 218 | 370 | 452 | 472 | 500 |
| **Total** | 896 | 1,692 | 1,377 | 2,320 | 4,958 | 8,308 | 6,490 | 7,736 | 9,836 | 7,451 | 8,585 | 8,182 | 9,548 | 9,925 | 8,777 | 10,291 |

**Fisheries:** Gillnet (**GN**); Longline (**LL**); Hook-and-Line (**HL**), including handline, trolling, baitboat, and sport fisheries; Other gears (**OT**)

Between the early-1950s and the late-1980s part of the Japanese fleet was licensed to operate within the EEZ of Australia, and reported very high catches of black marlin in that area, in particular in waters off northwest Australia (F**ig. 19**). In recent years, deep-freezing longliners from **Japan** and **Taiwan,China** have reported lower catches of black marlin, mostly in waters off the western coast of India and, to a lesser extent, the Mozambique Channel (**Fig. 20**).

The catches of black marlin in **Sri Lanka** have risen steadily since the mid-1990's as a result of the development of the fishery using a combination of drifting gillnets and longlines, from around 1,000 t in the early 1990s to over 4,500 t in 2011.

In recent years (2009–11) **India** has reported higher catches of black marlin for its fisheries, amounting to around 1,000 t to 2,000 t, largely from increases in catches from gillnet and troll).

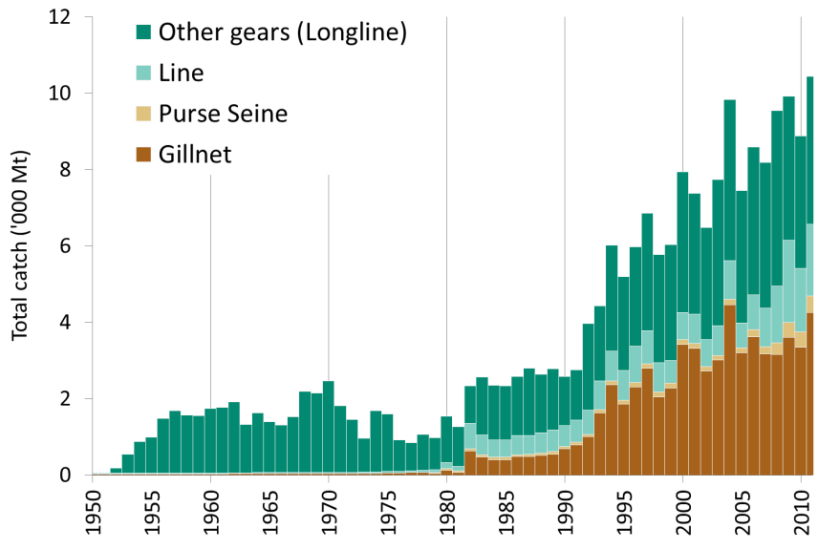



**Fig. 17.** Catches of black marlin by gear and year recorded in the IOTC Database (1960–2011).

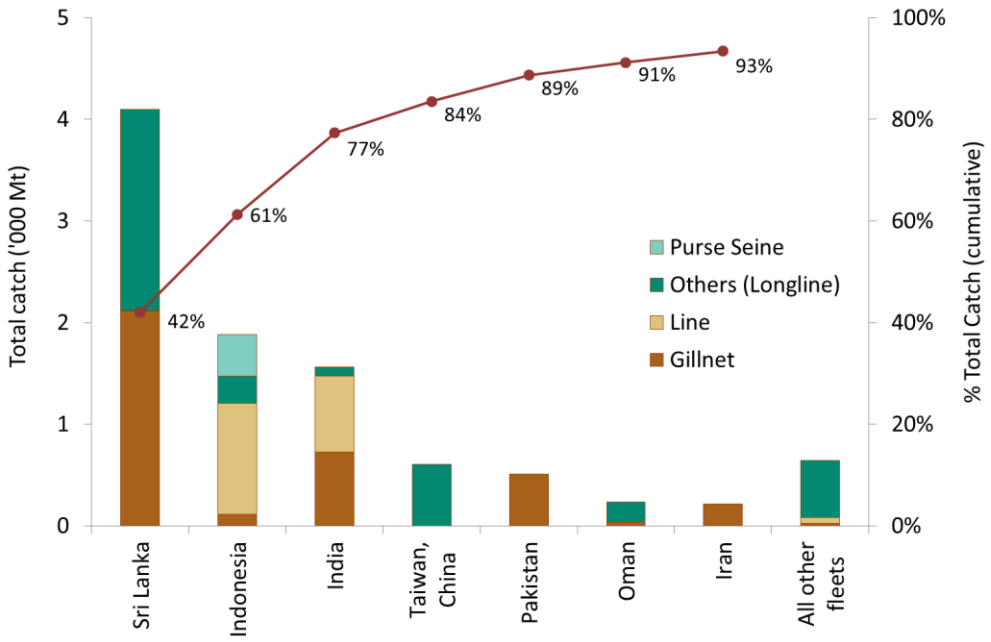



**Fig. 18:** Black marlin: Average catches in the Indian Ocean over the period 2009–11, by country. Countries are ordered from left to right, according to the importance of catches of black marlin reported. The red line indicates the (cumulative) proportion of catches of blue marlin for the countries concerned, over the total combined catches of this species reported from all countries and fisheries.

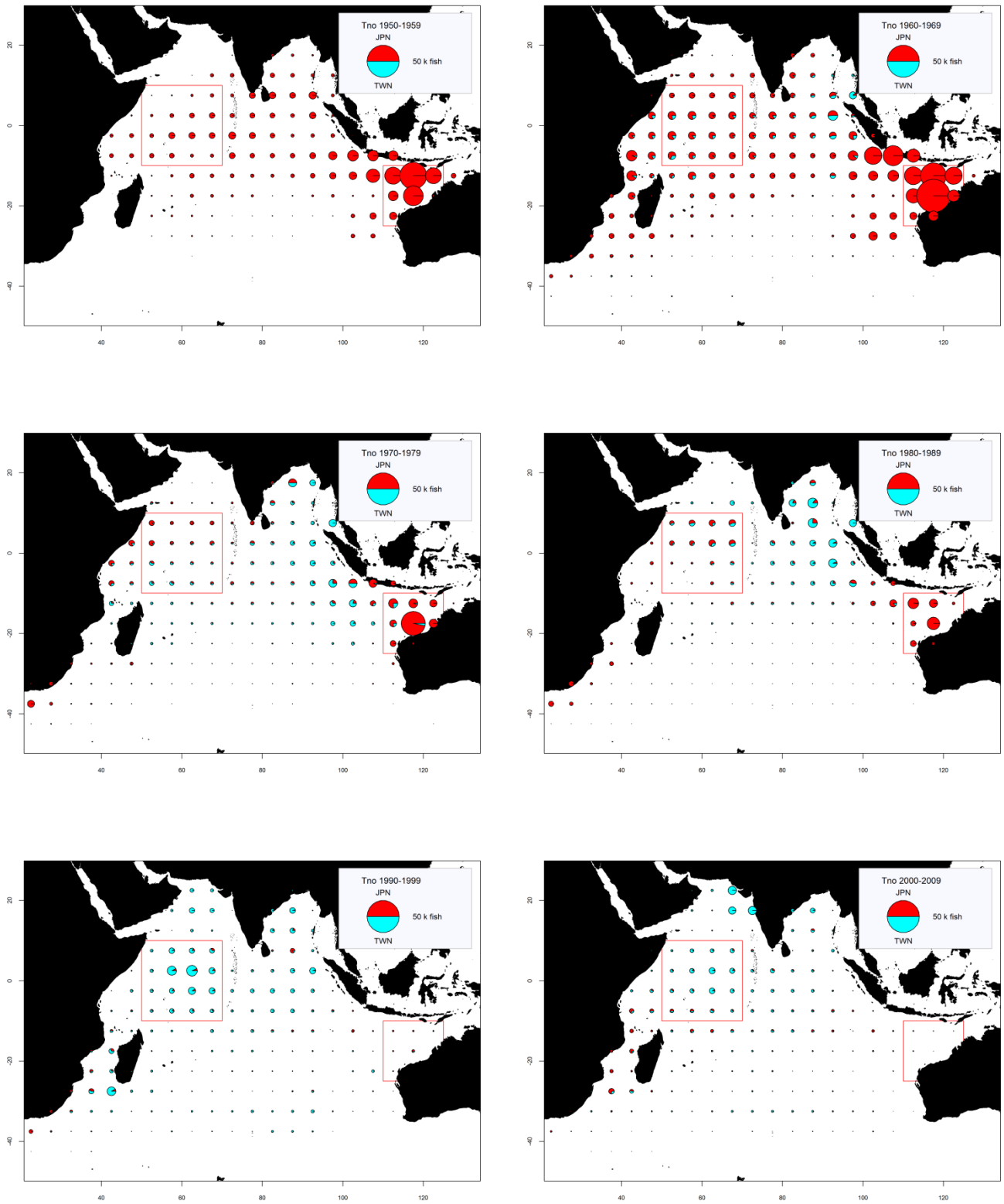



**Fig. 19a-f.** Time-area catches (in number of fish) of black marlin as reported for the longline fisheries of Japan (JPN) and Taiwan,China (TWN) for the period 1950–2009, by decade and fleet. Red lines represent the boundaries of the marlin hot spots identified by the WPB.

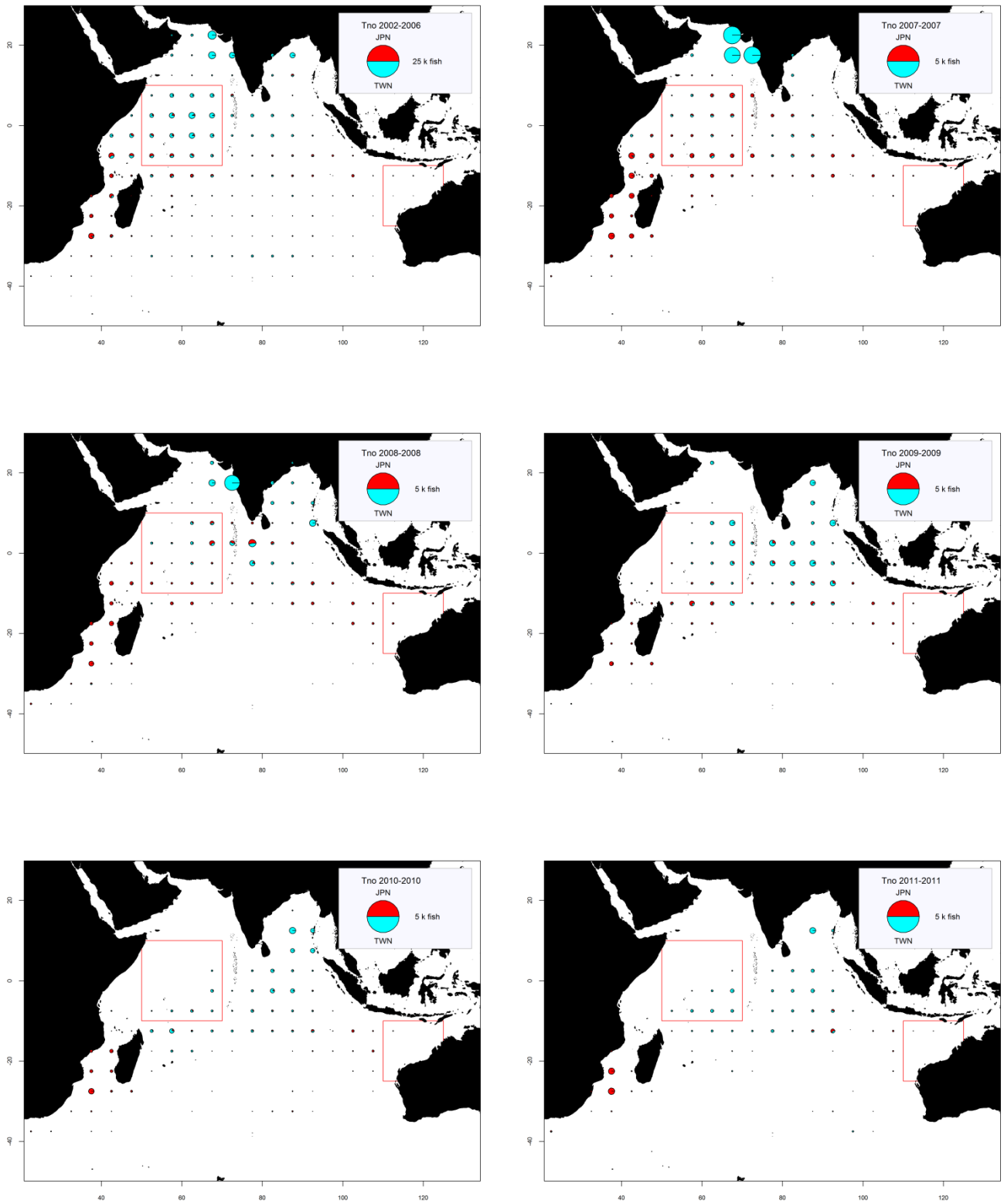



**Fig. 20a-f.** Time-area catches (in number of fish) of black marlin as reported for the longline fisheries of Japan (JPN) and Taiwan,China (TWN) for the period 2002–06 by fleet and for 2007–11, by year and fleet. Red lines represent the boundaries of the marlin hot spots identified by the WPB.

- **Status of Fisheries Statistics at the IOTC**

Minimum catch estimates have been derived from very small amounts of information and are therefore highly uncertain. Difficulties in the identification of marlins also contribute to the uncertainties of the information available to the Secretariat.

**Retained catches** are uncertain for some fisheries (**Fig. 21**), due to the fact that:

- catch reports often refer to total catches of all three marlin species combined; catches by species are estimated by the Secretariat for some artisanal (gillnet/longline fishery of **Sri Lanka** and artisanal fisheries of **India**, **Iran** and **Pakistan**) and industrial (longliners of **Indonesia** and **Philippines**) fisheries.
- catches of non-reporting industrial longliners (**India**, **NEI**) and the gillnet fishery of **Indonesia** are estimated by the Secretariat using alternative information.
- catches are likely to be incomplete for industrial fisheries for which the black marlin is not a target species.
- conflicting catch reports: Longline catches from the **Republic of Korea** are reported as nominal catches, and catch and effort reports are conflicting, with higher catches recorded in the catch and effort table. For this reason, the Secretariat revised the catches of black marlin for the Republic of Korea over the time-series using both datasets. Although the new catches estimated by the Secretariat are thought to be more accurate, catches of black marlin remain uncertain for this fleet.
- a lack of catch data for most sport fisheries.

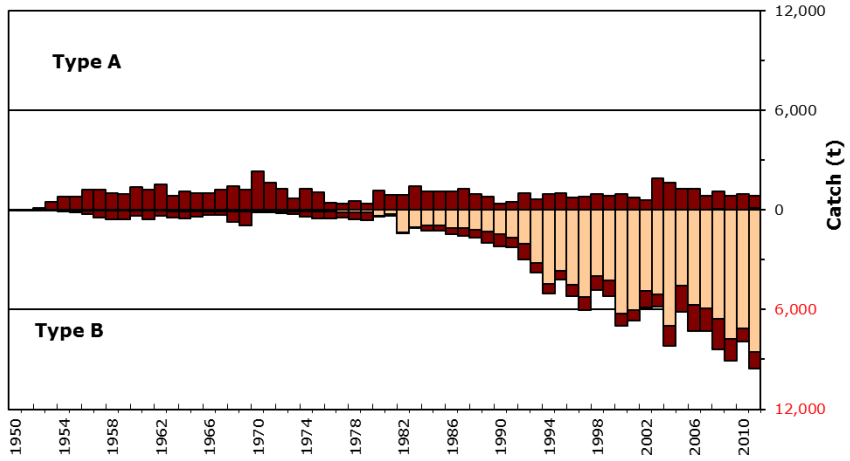



**Fig. 21**. Uncertainty of annual catch estimates for black marlin (Data as of July 2013).

*Catches below the zero-line (**Type B**) refer to fleets that do not report catch data to the IOTC (estimated by the IOTC Secretariat), do not report catch data by gear and/or species (broken by gear and species by the IOTC Secretariat) or any of the other reasons provided in the document. Catches over the zero-line (**Type A**) refer to fleets for which no major inconsistencies have been found to exist. Light bars represent data for artisanal fleets and dark bars represent data for industrial fleets.*

**Discards** are unknown for most industrial fisheries, mainly longliners. Discards of black marlin may also occur in the driftnet fishery of I.R. Iran, as this species has no commercial value in this country.

**Changes to the catch series:** There have been relatively large changes to catches of black marlin since the WPB meeting in 2012 (**Fig. 22a**), mostly as a result of revisions to catches estimates for Sri Lanka (**Fig. 22b**). Catches of marlins in Sri Lanka have frequently been misidentified, making catches in previous years highly uncertain and subject to sharp fluctuations between years. Estimates of black marlins have subsequently been revised by IOTC from around 1,000 t to over 4,000 t in the last decade in response to inconsistencies identified in the reported data; with most of the increase the result of reallocation of catch previously reported as blue marlin.

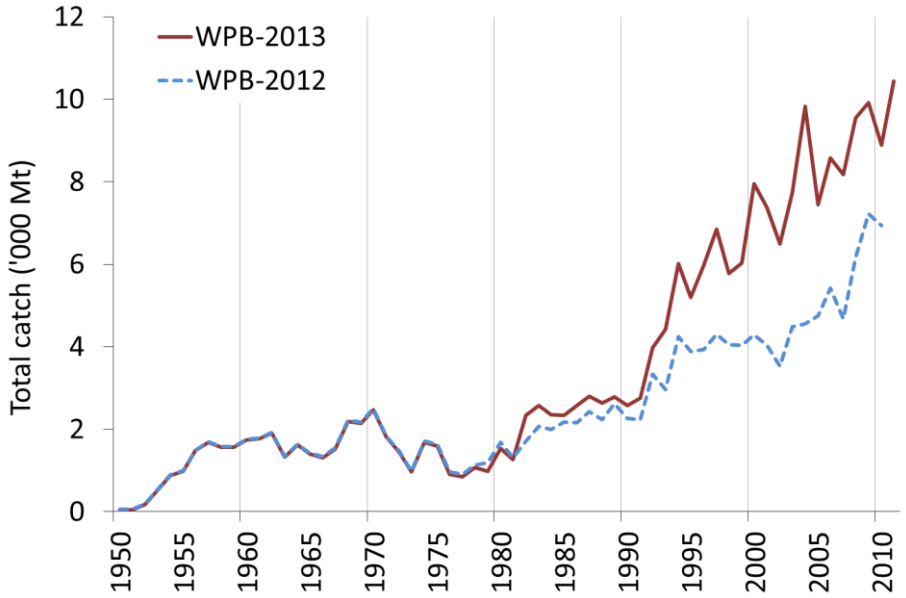



**Fig. 22a.** Black marlin: catches used by the WPB in 2013 *versus* those estimated for the WPB12 (1950–2010).

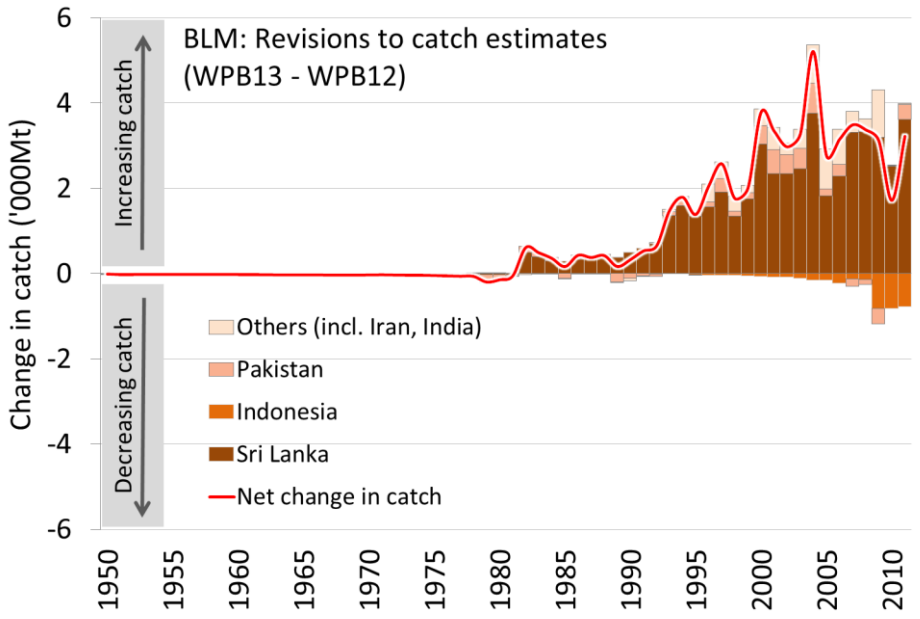



**Fig. 22b.** Black marlin: revisions to catch estimates (WPB13 – WPB12) by fleet, (1950-2011).

**Catch–per–unit–effort (CPUE) Series**: Standardised CPUE series have not yet been developed. Nominal CPUE series are however available from some industrial longline fisheries (primarily the Japanese longline fleet; **Appendix 1**) although catches are thought to be incomplete (catches of non-target species are not always recorded in logbooks). No catch and effort data are available from sports fisheries, other than for partial data from the sports fisheries of Kenya; or other artisanal (gillnet fisheries of Iran and Pakistan, gillnet/longlines of Sri Lanka, gillnets of Indonesia) or industrial fisheries (NEI longliners and all purse seiners).

**Fish size or age trends (e.g. by length, weight, sex and/or maturity):** Average fish weight can only be assessed for the longline fishery of Japan since 1970 and Taiwan,China since 1980. The number of specimens measured on Japanese longliners in recent years is, however, very low.

**Catch-at-Size(Age)** tables have not been built for black marlin due to a lack of information reported by CPCs. Fish size is derived from various length and weight information, however the reliability of the size data is reduced when relatively few fish out of the total catch are measured.

**Sex ratio** data have not been provided to the Secretariat by CPCs.

***Striped Marlin (MLS)***

- **Catch trends**

Striped marlin are caught almost exclusively under drifting longlines, which in previous years have accounted for as much as 98% of the catch. The remaining catches are recorded under gillnets and troll lines (**Table 5, Fig. 23**). Striped marlin are generally considered to be a bycatch of industrial fisheries. Catch trends for striped marlin are variable, ranging from 2000 t to 8000 t per year (**Fig. 24**); however, this may reflect the level of reporting. Similarly, catches reported under drifting longlines are highly variable, with recent falls since 2009 largely due to declining catches reported by Taiwan,China, deep-freezing and fresh-tuna longliners.

**TABLE 5**: Best scientific estimates of the catches of striped marlin by type of fishery for the period 1950–2010 (in metric tons). Data as of July 2013.

| Fishery | By decade (average) | | | | | | By year (last ten years) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1950s | 1960s | 1970s | 1980s | 1990s | 2000s | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
| LL | 1,024 | 3,077 | 3,609 | 5,036 | 4,990 | 2,946 | 3,112 | 3,111 | 3,722 | 2,964 | 3,091 | 2,415 | 2,279 | 1,849 | 1,882 | 1,675 |
| GN | 5 | 8 | 16 | 22 | 139 | 245 | 226 | 237 | 331 | 235 | 281 | 198 | 196 | 164 | 189 | 452 |
| HL | 3 | 5 | 11 | 32 | 69 | 130 | 80 | 84 | 102 | 92 | 129 | 134 | 223 | 272 | 284 | 300 |
| OT | 0 | 0 | 0 | 6 | 10 | 19 | 12 | 13 | 15 | 14 | 19 | 19 | 33 | 40 | 42 | 44 |
| **Total** | 1,032 | 3,089 | 3,636 | 5,096 | 5,208 | 3,341 | 3,430 | 3,445 | 4,170 | 3,304 | 3,520 | 2,766 | 2,731 | 2,324 | 2,397 | 2,470 |

**Fisheries:** Gillnet (**GN**); Longline (**LL**); Hook-and-Line (**HL**), including handline, trolling, baitboat, and sport fisheries; Other gears (**OT**)

Catches under drifting longlines have been recorded under **Taiwan,China**, **Japan**, **Republic of Korea** fleets and, recently, **Indonesia** and several **NEI** fleets. Taiwan,China and Japan have reported large drops in the catches of striped marlin for its longline fleets since the mid-1980's and mid-1990's, respectively. The reason for such decreases in catches is not fully understood. Between the early-50s and the late-80s part of the Japanese fleet was licensed to operate within the EEZ of Australia, reporting relatively high catches of striped marlin in the area, in particular in waters off northwest Australia. High catches of the species were also reported in the Bay of Bengal during this period, by both Taiwan,China and Japanese longliners. The distribution of striped marlin catches has changed since the 1980's with most of the catch now taken in the western areas of the Indian Ocean (**Fig. 25**). These changes of fishing area and catches over the years are thought to be related to changes in the type of access agreements to EEZs of coastal countries in the Indian Ocean, rather than changes in the distribution of the species over time. However, since 2007, catches in the northwest Indian Ocean have dropped markedly, in tandem with a reduction of longline effort in the area as a consequence of maritime piracy off Somalia (**Fig. 26**).

Discards are believed to be low although they are unknown for most industrial fisheries, mainly longliners. Discards of striped marlin may also occur in the driftnet fishery of the I.R of Iran, as this species has no commercial value in this country.

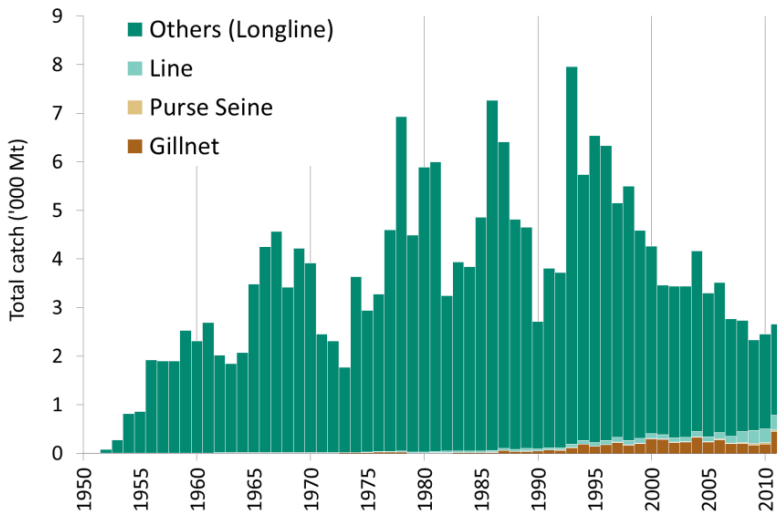



**Fig. 23.** Catches of Striped marlin by gear and year recorded in the IOTC Database (1960–2011).

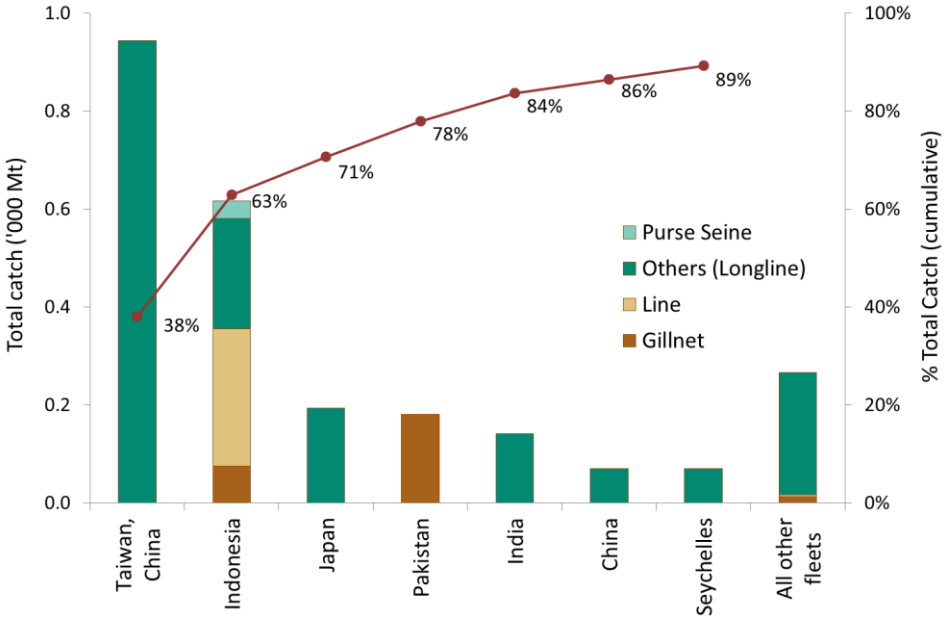



**Fig. 24:** Striped marlin: Average catches in the Indian Ocean over the period 2009–11, by country. Countries are ordered from left to right, according to the importance of catches of black marlin reported. The red line indicates the (cumulative) proportion of catches of Striped marlin for the countries concerned, over the total combined catches of this species reported from all countries and fisheries.

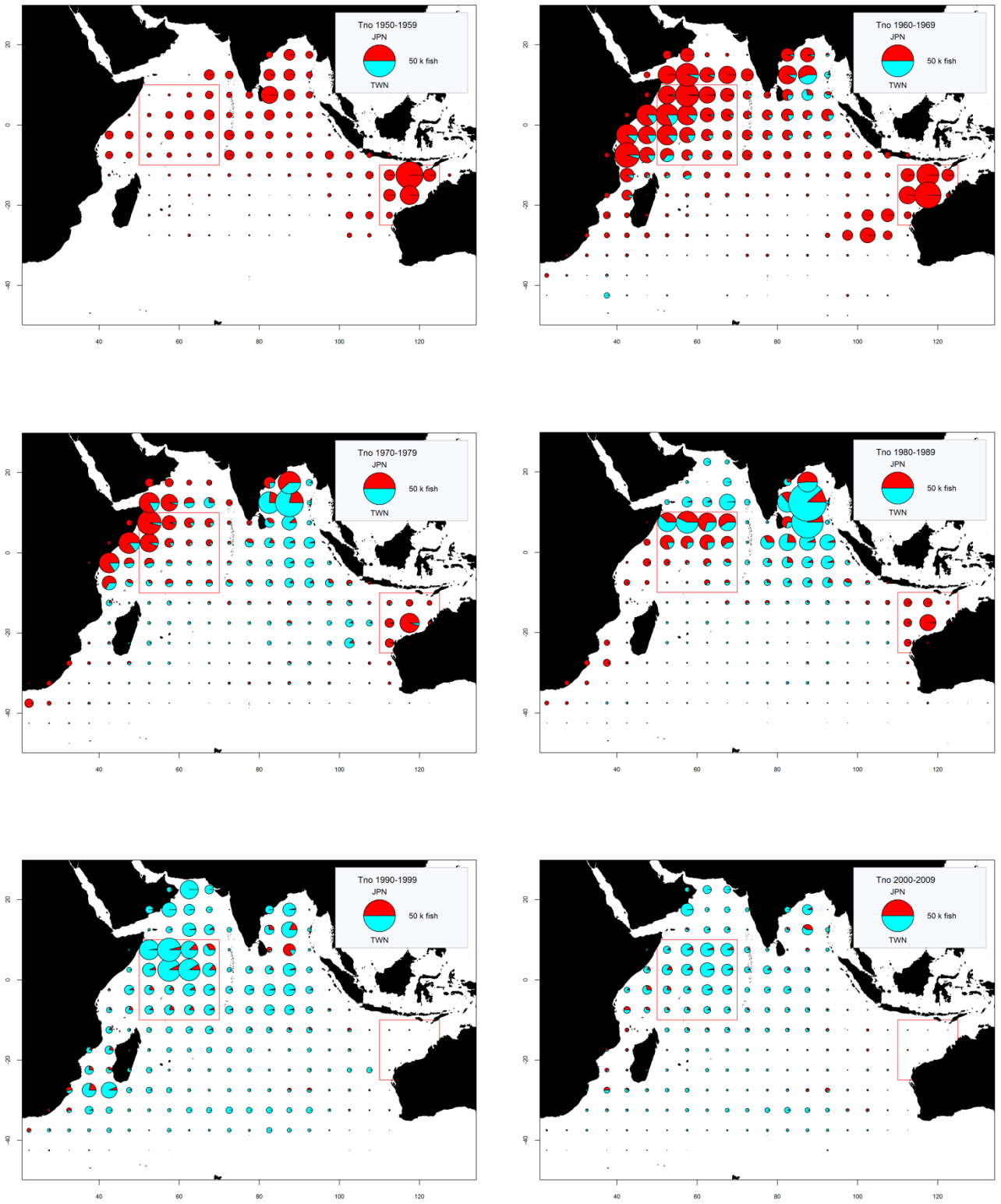



**Fig. 25a-f.** Time-area catches (in number of fish) of striped marlin as reported for the longline fisheries of Japan (JPN) and Taiwan,China (TWN) for the period 1950–2009, by decade and fleet. Red lines represent the boundaries of the marlin hot spots identified by the WPB.

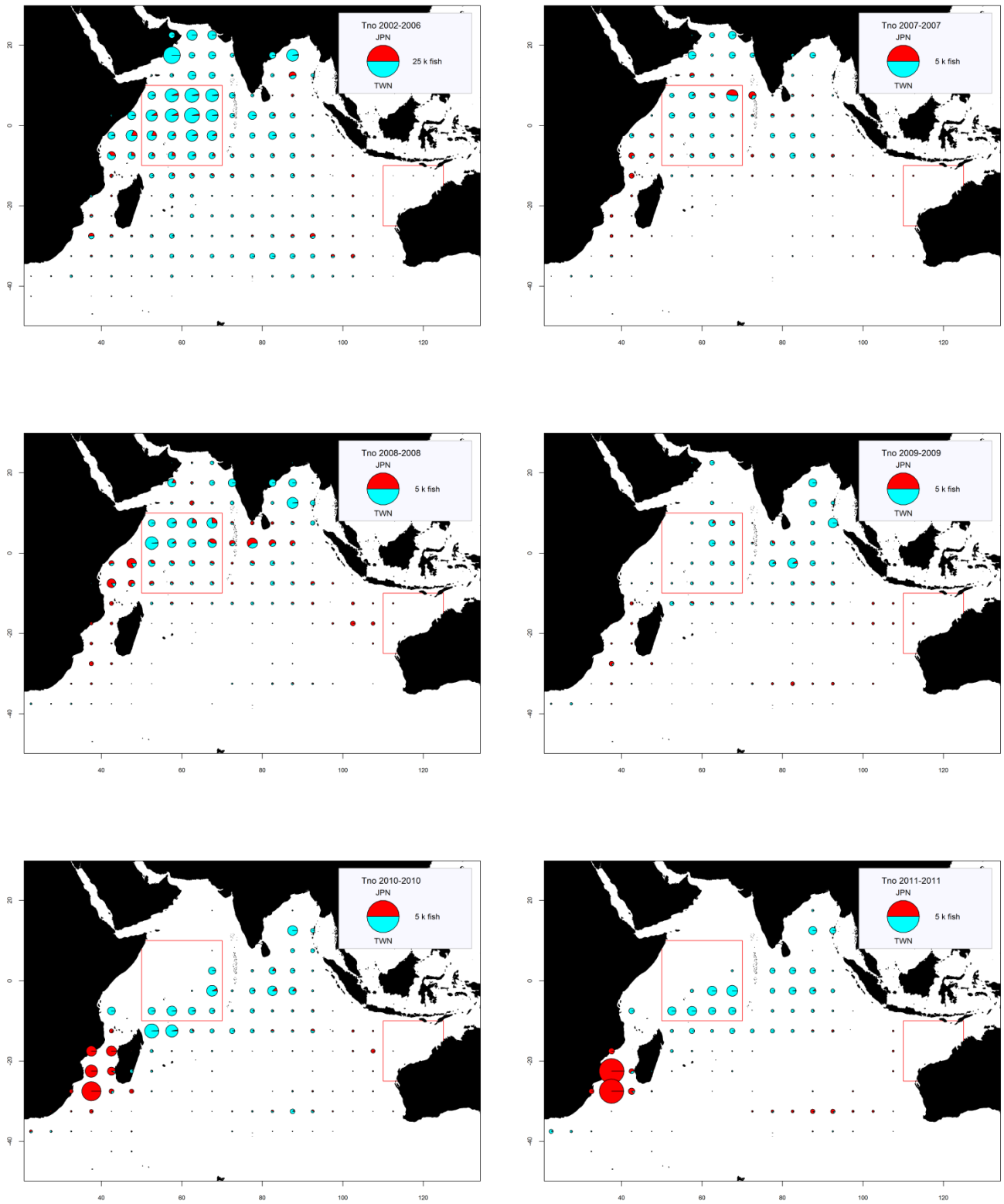



**Fig. 26a-f.** Time-area catches (in number of fish) of striped marlin as reported for the longline fisheries of Japan (JPN) and Taiwan,China (TWN) for the period 2002–06 by fleet and for 2007–11, by year and fleet. Red lines represent the boundaries of the marlin hot spots identified by the WPB.

- **Status of Fisheries Statistics at the IOTC**

**Retained catches** are reasonably well known (**Fig. 27**) although they remain uncertain for some fleets:

- Catch reports refer to total catches of all three marlin species; catches by species have to be estimated by the IOTC Secretariat for some industrial fisheries (longliners of **Indonesia** and **Philippines**).
- Catches of non-reporting industrial longliners (**India**, **NEI**) estimated by the IOTC Secretariat using alternative information. As they are not reported by the countries concerned, catches are likely to be incomplete for some industrial fisheries for which the striped marlin is seldom the target species.
- Conflicting catch reports: The catches for longliners flagged to the **Republic of Korea**, reported as nominal catches and catches and effort, are conflicting with higher catches recorded in the catch and effort table. For this reason, the IOTC Secretariat revised the catches of striped marlin over the time-series using both datasets. Although the new catches estimated by the IOTC Secretariat are thought to be more accurate, catches of striped marlin remain uncertain for this fleet.

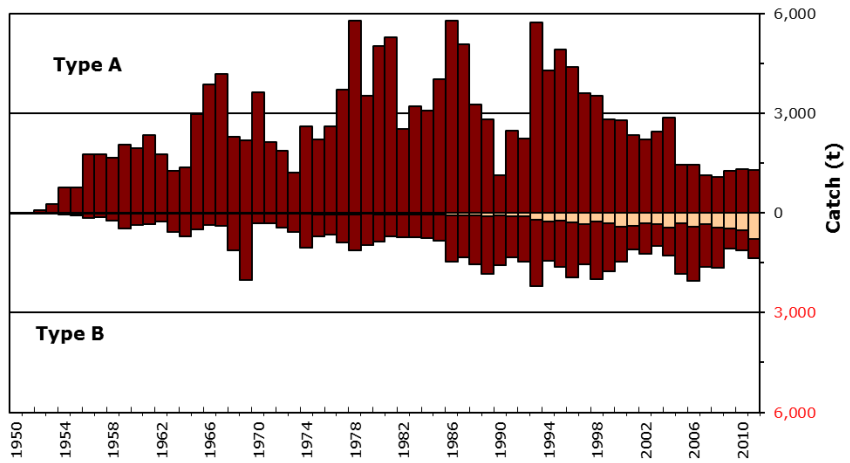



**Fig. 27**. Uncertainty of annual catch estimates for striped marlin (Data as of July 2013).

*Catches below the zero-line (**Type B**) refer to fleets that do not report catch data to the IOTC (estimated by the IOTC Secretariat), do not report catch data by gear and/or species (broken by gear and species by the IOTC Secretariat) or any of the other reasons provided in the document. Catches over the zero-line (**Type A**) refer to fleets for which no major inconsistencies have been found to exist. Light bars represent data for artisanal fleets and dark bars represent data for industrial fleets.*

**Discards** are thought to be low although they are unknown for most industrial fisheries, mainly longliners. Discards of striped marlin may also occur in the driftnet fishery of Iran, as this species has no commercial value in this country.

**Changes to the catch series:** Relatively minor revisions have been made to catches of striped marlin, which have been largely unchanged by reviews of the data series for Iran, Pakistan, Indonesia, Sri Lanka and Indonesia which have been used to adjust the catches of the other billfish species (**Fig. 28**).

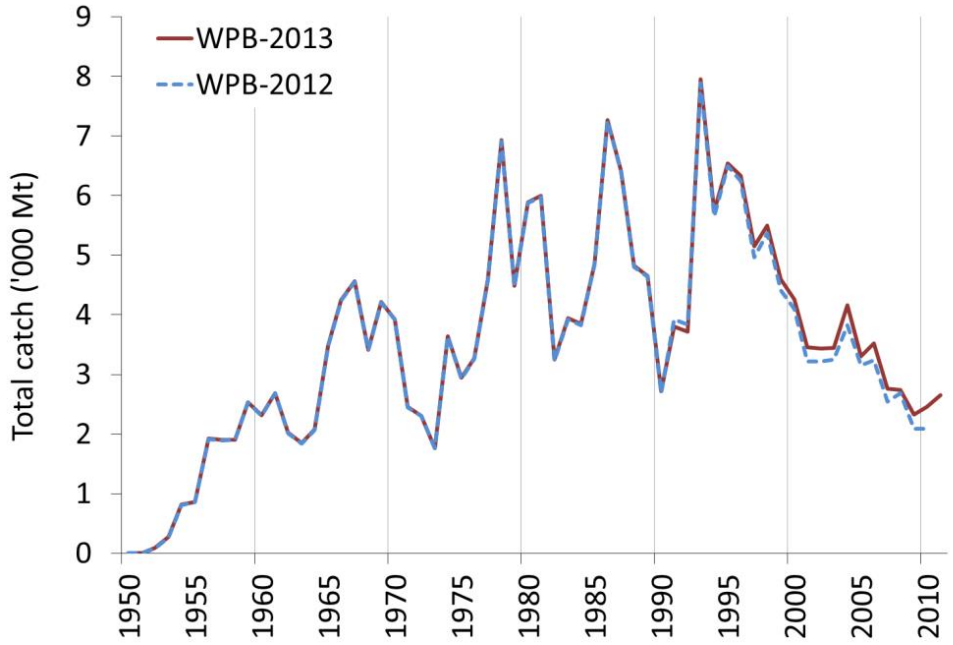



**Fig. 28.** Striped Marlin: catches used by the WPB in 2013 *versus* those estimated for the WPB12 (1950–2010).

**Catch–per–unit–effort (CPUE) series**: Standardised CPUE series have not yet been developed. Nominal CPUE series are however available from some industrial longline fisheries (primarily the Japanese longline fleet; **Appendix 1**) although catches are thought to be incomplete (catches of non-target species are not always recorded in logbooks). No catch and effort data are available from sports fisheries, other than for partial data from the sports fisheries of Kenya; or other artisanal (gillnet fisheries of I.R. Iran and Pakistan, gillnet/longlines of Sri Lanka, gillnets of Indonesia) or industrial fisheries (NEI longliners and all purse seiners).

**Fish size or age trends (e.g. by length, weight, sex and/or maturity):** Average fish weight can only be assessed for the longline fishery of Japan since 1970 and Taiwan,China since 1980. However, the number of specimens measured on Japanese longliners in recent years is very low and miss-identification of striped and blue marlin may be occurring in the Taiwanese longline fishery; the length frequency distributions derived from samples collected on Taiwanese longliners differ greatly from those collected on longliners flagged in Japan (**Appendix 1**).

Catch-at-Size(Age) tables have not been built for this species due to a lack of information reported by CPCs. Fish size is derived from various length and weight information, however the reliability of the size data is reduced when relatively few fish out of the total catch are measured.

Sex ratio data have not been provided to the Secretariat by CPCs.

### *Indo-Pacific Sailfish (SFA)*

Indo-Pacific sailfish is caught mainly under gillnets (70%) with remaining catches recorded under troll and hand lines (20%), longlines (8%) or other gears (**Table 6, Fig. 29**). The average annual catch over recent years is estimated at around 25,000 t. In recent years, the countries attributed with the highest catches of Indo-Pacific sailfish are situated in the Arabian Sea (India, Iran, Sri Lanka and Pakistan). Smaller catches are reported for line fishers in Comoros and Mauritius and by Indonesia longliners. This species is also a popular catch for sport fisheries (e.g. Kenya, Mauritius, Seychelles).

**TABLE 6**: Best scientific estimates of the catches of indo-pacific sailfish by type of fishery for the period 1950–2011 (in metric tons). Data as of July 2013.

| Fishery | By decade (average) | | | | | | By year (last ten years) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1950s | 1960s | 1970s | 1980s | 1990s | 2000s | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
| LL | 299 | 819 | 448 | 341 | 1,414 | 1,453 | 1,143 | 2,035 | 953 | 1,428 | 1,418 | 2,153 | 2,380 | 1,356 | 1,075 | 942 |
| GN | 165 | 181 | 493 | 1,805 | 5,997 | 12,282 | 9,329 | 12,167 | 14,559 | 10,128 | 11,467 | 13,261 | 13,753 | 17,700 | 20,955 | 22,480 |
| HL | 171 | 213 | 442 | 1,430 | 2,540 | 4,144 | 3,322 | 3,686 | 4,269 | 4,160 | 4,220 | 4,073 | 4,550 | 5,749 | 6,071 | 5,214 |
| OT | 0 | 0 | 3 | 44 | 42 | 81 | 50 | 52 | 63 | 57 | 80 | 81 | 149 | 168 | 175 | 185 |
| **Total** | 634 | 1,213 | 1,385 | 3,619 | 9,994 | 17,960 | 13,845 | 17,940 | 19,844 | 15,772 | 17,185 | 19,569 | 20,831 | 24,972 | 28,276 | 28,821 |

**Fisheries:** Gillnet (**GN**); Longline (**LL**); Hook-and-Line (**HL**), including handline, trolling, baitboat, and sport fisheries; Other gears (**OT**)

Catches of Indo-Pacific sailfish greatly increased since the mid-1990's (from around 5,000 t in the early 1990s to over 28,000 t in 2011. The increases are largely due to the development of a gillnet/longline fishery in Sri Lanka (**Fig. 29**) and, especially, the extension in the area of operation of Iranian gillnet vessels to areas beyond the EEZ of I.R. Iran. In the case of Iranian gillnets (**Fig. 30**), catches have increased from less than 1,000 t in the early 1990's to over 7,700 t in 2011.

Catches of Indo-Pacific sailfish under drifting longlines (**Table 6**) and other gears have also increased – to a lesser extent than catches from gillnet – from around 2,500 t to over 7,000 t in recent years. However, it is likely that longline fleets under report catches of this species due to its little commercial value. In recent years, deep-freezing longliners from Japan have reported catches of Indo-Pacific sailfish in the central western Indian Ocean, between Sri Lanka and the Maldives and the Mozambique Channel (**Fig. 31**).

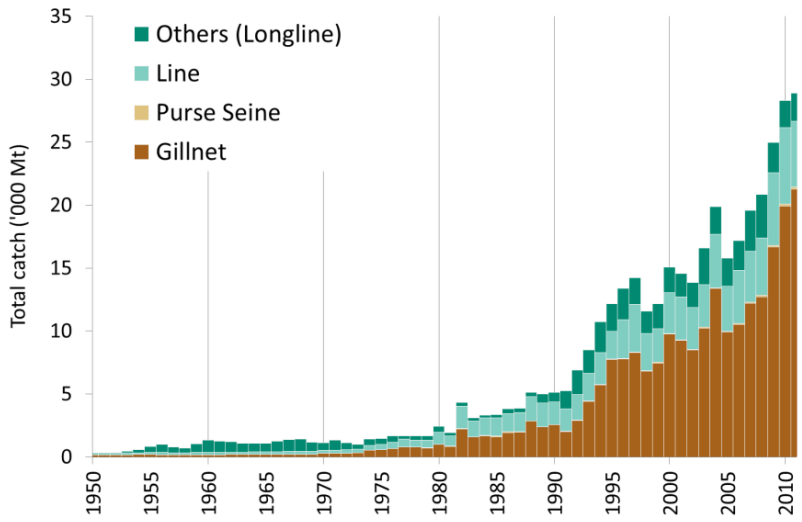



**Fig. 29.** Catches of Indo-pacific sailfish by gear and year recorded in the IOTC Database (1960–2011).

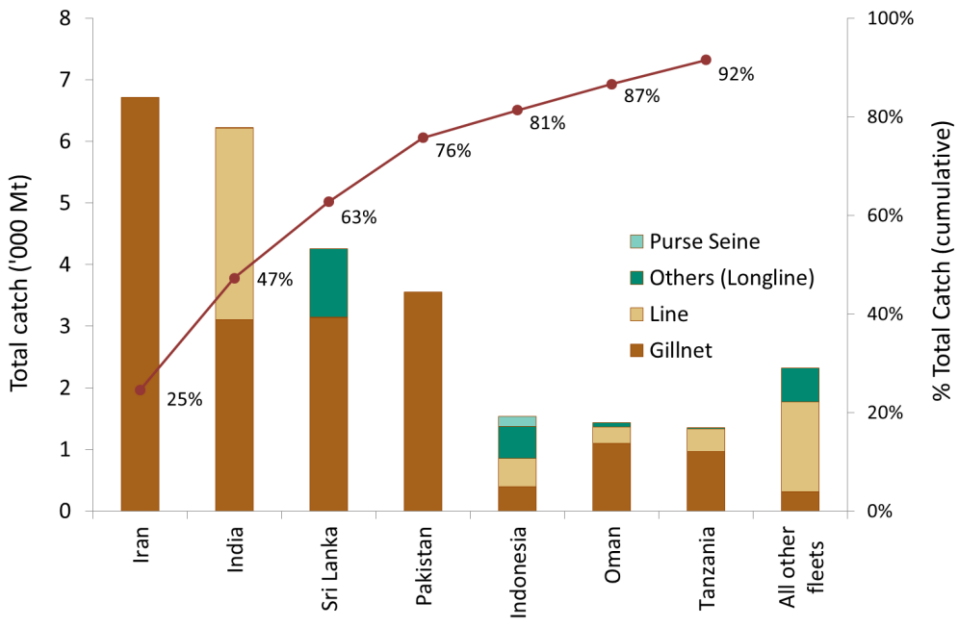



**Fig. 30:** Indo-Pacific sailfish: Average catches in the Indian Ocean over the period 2009–11, by country. Countries are ordered from left to right, according to the importance of catches of black marlin reported. The red line indicates the (cumulative) proportion of catches of Indo-Pacific sailfish for the countries concerned, over the total combined catches of this species reported from all countries and fisheries.

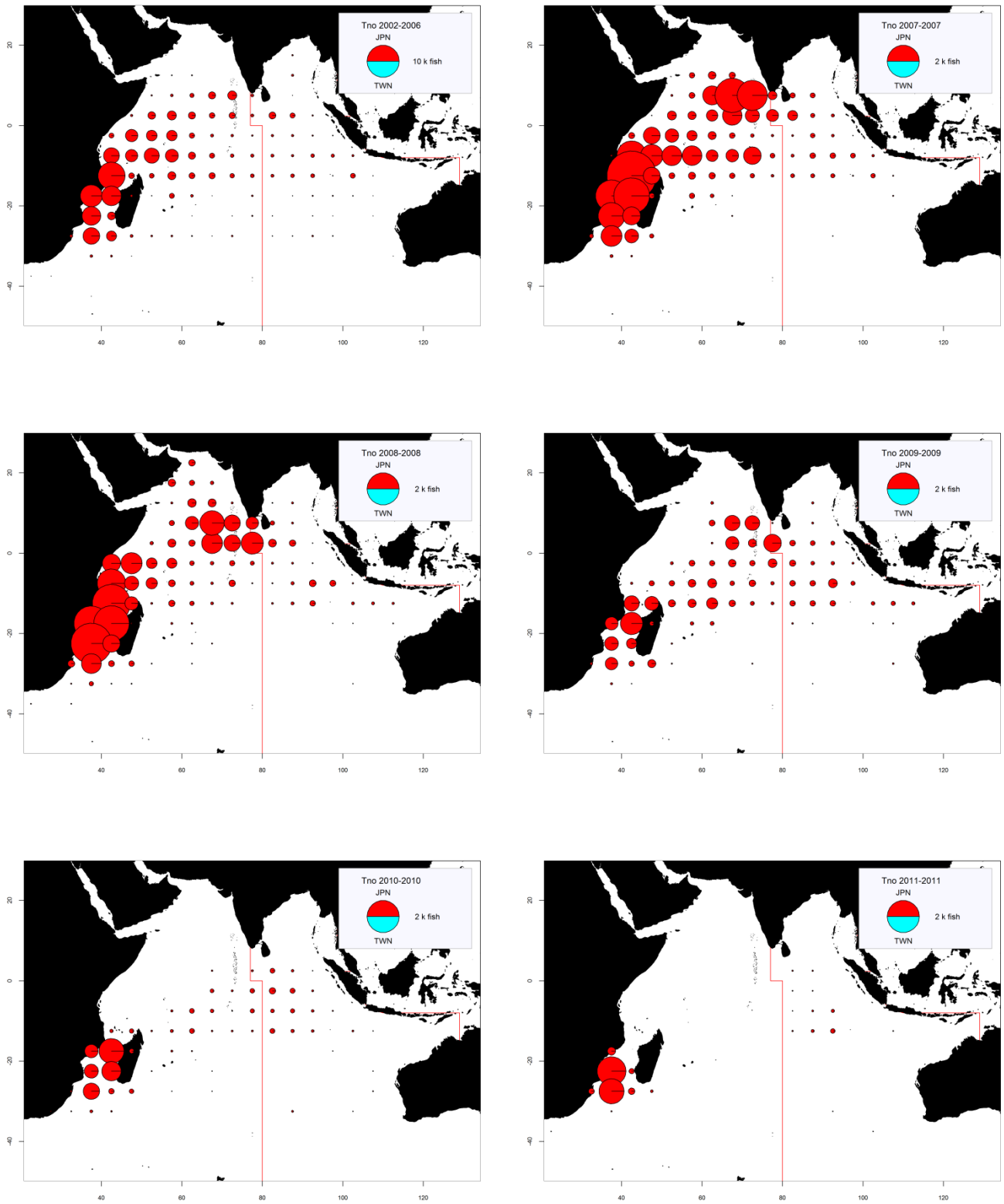



**Fig. 31a-f.** Time-area catches (in number of fish) of Indo-Pacific sailfish as reported for the longline fisheries of Japan (JPN) for the period 2002–06, by fleet and for 2007–11, by year and fleet.

- **Status of Fisheries Statistics at the IOTC**

Minimum catch estimates have been derived from very small amounts of information and are therefore highly uncertain. Unlike the other billfish, Indo-Pacific sailfish are probably more reliably identified because of the large and distinctive first dorsal fin that runs most of the length of the body.

**Retained catches** are poorly known for most fisheries (**Fig. 32**) due to:

- Catch reports often refer to total catches of all billfish species combined; catches by species are estimated by the Secretariat for some artisanal (gillnet/longline fishery of Sri Lanka and artisanal fisheries of India and Pakistan) and industrial (longliners of Indonesia and Philippines) fisheries.
- Catches of IP sailfish reported for some fisheries may refer to the combined catches of more than one species of billfish, in particular marlins and shortbill spearfish (gillnet fishery of Iran and many coastal fisheries).
- Catches likely to be incomplete for some artisanal fisheries (gillnets of Pakistan, pole and lines of Maldives) due to under-reporting.
- Catches are likely to be incomplete for industrial fisheries for which the Indo-Pacific sailfish is not a target species.
- A lack of catch data for most sport fisheries.

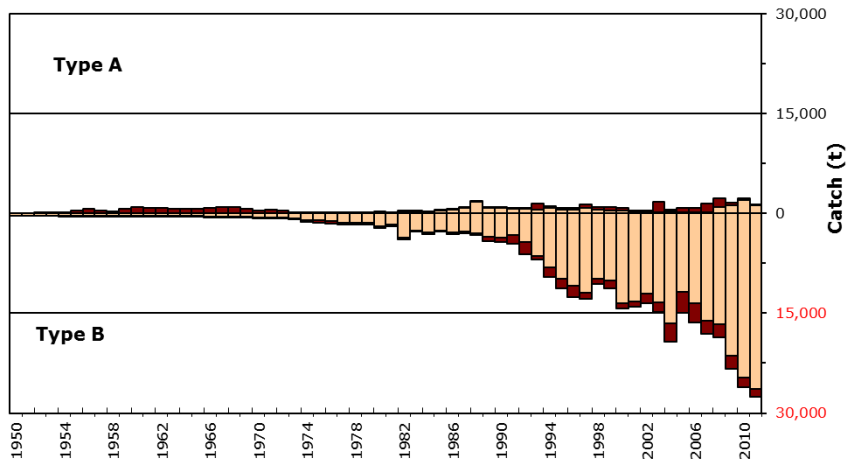



**Fig. 32**. Uncertainty of annual catch estimates for Indo-Pacific sailfish.

*Catches below the zero-line (**Type B**) refer to fleets that do not report catch data to the IOTC (estimated by the IOTC Secretariat), do not report catch data by gear and/or species (broken by gear and species by the IOTC Secretariat) or any of the other reasons provided in the document. Catches over the zero-line (**Type A**) refer to fleets for which no major inconsistencies have been found to exist. Light bars represent data for artisanal fleets and dark bars represent data for industrial fleets.* Data as of July 2013.

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

**Catch–per–unit–effort (CPUE) series**: Standardised and nominal CPUE series have not yet been developed. No catch and effort data are available from sports fisheries, other than for partial data from the sports fisheries of Kenya; or other artisanal (gillnet fisheries of I.R. Iran and Pakistan, gillnet/longlines of Sri Lanka, gillnets of Indonesia) or industrial fisheries (NEI longliners and all purse seiners).

**Changes to the catch series:** Catches of sailfish since the WPB meeting in 2012 (**Fig. 33a**) have been revised, in particular around the mid-2000s. The changes mostly affect catch estimates for Iran (**Fig. 33b**), which have been reduced following improvements in the estimation of catch-by-species (specifically, reported catches of sailfish that more likely refer to a combination of billfish species).

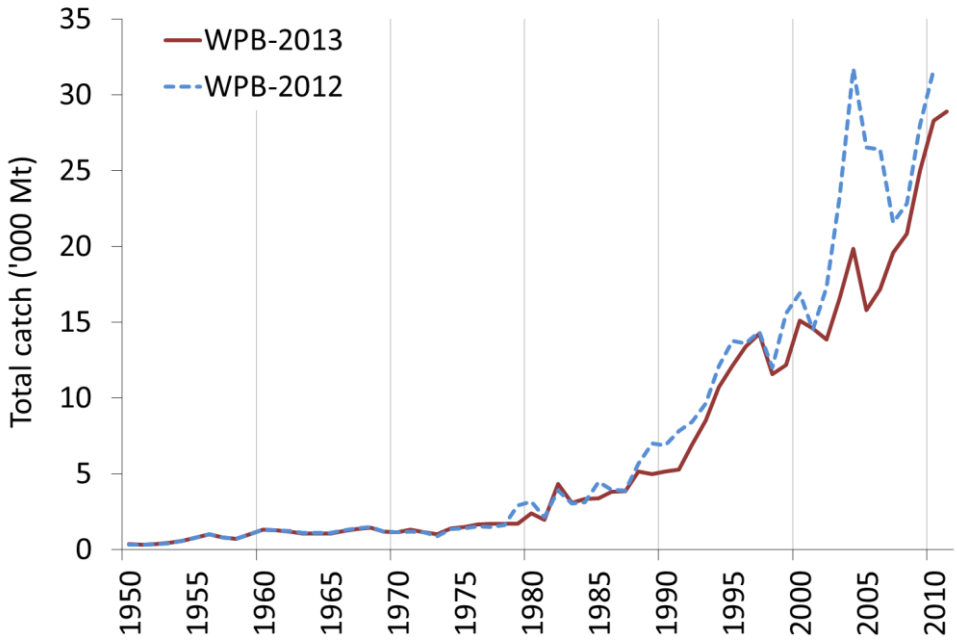



**Fig. 33a.** Indo-Pacific sailfish: catches used by the WPB in 2013 *versus* those estimated for the WPB12 (1950–2010).

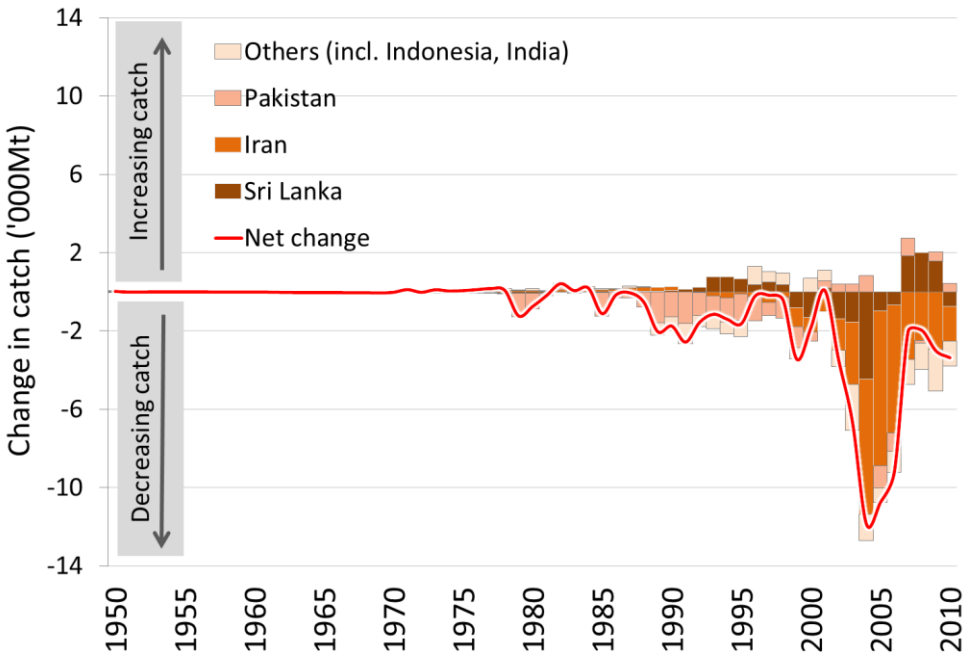



**Fig. 33b.** Blue marlin: revisions to catch estimates (WPB13 – WPB12) by fleet, (1950-2010).

**Fish size or age trends (e.g. by length, weight, sex and/or maturity):** Average fish weight can only be assessed for the longline fishery of Japan since 1970 and the gillnet/longline fishery of Sri Lanka since the late 1980s (**Appendix 1**). The number of specimens measured on Japanese longliners in recent years is, however, very low. Furthermore, the specimens discarded might be not accounted for in industrial fisheries, where they are presumed to be of lower size (possible bias of existing samples).

Catch-at-Size(Age) tables have not been built for this species due to a lack of information reported by CPCs. Fish size is derived from various length and weight information, however the reliability of the size data is reduced when relatively few fish out of the total catch are measured.

Sex ratio data have not been provided to the Secretariat by CPCs.

## *APPENDIX I*

## *REVIEW OF FISHERIES TRENDS FOR BILLFISH*

# 1. EFFORT

## a) Longline

Effort exerted by LONGLINE fleets in the Indian Ocean, in millions (M) of hooks set, by decade and main fleet:

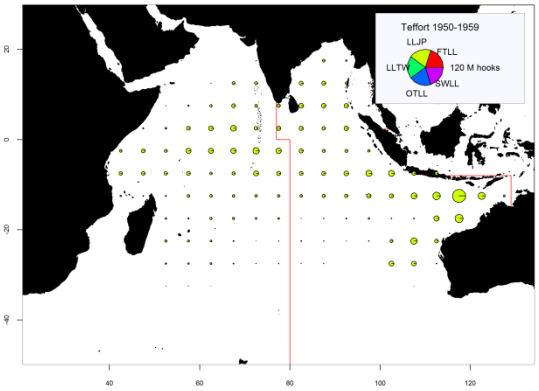
LLJP (light green): deep-freezing longliners from Japan

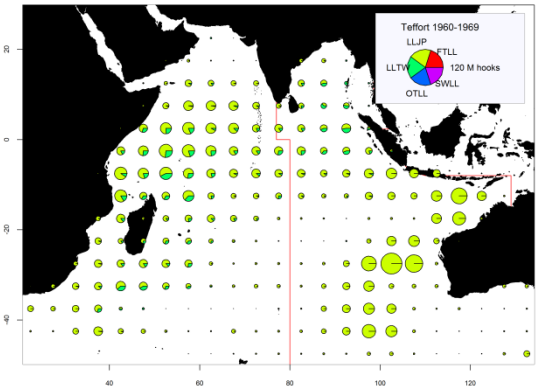
LLTW (dark green): deep-freezing longliners from Taiwan,China

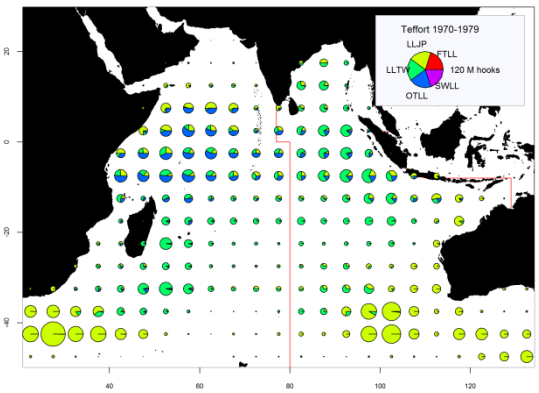
SWLL (turquoise): swordfish longliners (Australia, EU, Mauritius, Seychelles and other fleets)

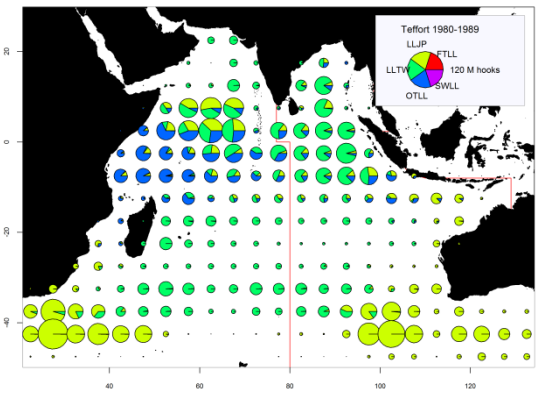
FTLL (red) : fresh-tuna longliners (China, Taiwan,China and other fleets)

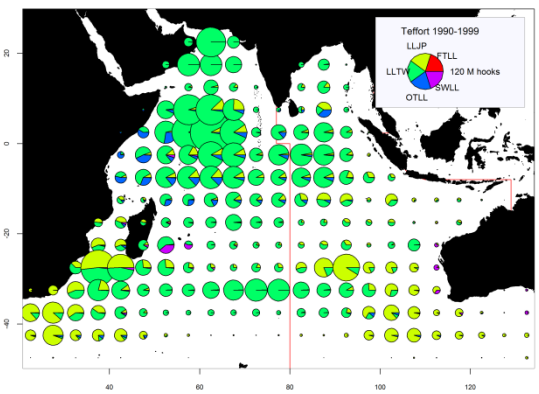
OTLL (blue): Longliners from other fleets (includes Belize, China, Philippines, Seychelles, South Africa, South Korea and various other fleets)

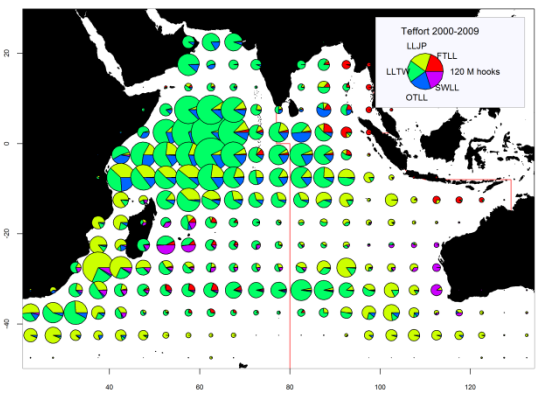


Effort exerted by LONGLINE fleets in the Indian Ocean, in millions (M) of hooks set, for 2002-06 and 2007-11, by year, and main fleet:

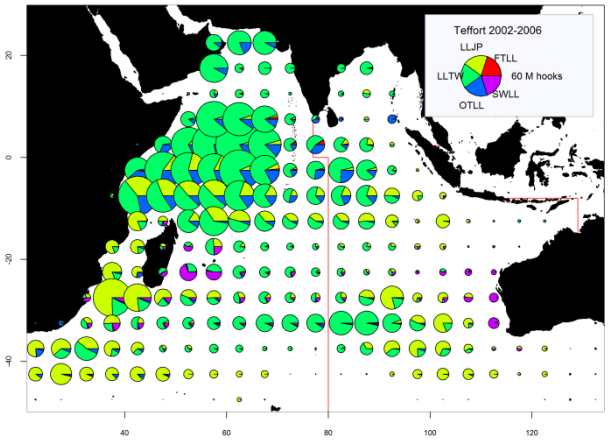
LLJP (light green): deep-freezing longliners from Japan

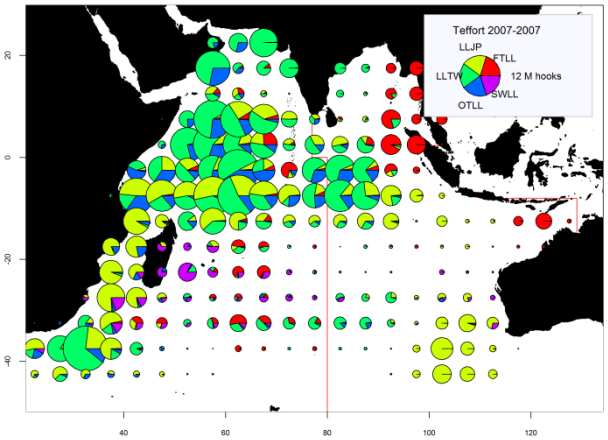
LLTW (dark green): deep-freezing longliners from Taiwan,China

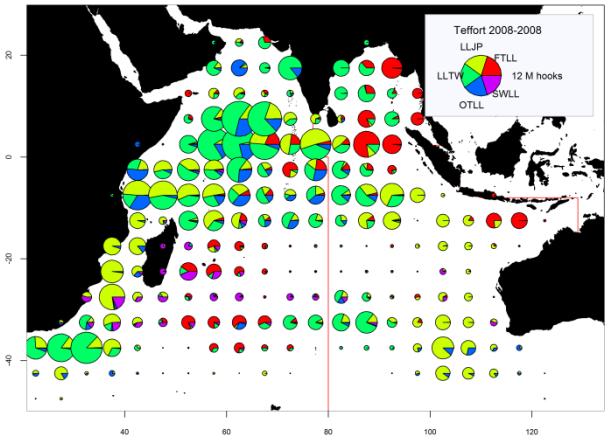
SWLL (turquoise): swordfish longliners (Australia, EU, Mauritius, Seychelles and other fleets)

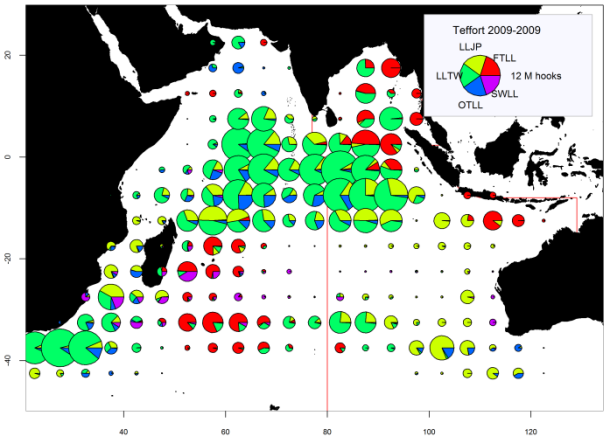
FTLL (red) : fresh-tuna longliners (China, Taiwan,China and other fleets)

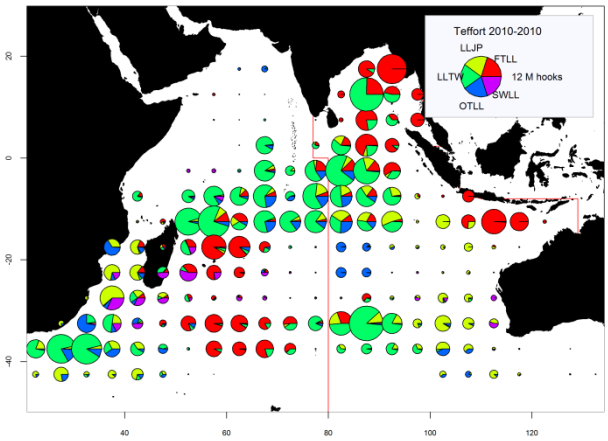
OTLL (blue): Longliners from other fleets (includes Belize, China, Philippines, Seychelles, South Africa, South Korea and various other fleets)

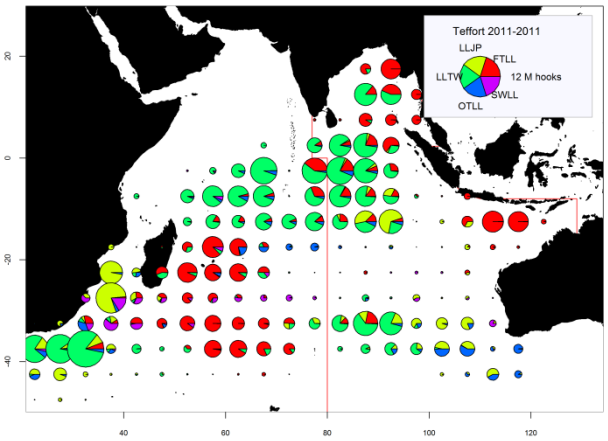


Effort exerted by LONGLINE fleets in the Indian Ocean, in millions (M) of hooks set, for 2002-06 and 2007-11, by year, quarter, and main fleet:

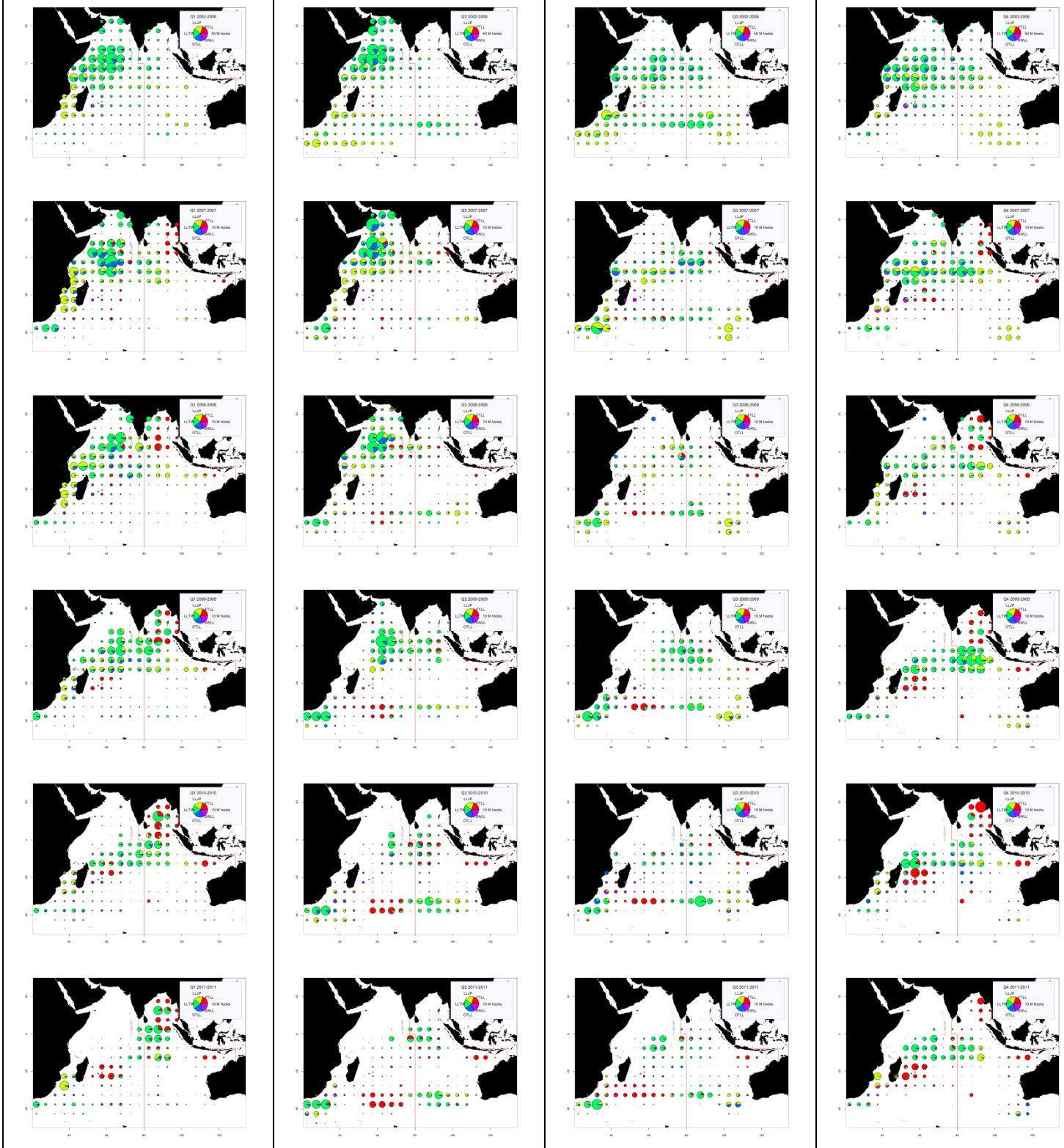
LLJP (light green): deep-freezing longliners from Japan

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)



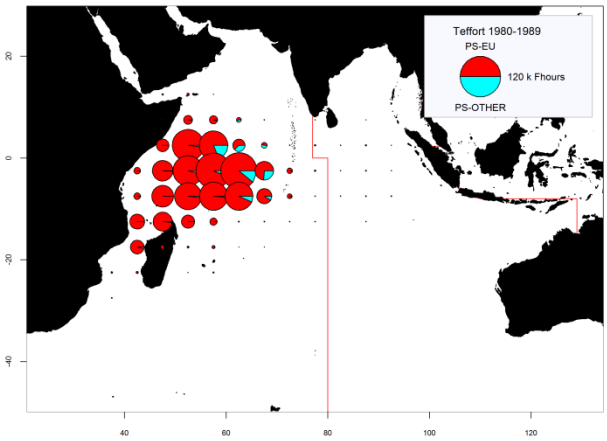
### b) *Purse seine*

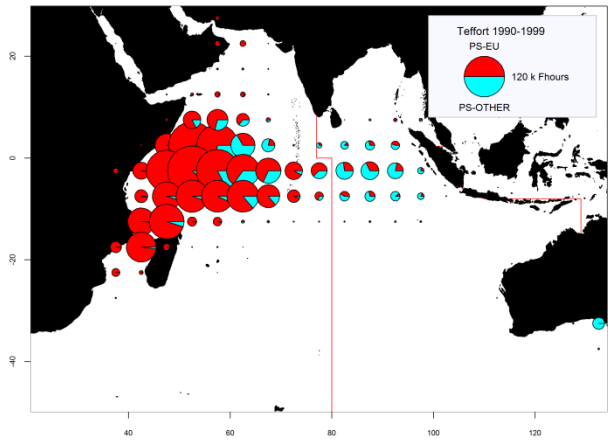
Effort exerted by industrial PURSE SEINE fleets in the Indian Ocean, in thousands (k) of fishing hours (Fhours), by decade and main fleet:

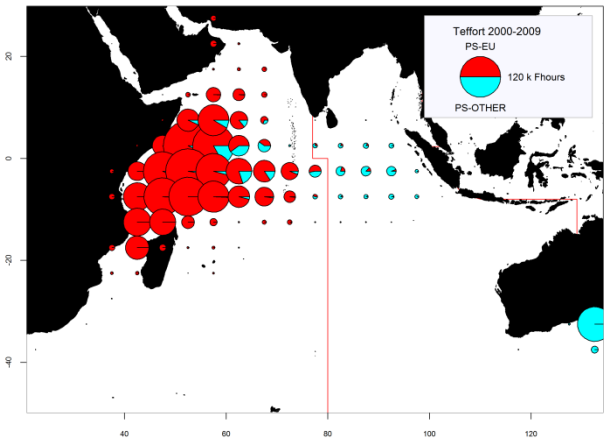
PS-EU (red): Industrial purse seiners monitored by the EU and Seychelles (operating under flags of EU countries, Seychelles and other flags)

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)



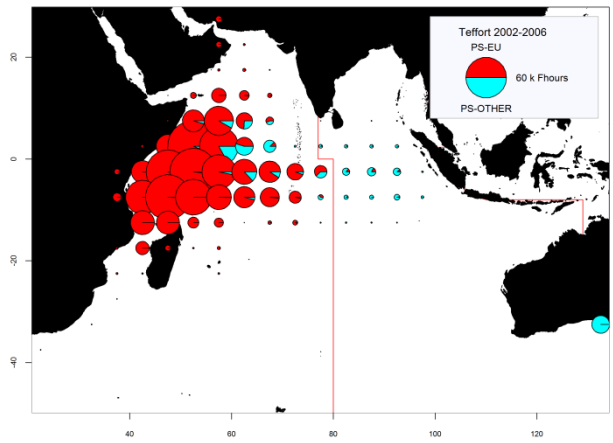



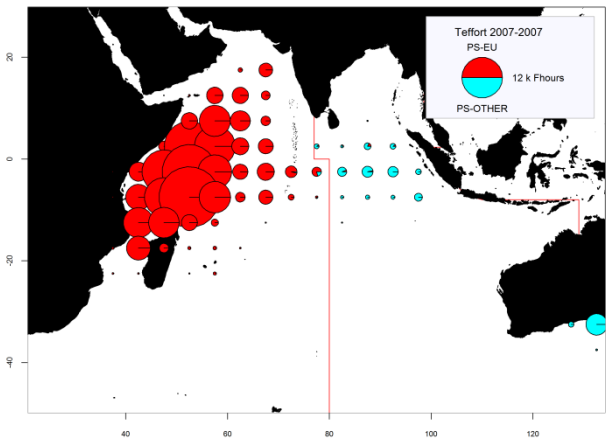
Effort exerted by industrial PURSE SEINE fleets in the Indian Ocean, in thousands (k) of fishing hours (Fhours), for 2002-06 and 2007-11, by year, and main fleet:

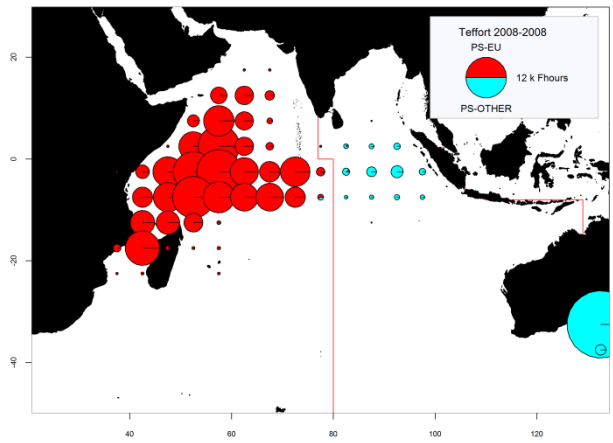
PS-EU (red): Industrial purse seiners monitored by the EU and Seychelles (operating under flags of EU countries, Seychelles and other flags)

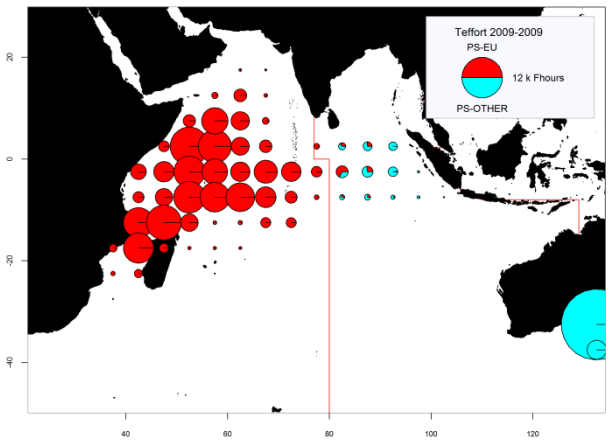
PS-OTHER (green): Industrial purse seiners from other fleets (includes Japan, Mauritius and purse seiners of Soviet origin)

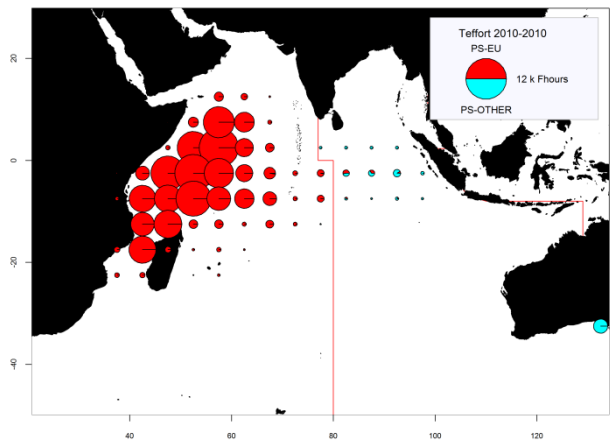
(excludes effort data for purse seiners of Iran and Thailand)

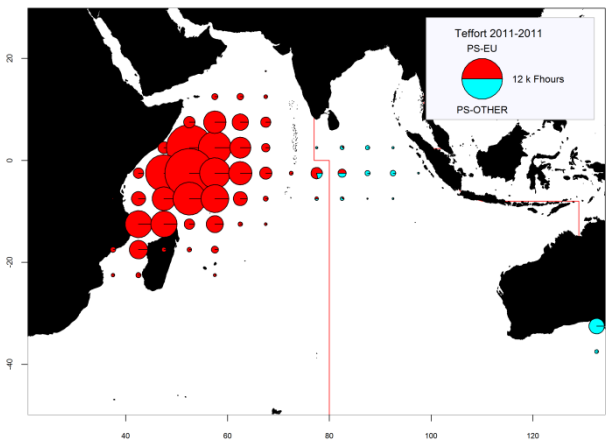


Effort exerted by industrial PURSE SEINE fleets in the Indian Ocean, in thousands (k) of fishing hours (Fhours), for 2002-06 and 2007-11, by year, quarter, and main fleet:

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

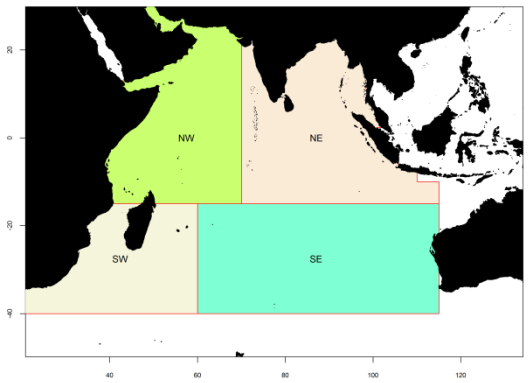
PS-OTHER (green): Industrial purse seiners from other fleets (includes Japan, Mauritius and purse seiners of Soviet origin)

(excludes effort data for purse seiners of Iran)

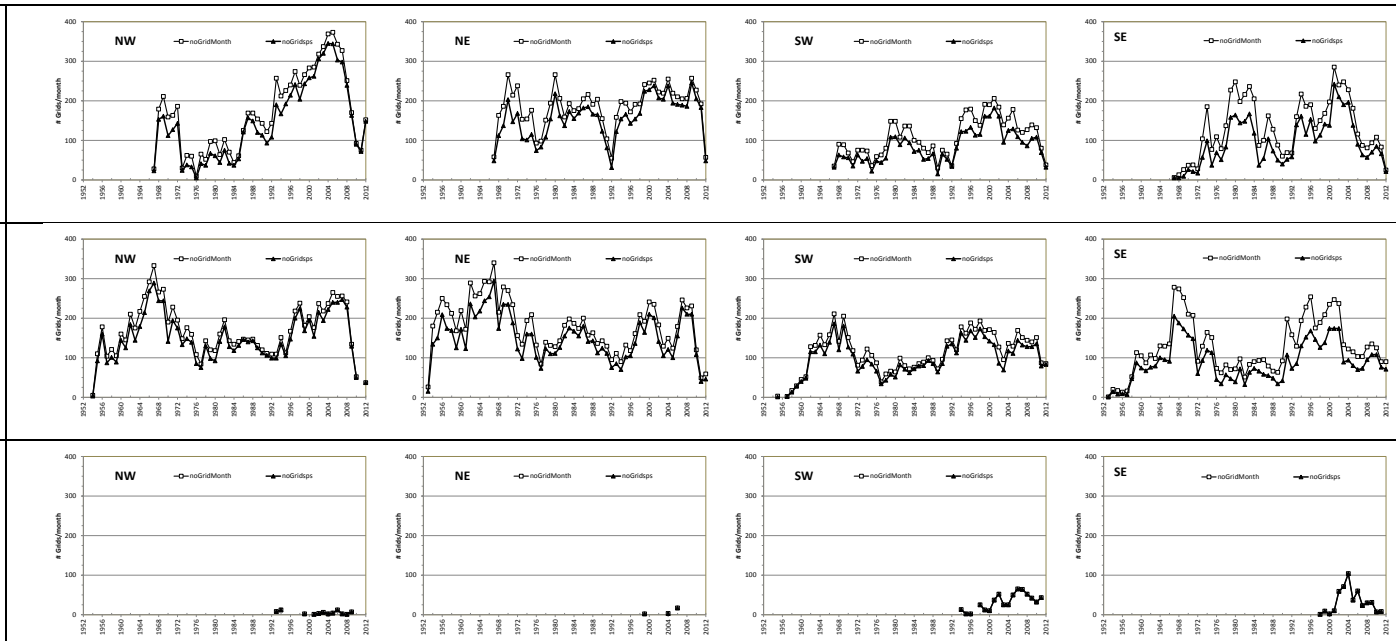
## 2. SWORDFISH

### a. Catch rates and area fished

Areas used for the assessment of the Indian Ocean swordfish stock



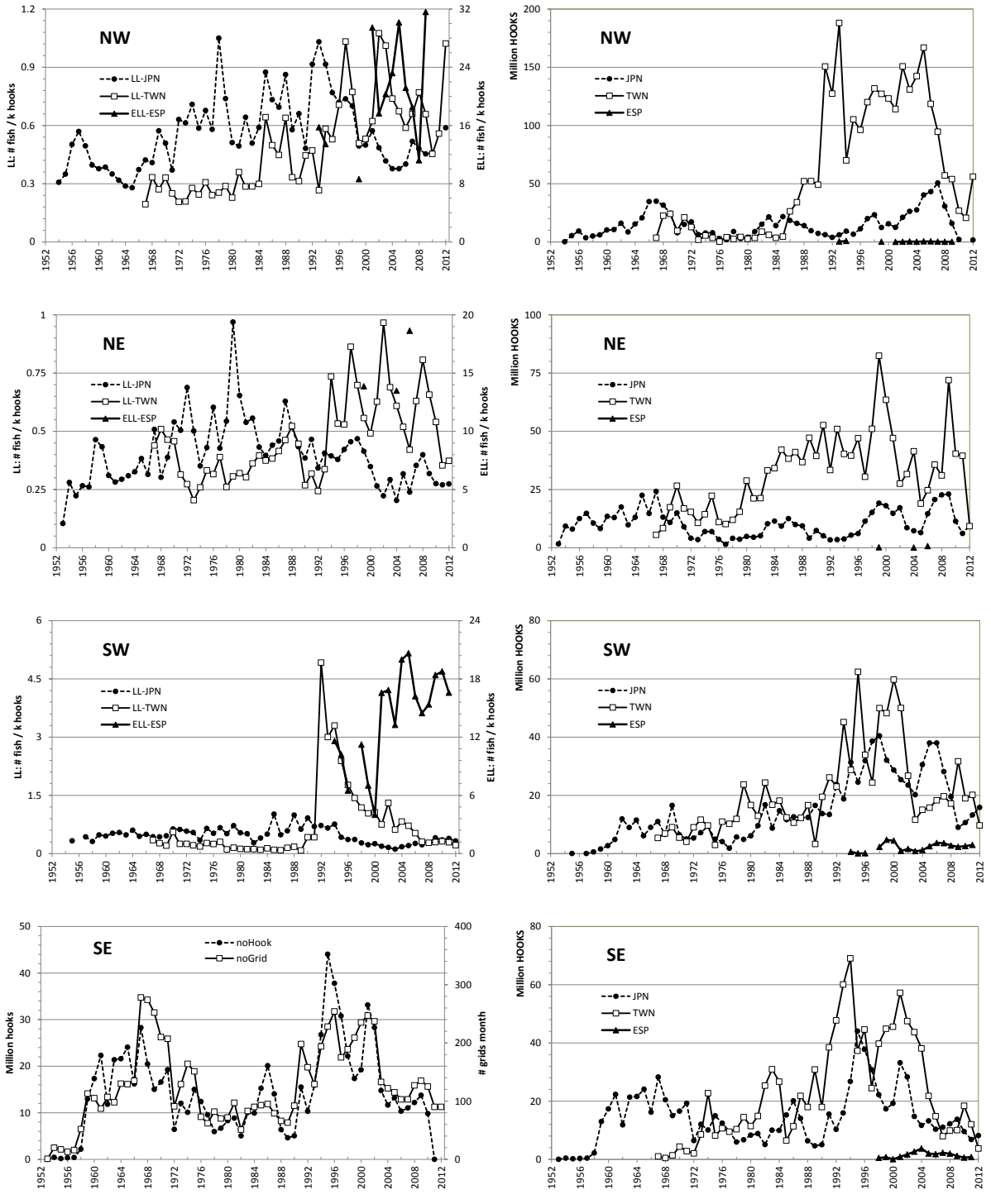

Number of five degree squares/month explored and number of squares/month with catches of swordfish reported by the longline fisheries of EU-Taiwan,China (top), Japan (center), and Spain (bottom), by area and year (1952 to 2012): Indian Ocean NW (left); NE (center right); SW (center left); SE (right). The areas referred to above are shown in the map above




Total number of five degree squares/month on which catches of swordfish have been ever reported: NW (1,231); NE (665); SW (382); SE (645)

Nominal CPUE (number of fish/1000 hooks; left panel) and total fishing effort (million of hooks set; right panel) for the longline fleets of EU-Spain, Japan, and Taiwan,China fishing in the Indian Ocean, by area and year (1952 to 2012): Indian Ocean from top to bottom: NW; NE; SW; SE. The areas referred to before are shown in the map in the previous page

| CPUE number of swordfish per thousand hooks | EFFORT: Number of Hooks (millions) |
|---|---|



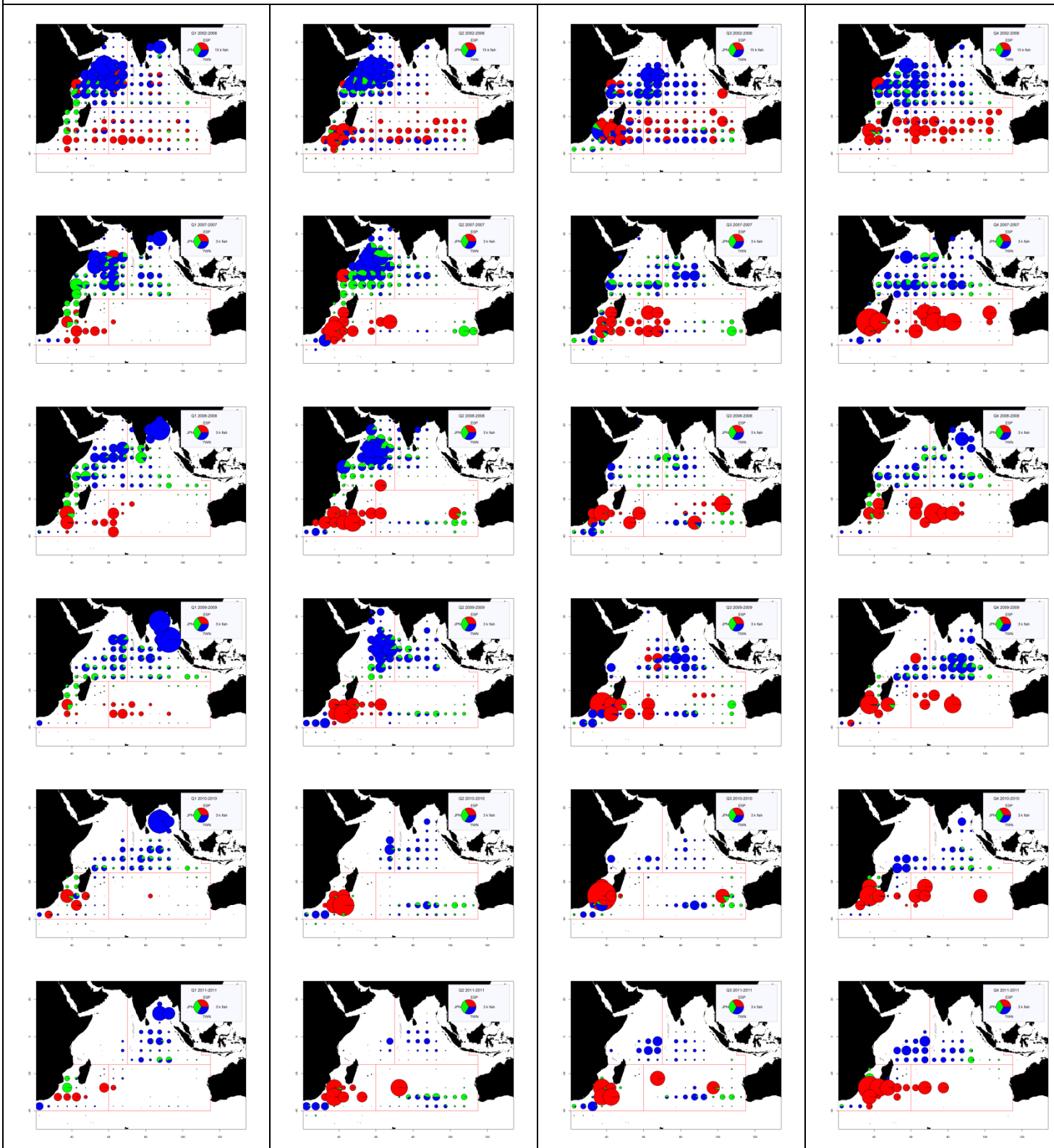
### b. Recent catches

Time-area catches (total combined in number of fish for main longline fleets) of SWORDFISH estimated for 2002-06 and 2007-11, by year, and quarter (Time-area catches are not available for all fleets; catches of fresh-tuna longliners are not represented):

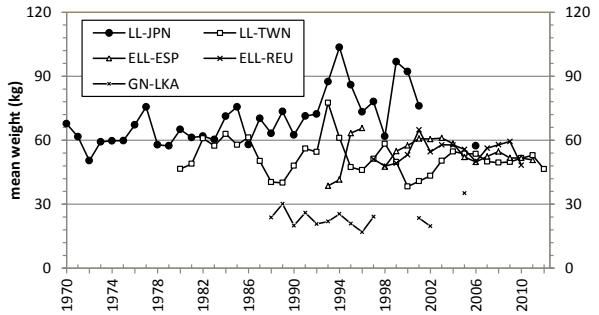
EU-Spain (ESP, red): Longliners from Spain (target swordfish).

Taiwan,China (TWN, blue): Deep-freezing longliners flagged in Taiwan,China (target tunas or swordfish).

Japan (JPN, green): Deep-freezing longliners flagged in Japan (target tunas).

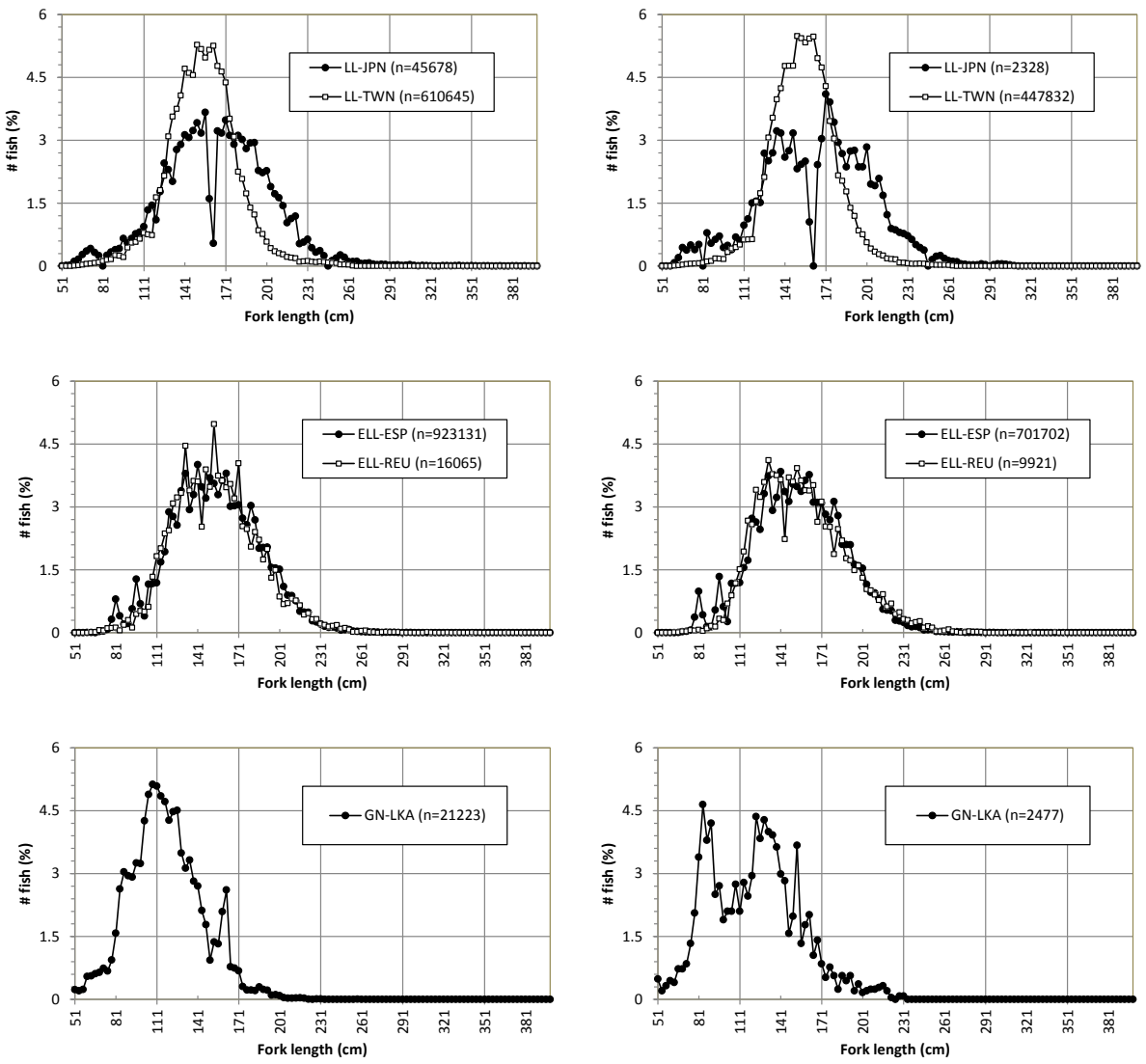


## c. Average weight and length frequency samples




Average weight of swordfish (kg) estimated from the size samples available for longliners of Japan (1970-2012), Taiwan,China (1980-2012), EU-Spain (1993-2012), and EU-France-Reunion (1997-2012); and the gillnet fishery of Sri Lanka (1988-2012)

NOTE: Average weights are shown only for years in which 300 or more specimens were sampled for length

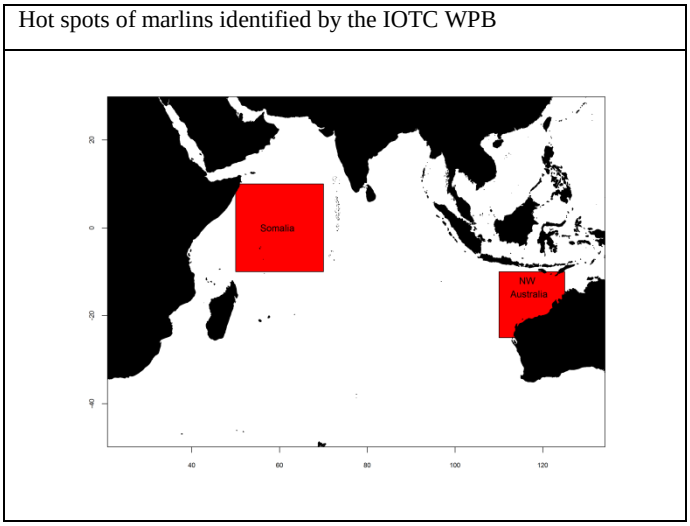



Number of swordfish by length class (fork length; expressed as %) estimated in the Indian Ocean, for 1950-2012 (left) and 2000-09 (right): Longline fisheries of Japan and Taiwan,China (top); swordfish longline fisheries of EU-Spain and EU-France-Reunion (center); gillnet fisheries of Sri Lanka (bottom)

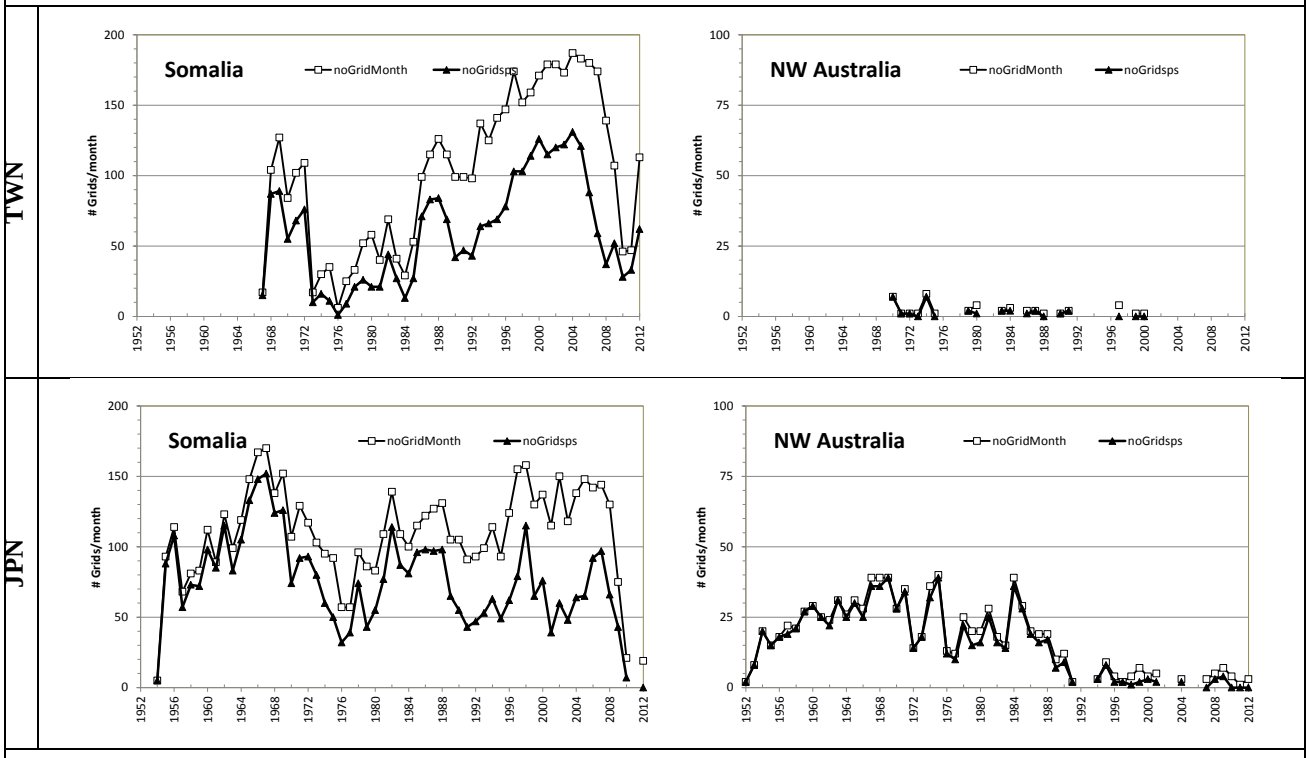
# 3. BLACK MARLIN

## a. Catch rates and area fished

Hot spots of marlins identified by the IOTC WPB



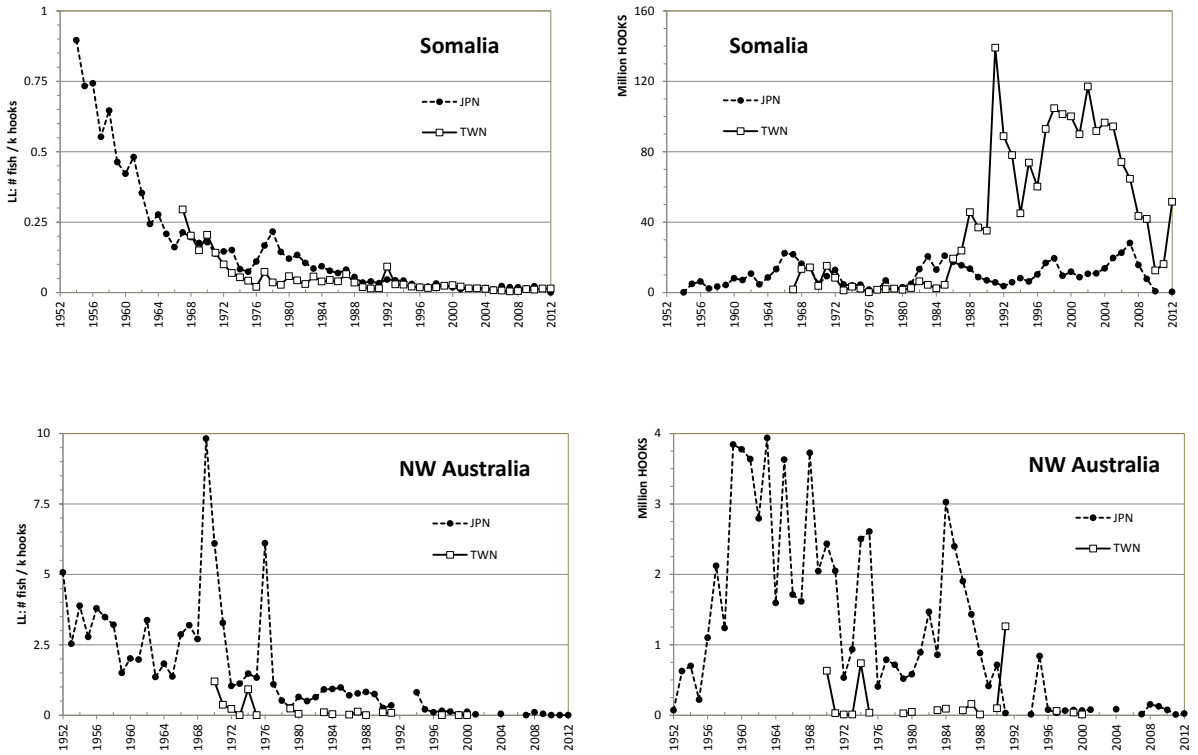

Number of five degree squares/month explored and number of squares/month with catches of black marlin reported by the longline fisheries of Taiwan,China (top), Japan (bottom) by area and year (1952 to 2012): Somalia (left); NW Australia (right). The areas referred to above are shown in the map above



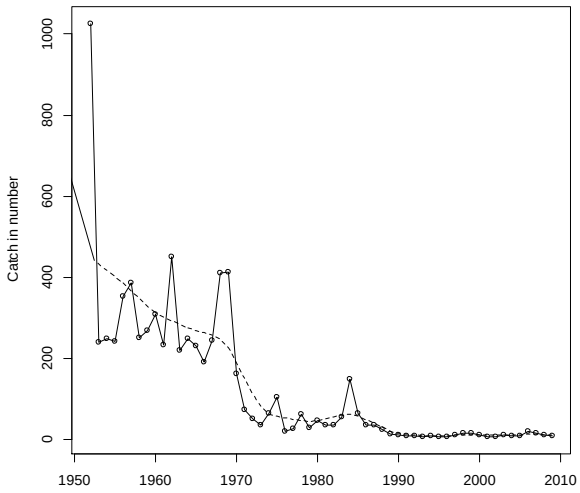

Total number of five degree squares/month on which catches of black marlin have been ever reported: Somalia (192); NW Australia (56)

Nominal CPUE (number of fish/1000 hooks; left panel) and total fishing effort (million of hooks set; right panel) for the longline fleets of Japan, and Taiwan,China fishing in the Indian Ocean, by area and year (1952 to 2012): Somalia (top); NW Australia (bottom). The areas referred to above are shown in the map in the previous page

| CPUE number of black marlin per thousand hooks | EFFORT: Number of Hooks (millions) |
|---|---|




Average catch (number of fish) in the three 5 degree square grids recording the highest catches of black marlin in the Indian Ocean for the combined Japan and Taiwan,China longline fleets (1952-2010)



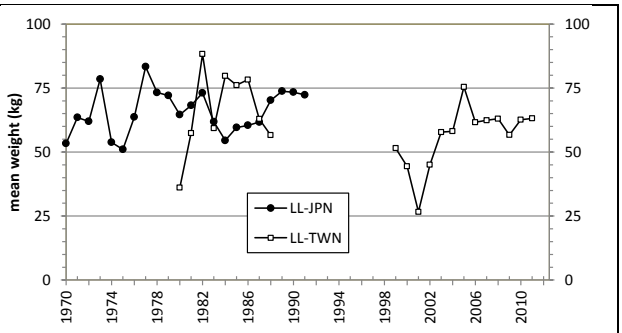
### b. Recent catches

Time-area catches (total combined in number of fish for main longline fleets) of BLACK MARLIN estimated for 2002-06 and 2007-11, by year, and quarter:

Taiwan,China (TWN, blue): Deep-freezing longliners flagged in Taiwan,China (target tunas or swordfish).

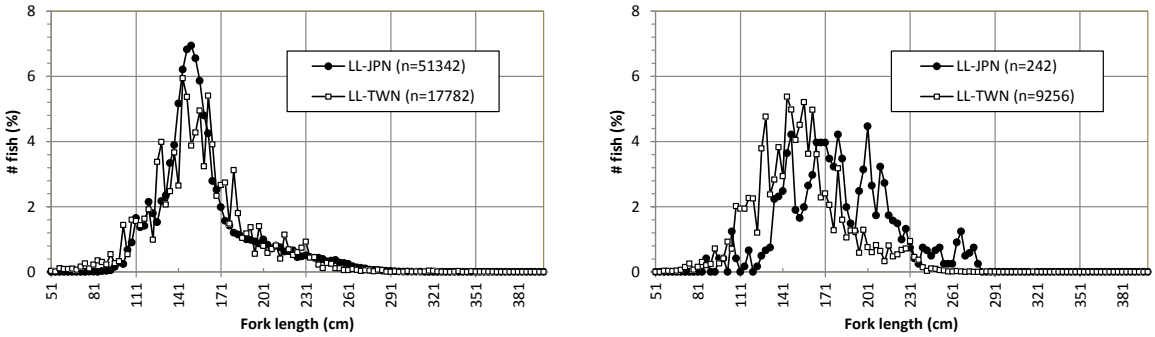
Japan (JPN, red): Deep-freezing longliners flagged in Japan (target tunas).

### c. Average weight and length frequency samples




Average weight of black marlin (kg) estimated from the size samples available for longliners of Japan (1970-2012) and Taiwan,China (1980-2012)

NOTE: Average weights are shown only for years in which 300 or more specimens were sampled for length

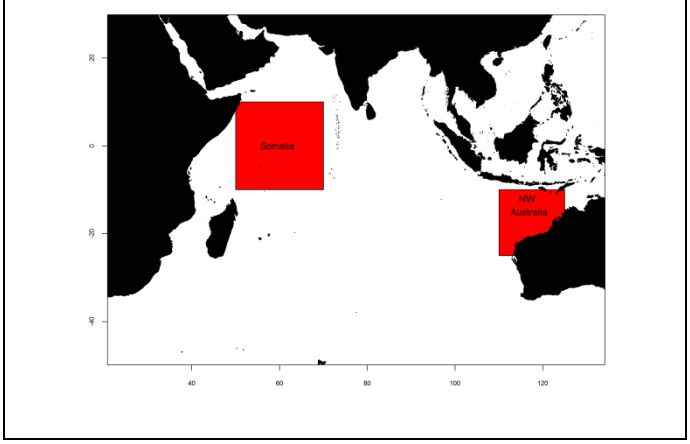



Number of black marlin by length class (eye to fork length; expressed as %) estimated for the longline fisheries of Japan and Taiwan,China in the Indian Ocean, for 1950-2012 (left) and 2000-09 (right)

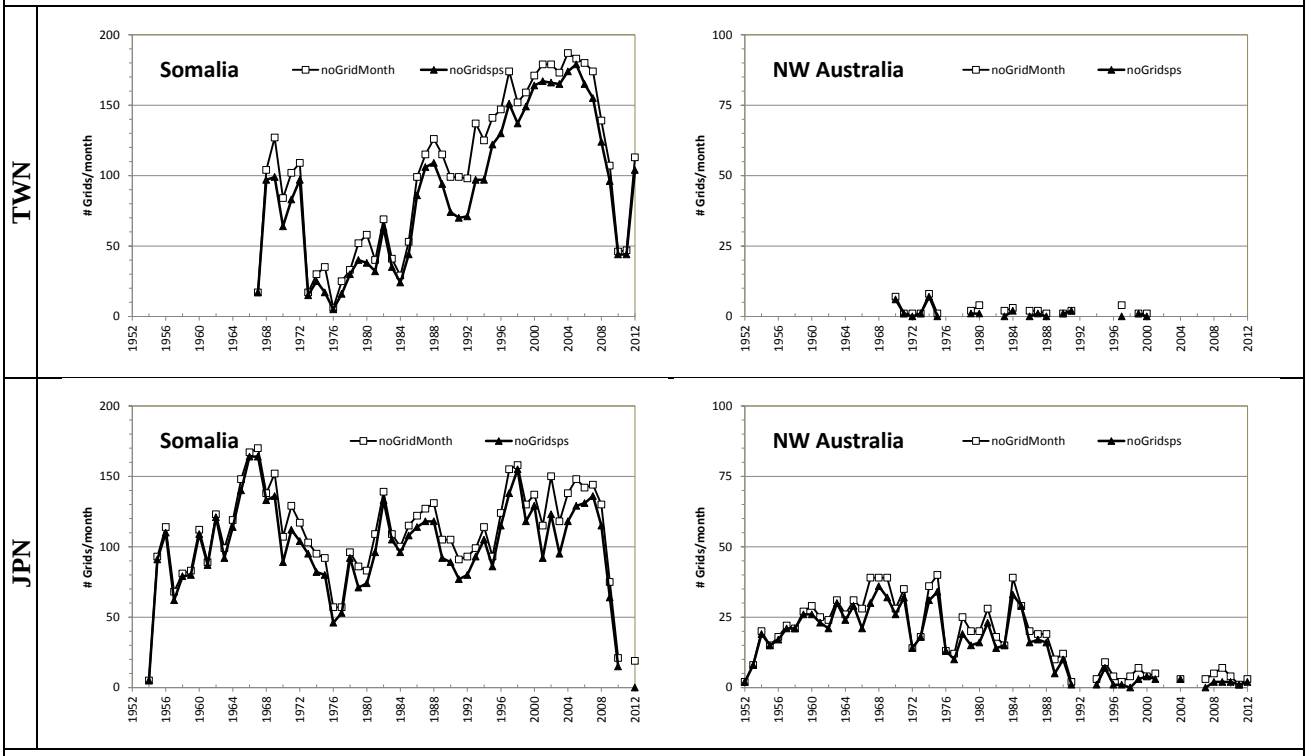
# 4. BLUE MARLIN

## a. Catch rates and area fished

Hot spots of marlins identified by the IOTC WPB



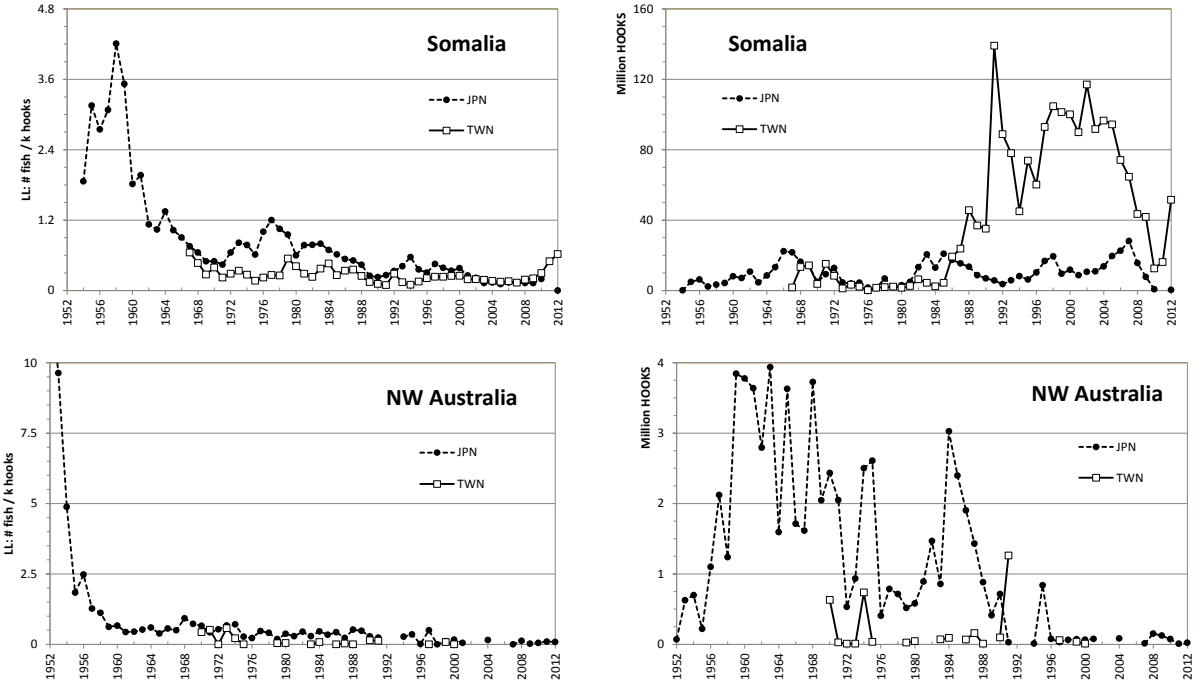

Number of five degree squares/month explored and number of squares/month with catches of blue marlin reported by the longline fisheries of Taiwan,China (top), Japan (bottom) by area and year (1952 to 2012): Somalia (left); NW Australia (right). The areas referred to above are shown in the map above



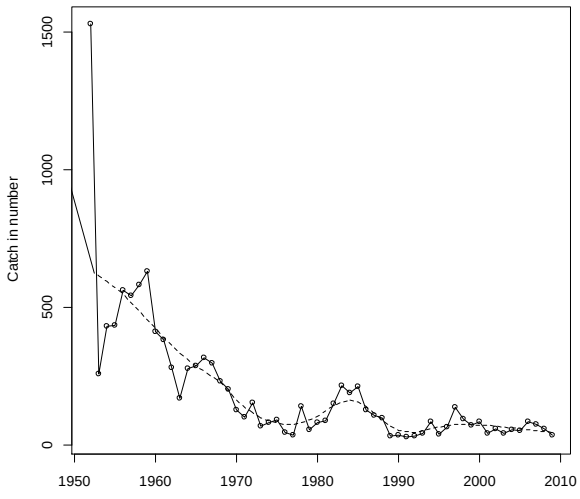

Total number of five degree squares/month on which catches of blue marlin have been ever reported: Somalia (192); NW Australia (56)

Nominal CPUE (number of fish/1000 hooks; left panel) and total fishing effort (million of hooks set; right panel) for the longline fleets of Japan, and Taiwan,China fishing in the Indian Ocean, by area and year (1952 to 2012): Somalia (top); NW Australia (bottom). The areas referred to above are shown in the map in the previous page

| CPUE number of blue marlin per thousand hooks | EFFORT: Number of Hooks (millions) |
|---|---|




Average catch (number of fish) in the three 5 degree square grids recording the highest catches of blue marlin in the Indian Ocean for the combined Japan and Taiwan,China longline fleets (1952-2010)

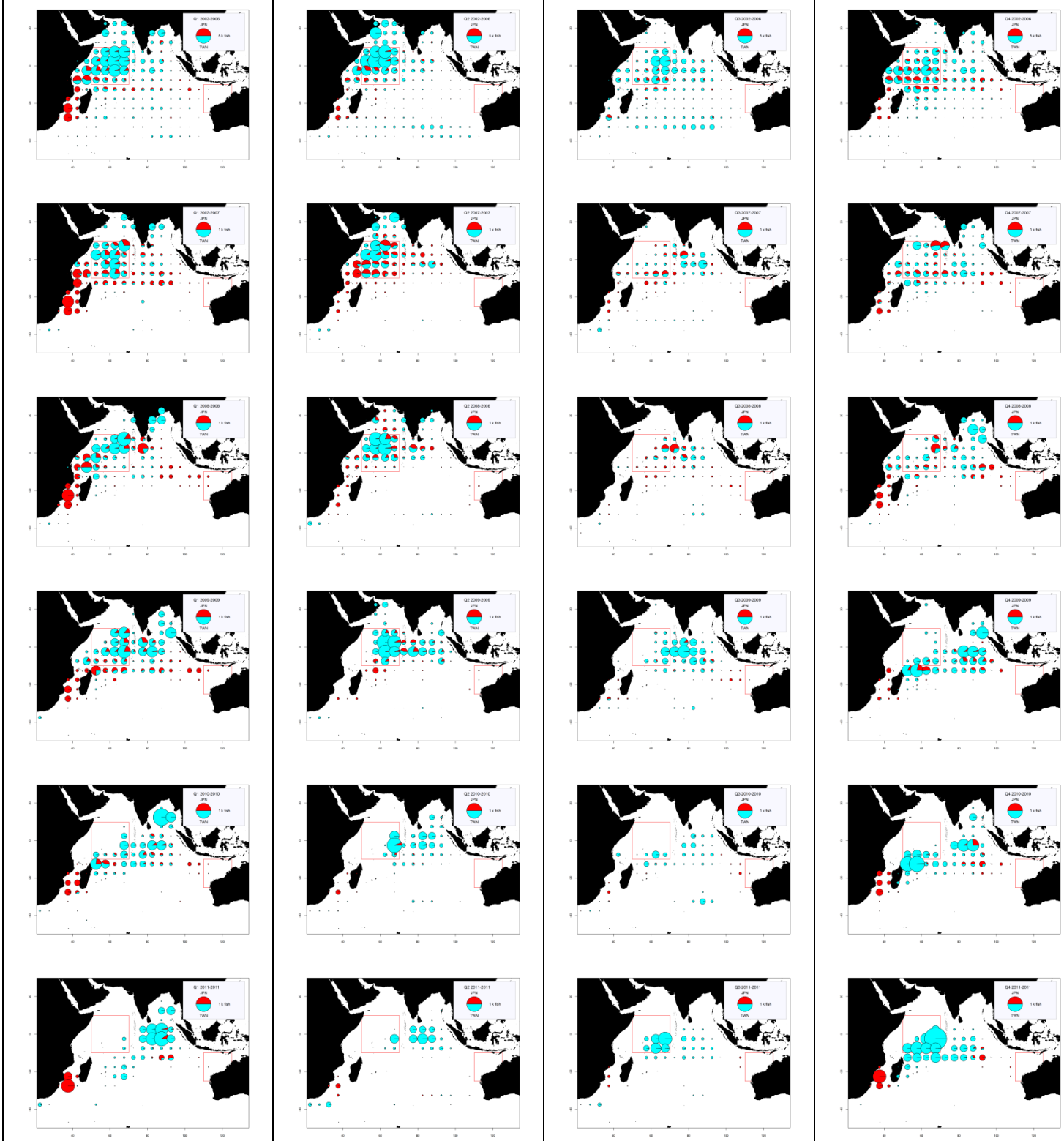


### b. Recent catches

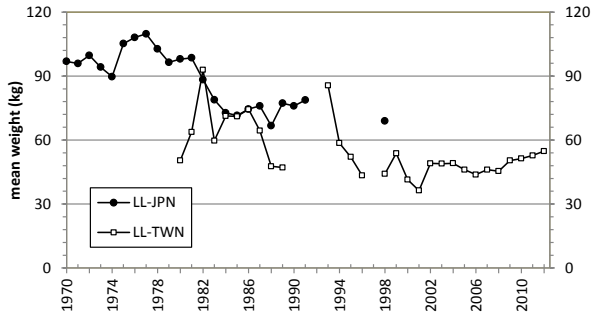
Time-area catches (total combined in number of fish for main longline fleets) of BLUE MARLIN estimated for 2002-06 and 2007-11, by year, and quarter:

Taiwan,China (TWN, blue): Deep-freezing longliners flagged in Taiwan,China (target tunas or swordfish).

Japan (JPN, red): Deep-freezing longliners flagged in Japan (target tunas).

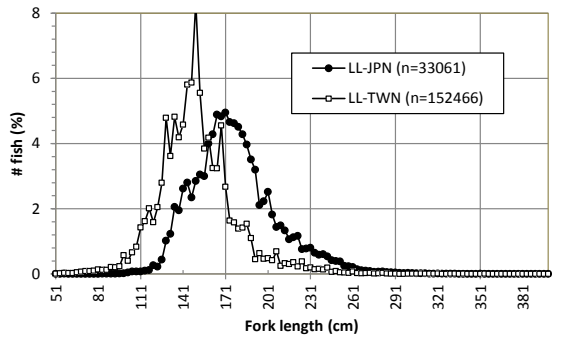


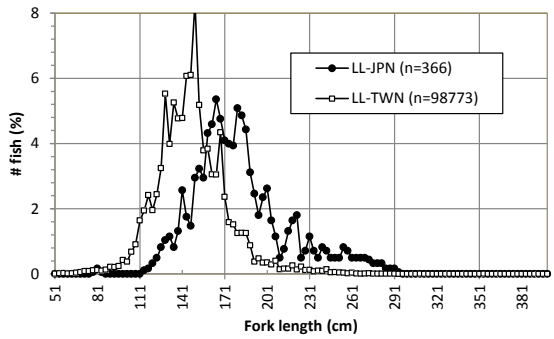
### c. Average weight and length frequency samples




Average weight of blue marlin (kg) estimated from the size samples available for longliners of Japan (1970-2012) and Taiwan,China (1980-2012)

NOTE: Average weights are shown only for years in which 300 or more specimens were sampled for length



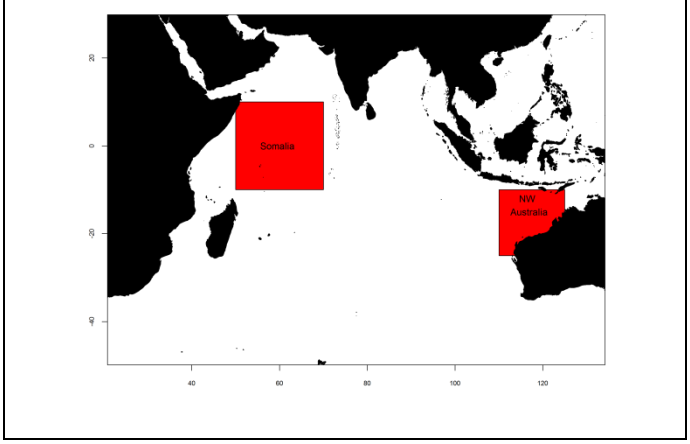




Number of blue marlin by length class (eye to fork length; expressed as %) estimated for the longline fisheries of Japan and Taiwan,China in the Indian Ocean, for 1950-2012 (left) and 2000-09 (right)

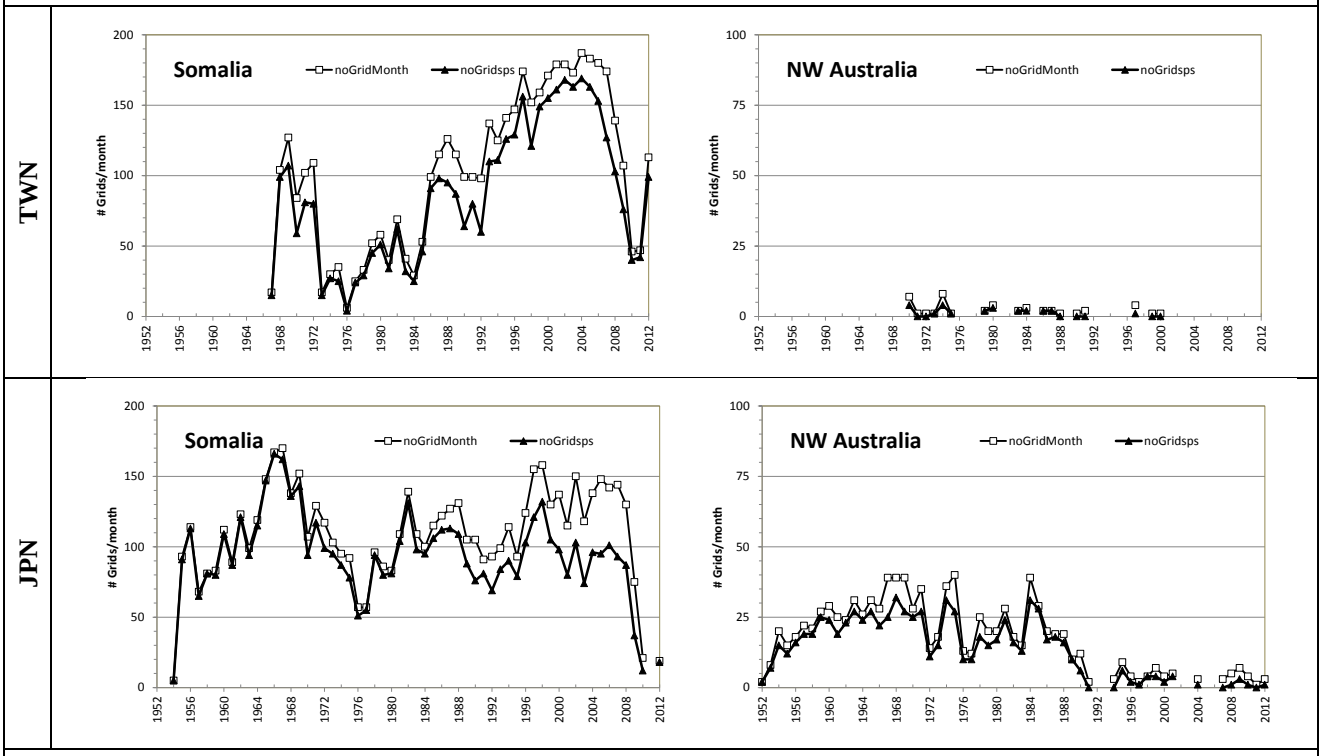
# 5. STRIPED MARLIN

## a. Catch rates and area fished

Hot spots of marlins identified by the IOTC WPB



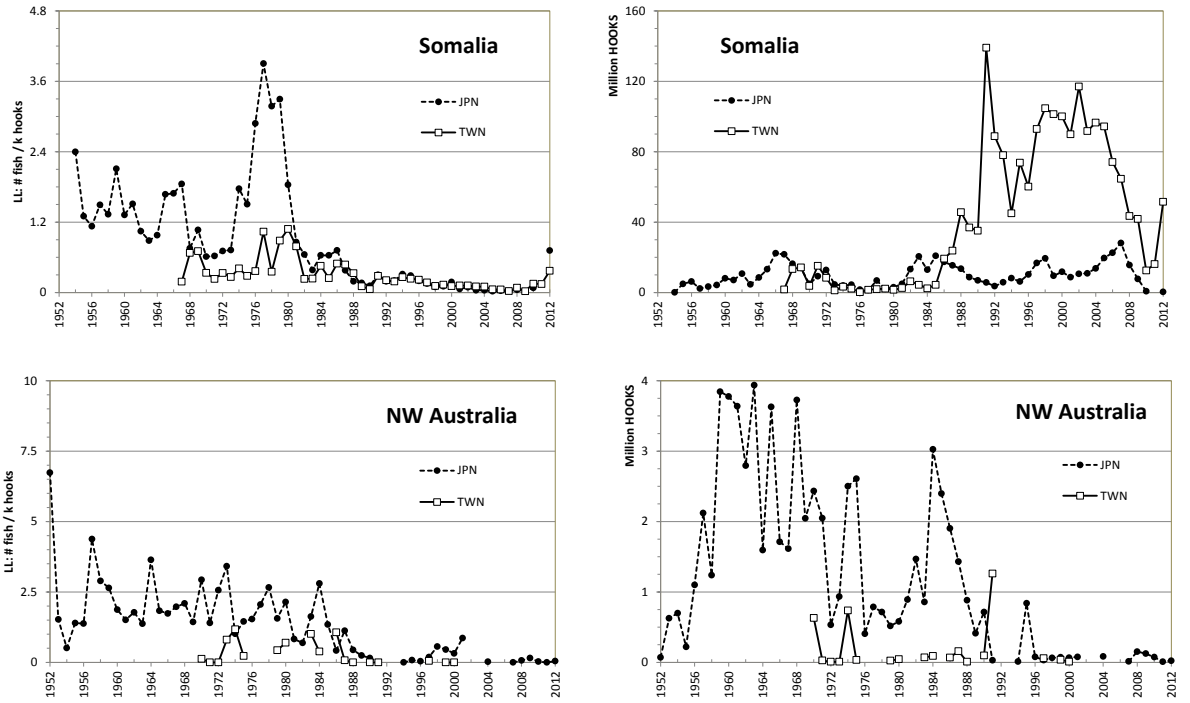

Number of five degree squares/month explored and number of squares/month with catches of striped marlin reported by the longline fisheries of Taiwan,China (top), Japan (bottom) by area and year (1952 to 2011): Somalia (left); NW Australia (right). The areas referred to above are shown in the map above



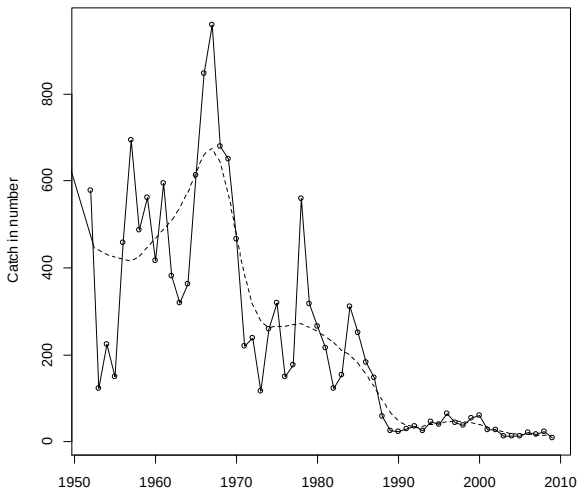

Total number of five degree squares/month on which catches of striped marlin have been ever reported: Somalia (192); NW Australia (54)

Nominal CPUE (number of fish/1000 hooks; left panel) and total fishing effort (million of hooks set; right panel) for the longline fleets of Japan, and Taiwan,China fishing in the Indian Ocean, by area and year (1952 to 2012): Somalia (top); NW Australia (bottom). The areas referred to above are shown in the map in the previous page

| CPUE number of striped marlin per thousand hooks | EFFORT: Number of Hooks (millions) |
|---|---|




Average catch (number of fish) in the three 5 degree square grids recording the highest catches of striped marlin in the Indian Ocean for the combined Japan and Taiwan,China longline fleets (1952-2010)

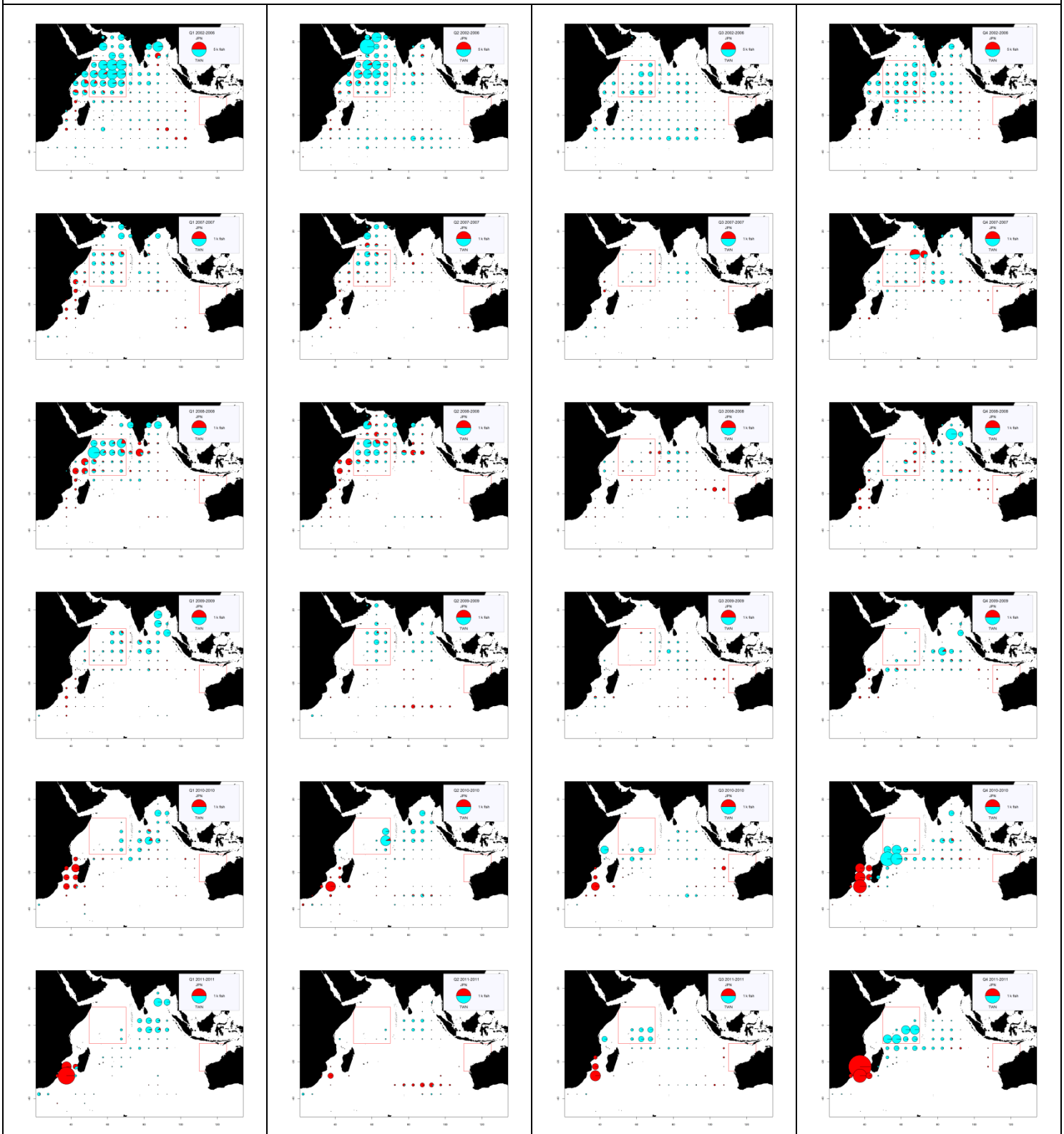


## b. Recent catches

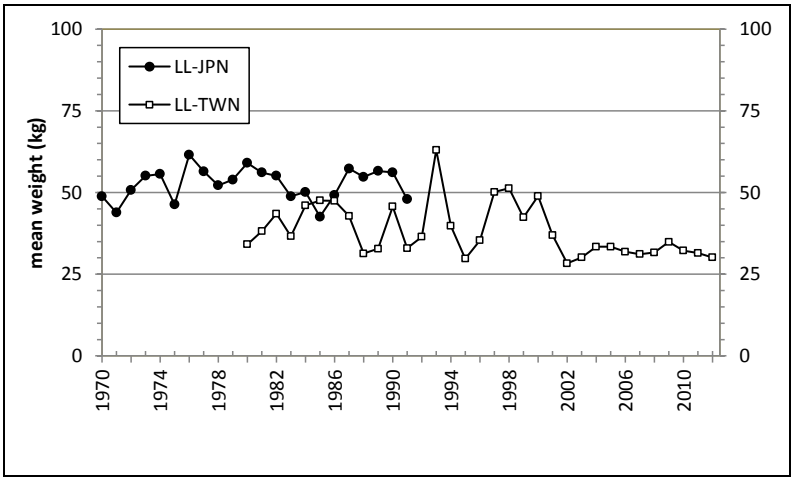
Time-area catches (total combined in number of fish for main longline fleets) of BLUE MARLIN estimated for 2002-06 and 2007-11, by year, and quarter:

Taiwan,China (TWN, blue): Deep-freezing longliners flagged in Taiwan,China (target tunas or swordfish).

Japan (JPN, red): Deep-freezing longliners flagged in Japan (target tunas).



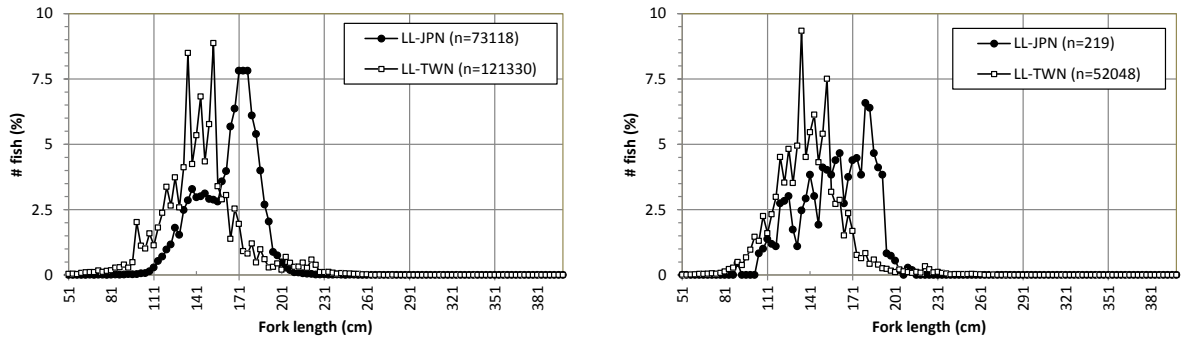
## c. Average weight and length frequency samples




Average weight of striped marlin (kg) estimated from the size samples available for longliners of Japan (1970-2012) and Taiwan,China (1980-2012)

NOTE: Average weights are shown only for years in which 300 or more specimens were sampled for length

***Data revised as of 13/09/2013***




Number of striped marlin by length class (eye to fork length; expressed as %) estimated for the longline fisheries of Japan and Taiwan,China in the Indian Ocean, for 1950-2012 (left) and 2000-09 (right)

***Data revised as of 13/09/2013***

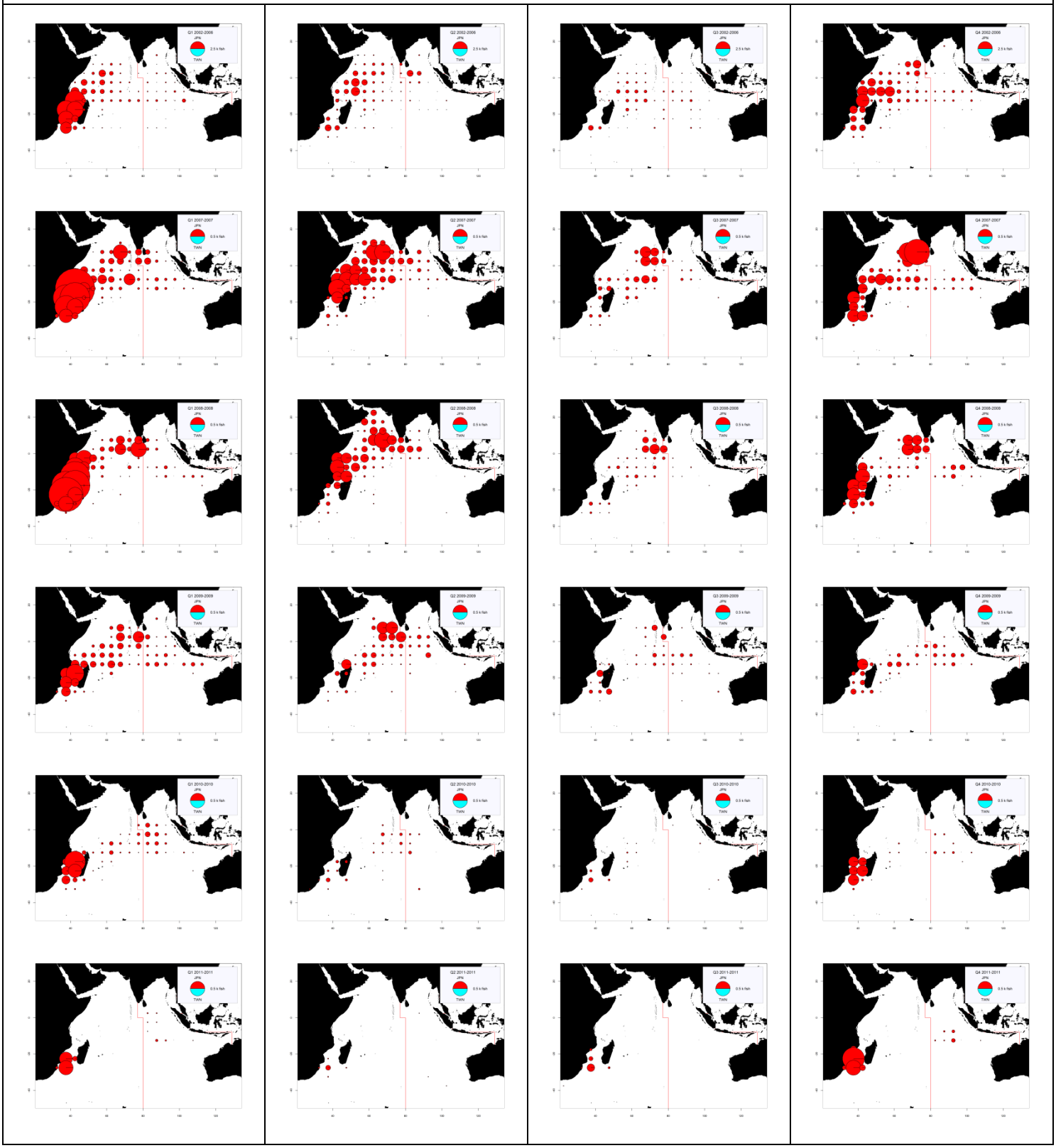
# 6. INDO-PACIFIC SAILFISH

## a. Recent catches

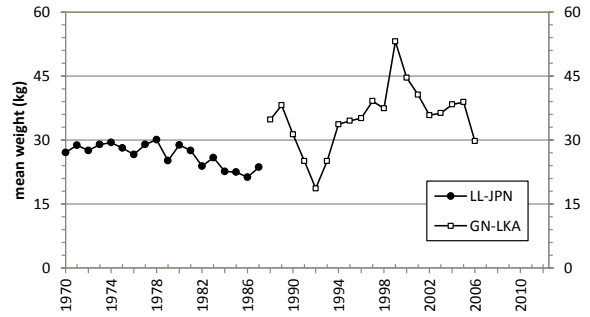
Time-area catches (total combined in number of fish for main longline fleets) of BLUE MARLIN estimated for 2002-06 and 2007-11, by year, and quarter:

Taiwan,China (TWN, blue): Deep-freezing longliners flagged in Taiwan,China (target tunas or swordfish).

Japan (JPN, red): Deep-freezing longliners flagged in Japan (target tunas).

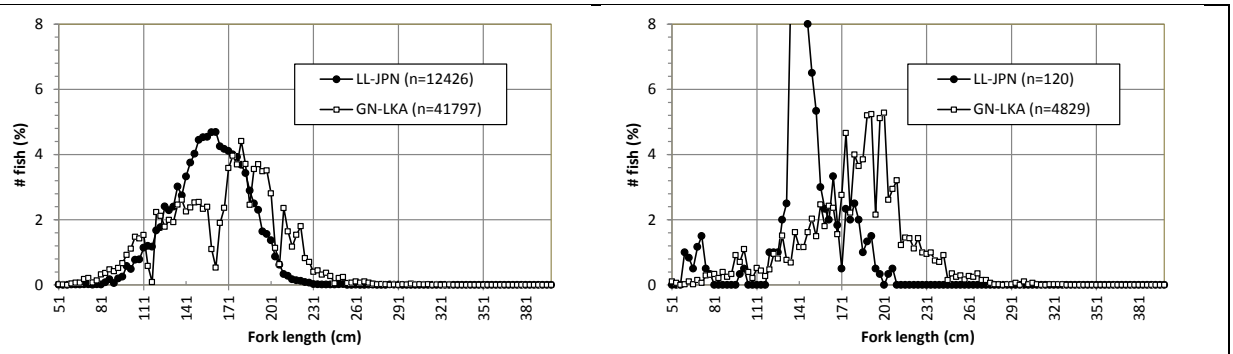


**b. Average weight and length frequency samples**




Average weight of Indo-Pacific sailfish (kg) estimated from the size samples available for longliners of Japan (1970-2012) and gillnets of Sri Lanka (1980-2012)

NOTE: Average weights are shown only for years in which 300 or more specimens were sampled for length




Number of Indo-Pacific sailfish by length class (eye to fork length; expressed as %) estimated for the longline fishery of Japan and the gillnet fishery of Sri Lanka in the Indian Ocean, for 1950-2012 (left) and 2000-09 (right)