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

IOTC–2011–WPB09–06

REVIEW OF THE STATISTICAL DATA AVAILABLE FOR THE BILLFISH SPECIES

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Abstract

This document reviews the status of the information available on billfishes in the databases at the IOTC Secretariat as of June 2011. It covers data on nominal catches, catch-and-effort, and size-frequency data.

1. OVERVIEW

This document summarises the standing of a range of information received by the secretariat for billfish species, in accordance with IOTC Resolution 10/02 *Mandatory statistical requirements for IOTC Members and Cooperating non-Contracting Parties (CPC's)*[3], for the period 1950-2009. Statistics for 2010 are not covered in this paper as preliminary catches for the previous year are usually reported later during the following year (June-October).

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 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 species

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 (eastern and western Indian Ocean). If these data are not reported the Secretariat estimates a total catch from a range of sources (including: partial catch and effort data; data in the FAO FishStat database; catches estimated by the IOTC from data collected through port sampling; data published through web pages or other means; and data reported by other parties on the activity of vessels (IOTC Resolution 07/04; IOTC Resolution 05/03; IOTC Resolution 08/02) or on imports of bigeye tuna from vessels under the flag concerned (IOTC Resolution 01/06).

Catch and effort data which refer to the fine-scale data – usually from logbooks, and reported per fleet, year, gear, 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.

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[3] This Resolution superseded IOTC Resolutions 98/01, 05/01 and 08/01

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).
- **Gillnet/longline** fishery of **Sri Lanka**: 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.
- **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. 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 2011 the Secretariat revised the complete nominal catch dataset for India, using new information available. 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.

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 in port.
- **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.
- **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 is unknown.
- **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.

4. Size data from All Fisheries:

- **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).
- **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**[4]**:** To date, Taiwan,China has not provided size frequency data for its fresh-tuna longline fishery.
- **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.

[4] Refers to Taiwan Province of China

2. STATUS OF FISHERIES STATISTICS FOR BILLFISH SPECIES

Swordfish (SWO)

- **Catch trends**

Swordfish are caught mainly using drifting longlines (95%) and gillnets (5%) (**Figure 1**). Swordfish were mainly by-catch 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, reaching 35,000 t in 1998 and 36,000 t in 2003 and 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[5]), all targeting swordfish, are the main reasons for this significant increase.

Catches have shown a decreasing trend since 2004, with current catch levels at around 21,000 t (2008 and 2009).

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 four years (5,000 t) (**Figure 2**). Catches in 2009 amounted to 6,300 t, representing one third of the total catches of swordfish in the Indian Ocean.

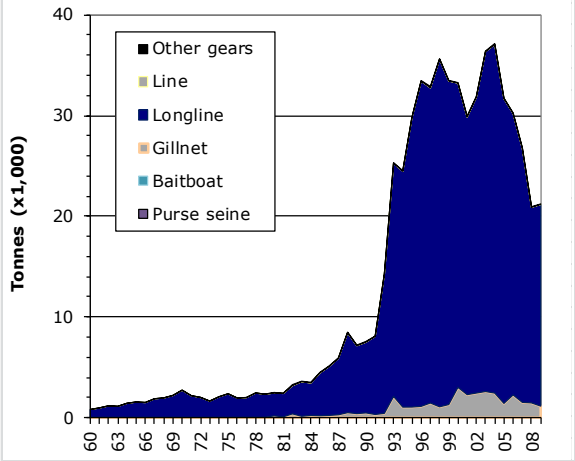


Figure 1: Catches of swordfish per gear and year recorded in the IOTC Database (1960-2009).

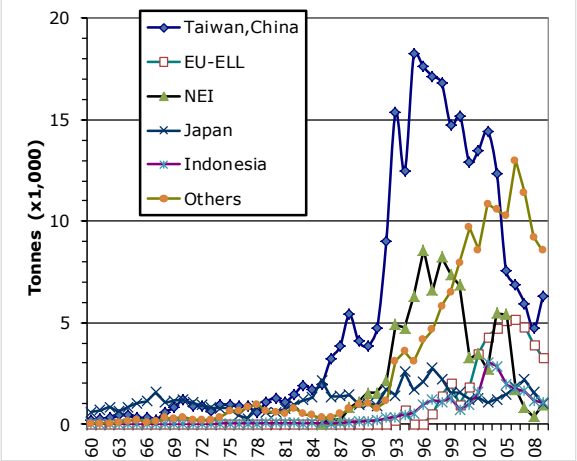
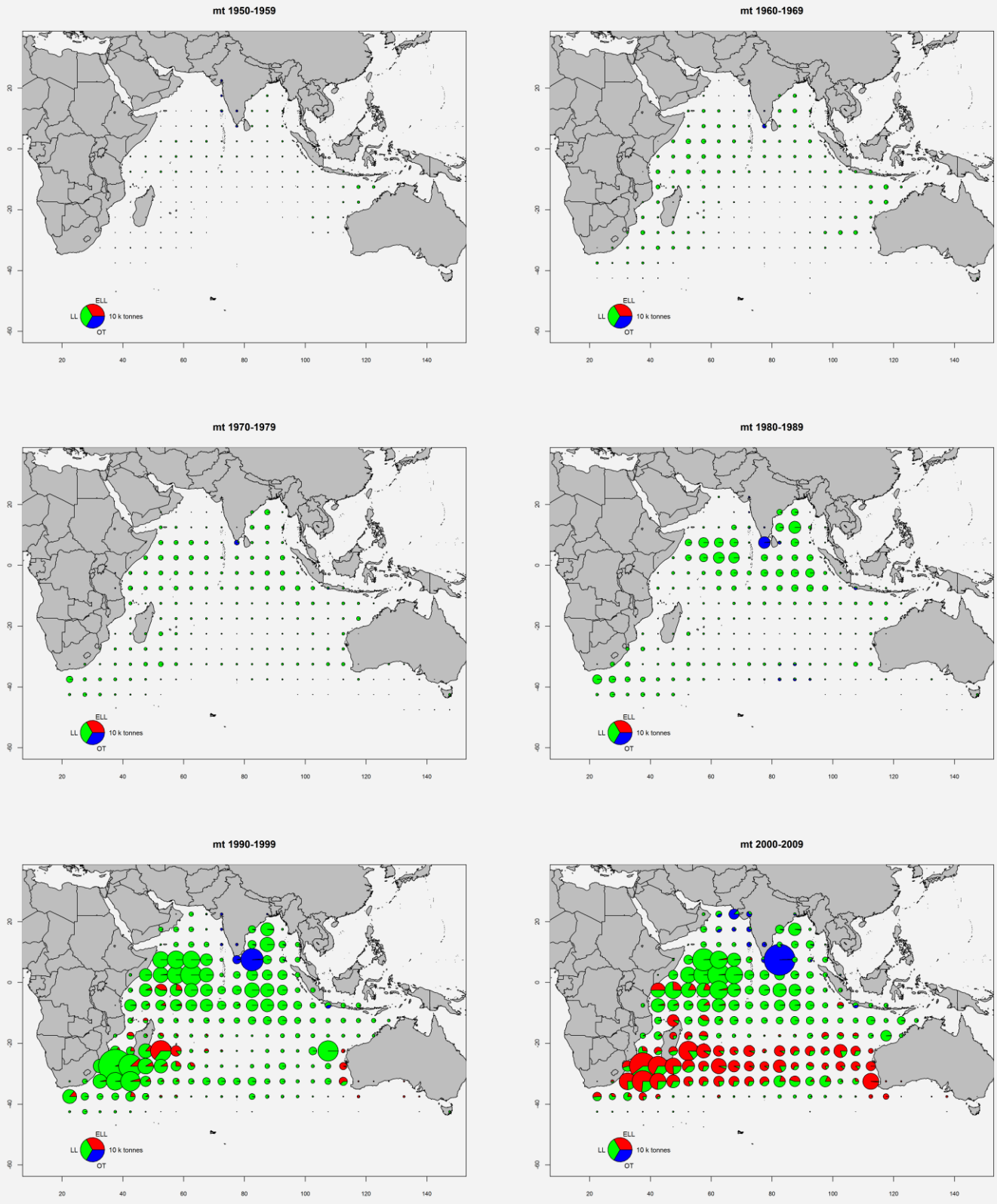


Figure 2: Catches of swordfish by fleet recorded in the IOTC Database (1960-2009)

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, with catches in recent years amounting to around 1,000 t per year (**Figure 2**).

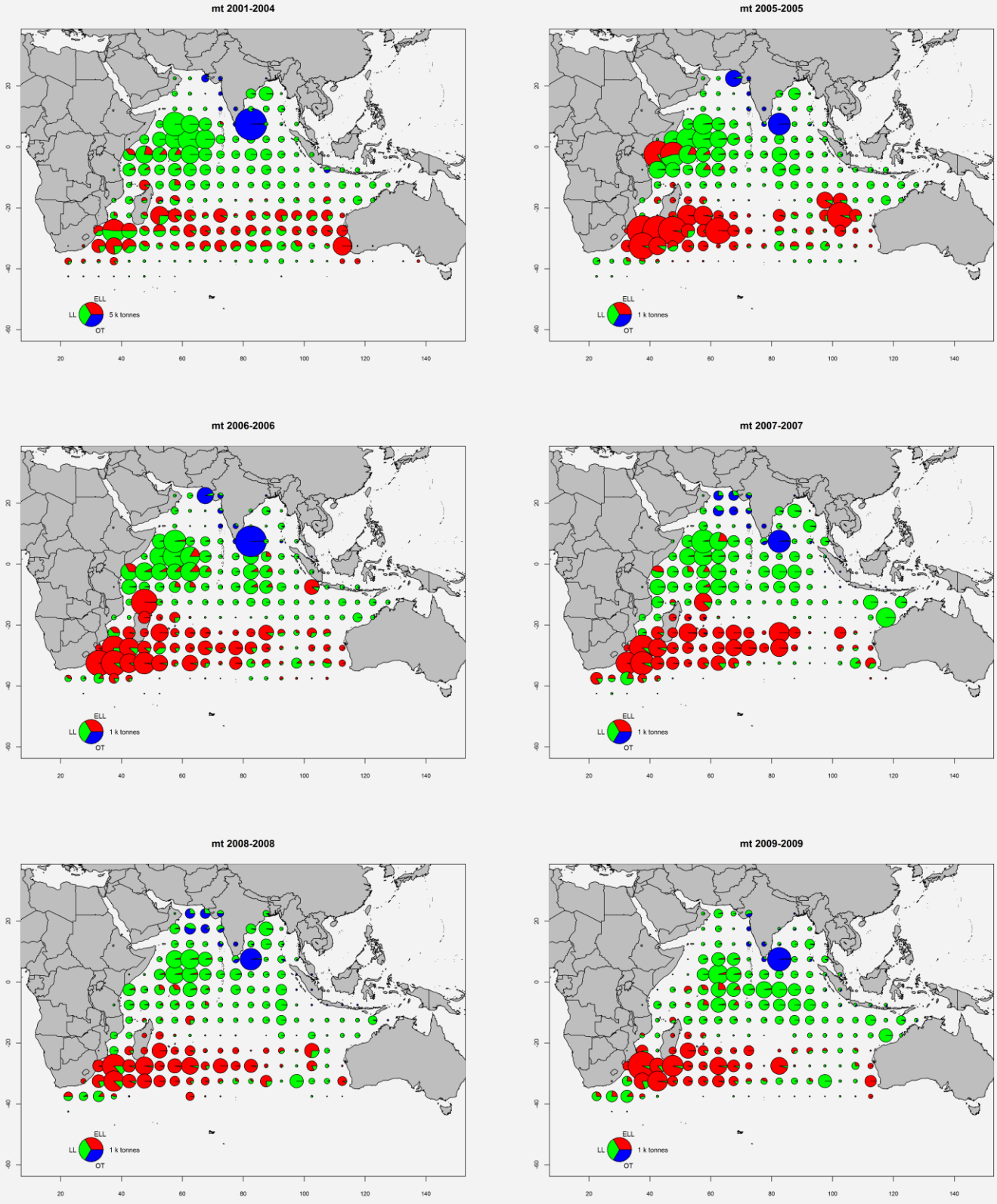
[5] Senegal, Guinea, etc.



Maps 1-6: Time-area catches (total combined in tonnes) of swordfish estimated for the period 1950-2009, by decade and type of gear:

Swordfish longliners (**ELL**), Other longliners (**LL**), Other fleets (**OT**)

Time-area catches are not available for non-longline fleets (OT, blue); catches for those were fully assigned to the one or more 5x5 squares lying within the EEZs of the countries concerned.



Maps 7-12: Time-area catches (total combined in tonnes) of swordfish estimated for the period 2000-2004 by type of gear and for 2005-09, by year and type of gear:

Swordfish longliners (**ELL**), Other longliners (**LL**), Other fleets (**OT**)

Time-area catches are not available for non-longline fleets (OT, blue); catches for those were fully assigned to the one or more 5x5 squares lying within the EEZs of the countries concerned.

The catches of Swordfish of industrial longliners from **Japan** (**Figure 2**) increased proportionally to those of yellowfin tuna, target species of this fleet during the first years of the fishery, to remain quite stable until the early 1990's. The average annual catches amounted to 1,600 t during the last two decades and catches over 2,500 t were recorded in 1994 and 1997.

In **Sri Lanka**, swordfish catches have fluctuated between 2,000 and 4,000 t over the last decade with the highest and lowest catches recorded in 2000 (4,300 t) and 2009 (1,900 t), respectively. These are taken mostly by boats that use a combination of drifting gillnets and longlines. This said, the first results from the sampling conducted by NARA[6] during 2005 and 2006 with the support of the IOTC-OFCF[7] Project in different locations in Sri Lanka appear to indicate that the estimates of historical catches of this species may need to be revisited.

The catches of **Indonesian** fresh-tuna longliners operating in Indian Ocean waters increased steadily until 2003 (3,000 t), having shown a decreasing trend since then. It is, however, likely that the catches recorded for years before 2003 are incomplete, as the statistics for this period are thought to be more uncertain (port sampling was initiated in 2003).

During the last two decades, several domestic longline fisheries targeting swordfish started to operate in Reunion (EU-**France**), **Australia**, **Seychelles** and more recently **Mauritius**, with total accumulated catches estimated to be between 2,000 t and 3,000 t in recent years.

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 (EU-ELL on **Figure 2**). 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 (**Maps 1-6**), 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 (**Maps 7-12**) the catches of swordfish in the western tropical Indian Ocean have dropped considerably, especially in areas off Somalia, Kenya and Tanzania particular in 2008 and, even more so in 2009. 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.

- ## Status of Fisheries Statistics at the IOTC

Retained catches are fairly well known (**Figure 3**); 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.
- **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.
- **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.
- **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.

[6] National Aquatic Resources and Development Agency of Sri Lanka
[7] Overseas Fisheries Cooperation Foundation of Japan

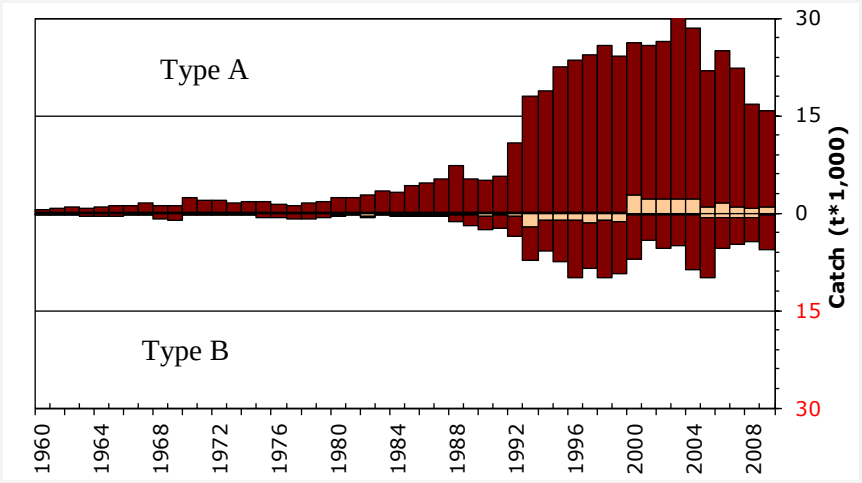


Figure 3. Uncertainty of time-area catches for swordfish (Data as of May 2011)

*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.*

Changes to the catch series: There have not been significant changes to the catch series of swordfish since the WPB in 2010 (**Figure 4**). Changes since the last WPB refer to revisions of historic data series for the artisanal fisheries of Indonesia and India. These changes, however, did not lead to significant changes in the total catch estimates (Figure 4).

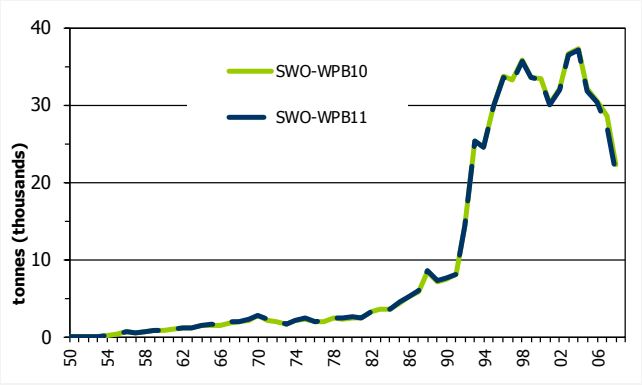


Figure 4: Swordfish: Catches used by the WPB in 2010 *versus* those estimated for the WPB in 2011 (1950-2009)

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.

CPUE Series: Catch and effort series are available from some industrial longline fisheries. Nevertheless, catch and effort are not available from some fisheries or they are considered poor quality, especially since the early 90s (**Indonesia**, fresh-tuna longliners from **Taiwan,China**[8], Non-reporting longliners (**NEI**)) (**Figure 5**).

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

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

Trends in average weight can be assessed for several industrial fisheries although they are incomplete or poor quality for most fisheries before the early-80s and in recent years (low size of samples and time-area coverage of longliners from **Japan**) (**Figure 5**).

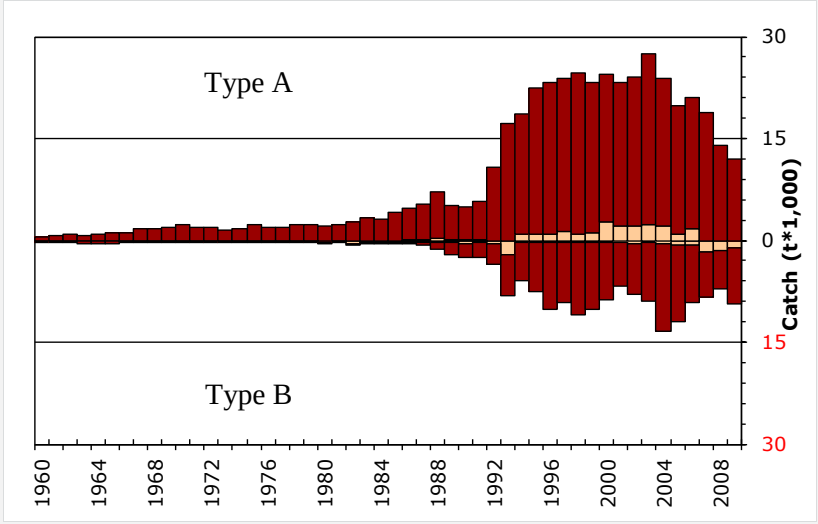


Figure 5: Uncertainty of time-area catches for swordfish (Data as of May 2011)

*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.*

Catch-at-Size(Age) table: CAS are available but the estimates are thought to have been compromised (**Figure 6**) for some years and fisheries due to:

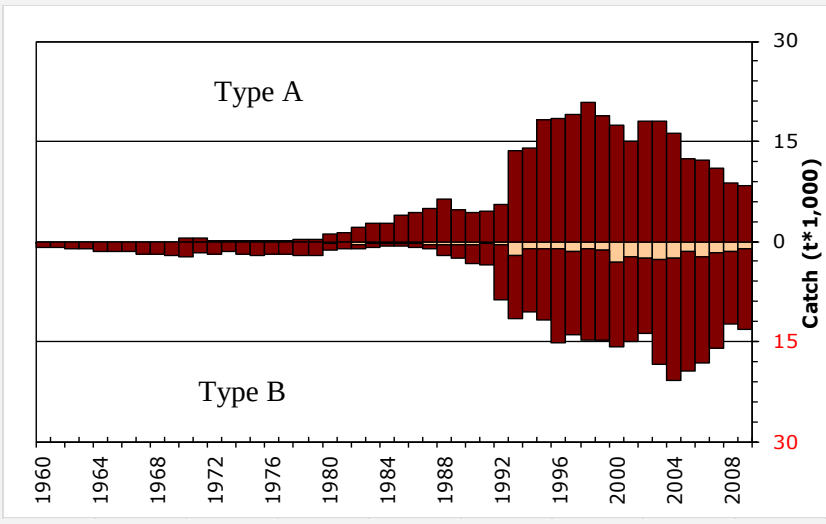


Figure 6. Uncertainty of catch-at-size data for swordfish (Data as of May 2011)

*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.*

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

Blue Marlin (BUM)

- **Catch trends**

Blue marlins are caught mainly under drifting longlines (60%) and gillnets (30%) with remaining catches recorded under troll and hand lines (**Figure 7**). Blue marlins are the by-catch of industrial and artisanal fisheries. The catches of blue marlin are typically higher than those of black marlin and striped marlin combined.

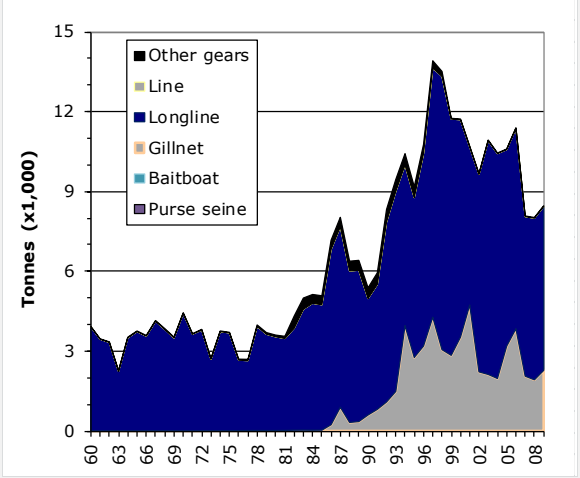


Figure 7: Catches of blue marlin per gear and year recorded in the IOTC database (1960-2009)

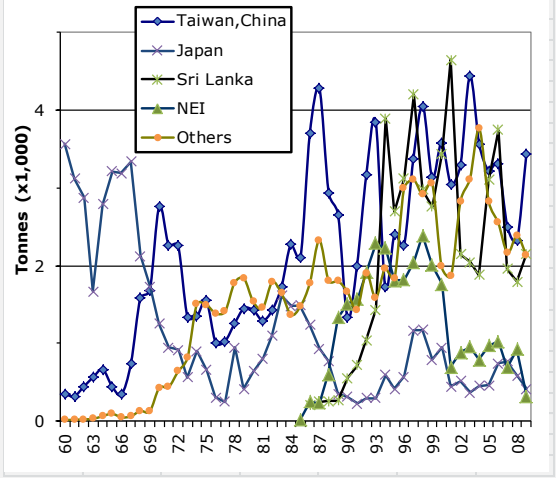
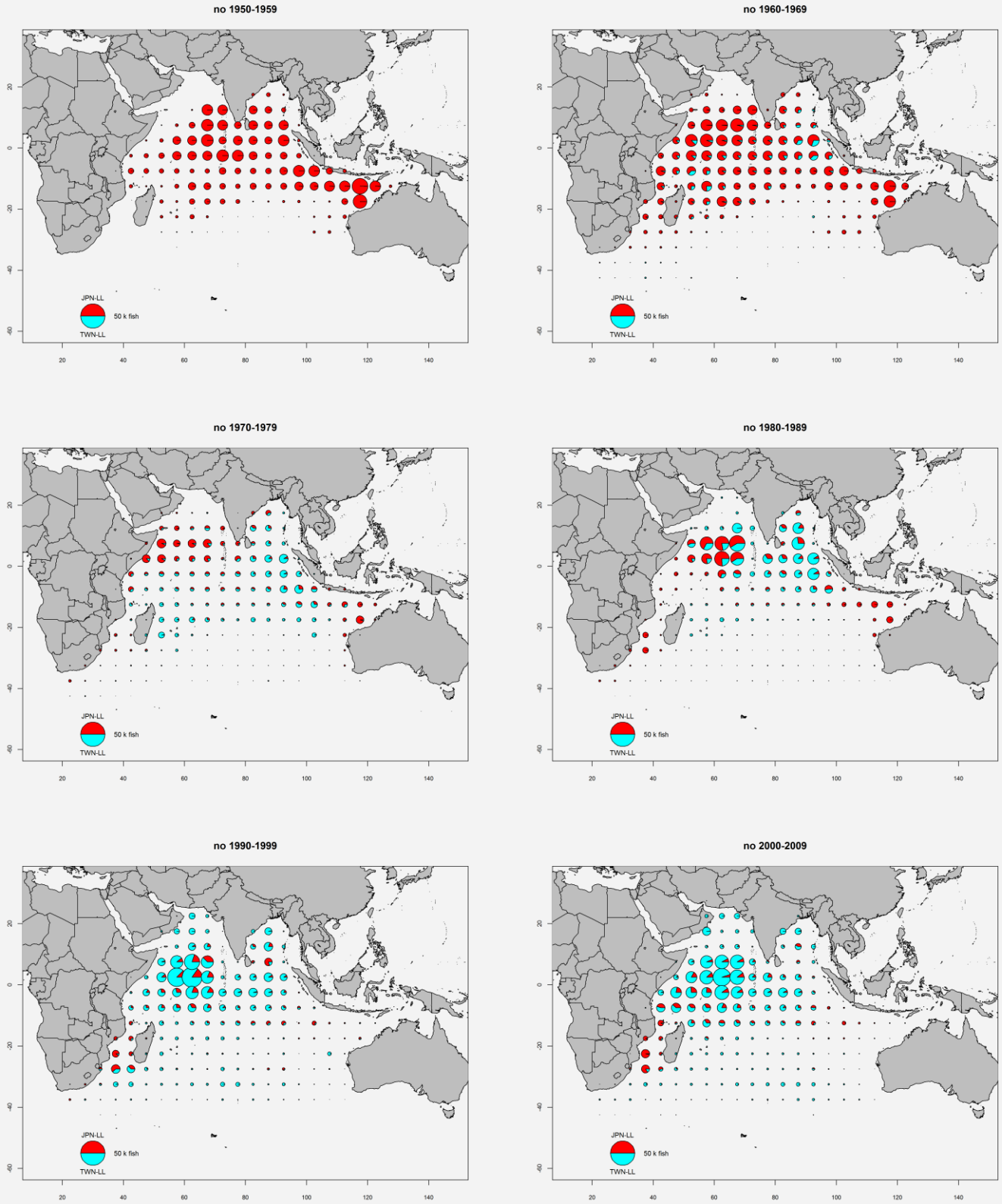


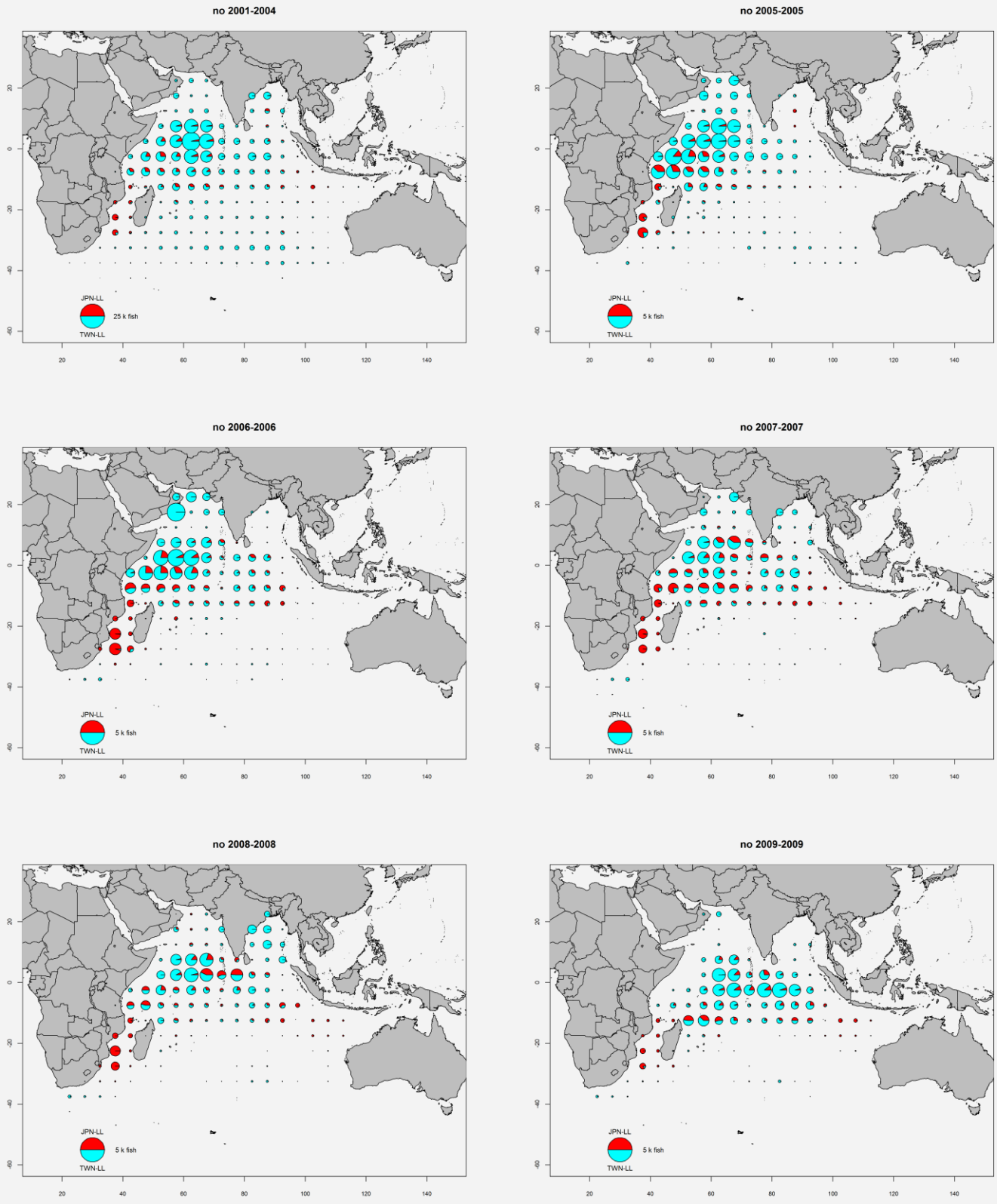
Figure 8: Catches of blue marlin by fleet recorded in the IOTC database (1960-2009)

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, steadily increasing since then. The largest catches were recorded in 1997 (14,000 t). Current catches are around 8,000 t. Catches under drifting longlines have been recorded under **Taiwan,China** and **Japan** fleets and, recently, **Indonesia** and several **NEI** fleets (**Figure 8, Maps 7-18**). In recent years, deep-freezing longliners from Japan and Taiwan,China 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 (**Maps 13-18**).

The catches of blue marlin in **Sri Lanka** (**Figure 8**) have been high since the mid-80's as a result of the development of a fishery using a combination of drifting gillnets and longlines. The highest catch (4,600 t) was recorded in 2001, while current catches are around 2,000 t. However, the catches of marlins have been frequently misidentified in Sri Lanka making it uncertain the catches by species.



Maps 7-12: 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.



Maps 13-18: 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 2000-2004 by fleet and for 2005-09, by year and fleet

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

Retained catches are poorly known (**Figure 9**) for most fisheries due to:

- catch reports refer to total catches of all three marlin species; catches by species have to be 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
- uncertain catches for non-reporting industrial longliners (**India**, **NEI**)
- catches likely to be incomplete for some industrial fisheries for which blue marlin is seldom the target species.
- conflicting catch reports: The catches of **Republic of Korea** longliners reported as nominal catches and catches and effort are conflicting, with higher catches recorded in the CE 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 catches remain uncertain for this fleet.
- a lack of catch data for most sport fisheries.

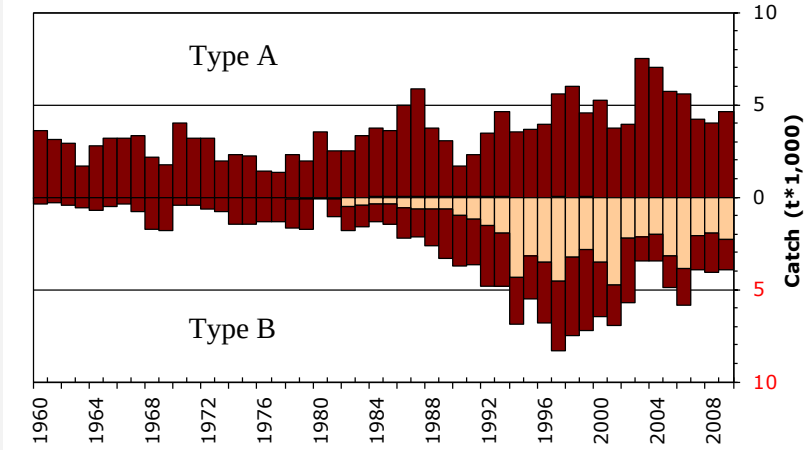


Figure 9. Uncertainty of time-area catches for blue marlin (Data as of May 2011)

*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.*

Changes to the catch series: There have not been significant changes to the catches of blue marlin since the WPB in 2010 (**Figure 10**).

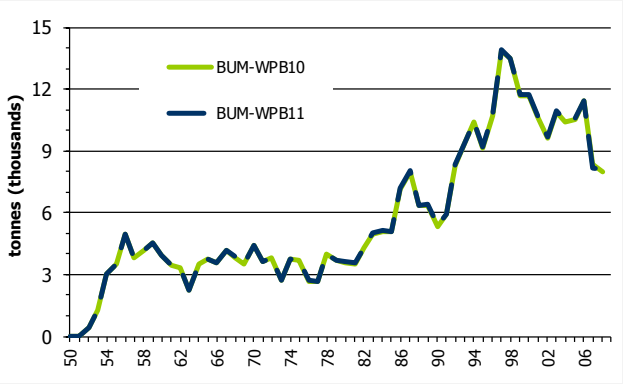


Figure 10: Blue Marlin: Catches used by the WPB in 2010 *versus* those estimated for the WPB11 (1950-2009)

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

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

Trends in average weight can only be assessed for the longline fisheries 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) table: The Secretariat has not built CAS or CAA tables for blue marlin.

Black Marlin (BLM)

- **Catch trends**

Black marlins are caught mainly under drifting longlines (44%) and gillnets (49%) with remaining catches recorded under troll and hand lines (**Figure 11**). Black marlins are the by-catch of industrial and artisanal fisheries.

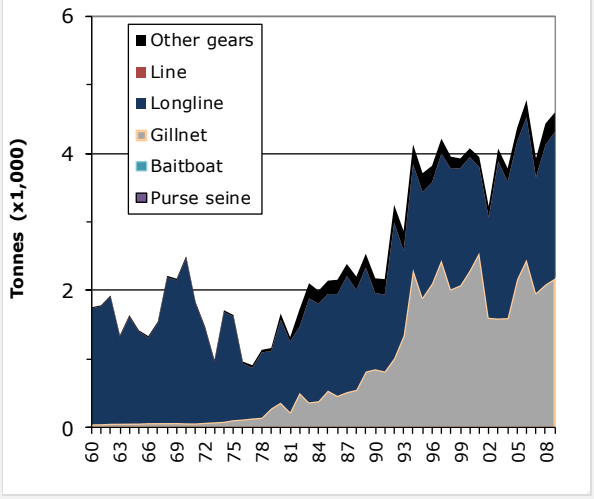


Figure 11: Catches of Black Marlin per gear and year recorded in the IOTC Database (1960-2009)

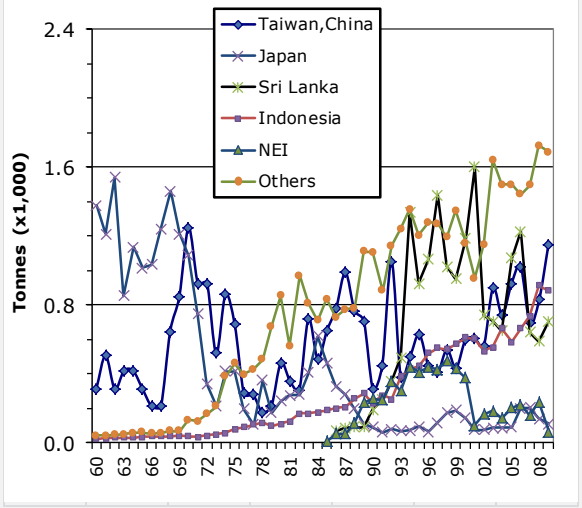


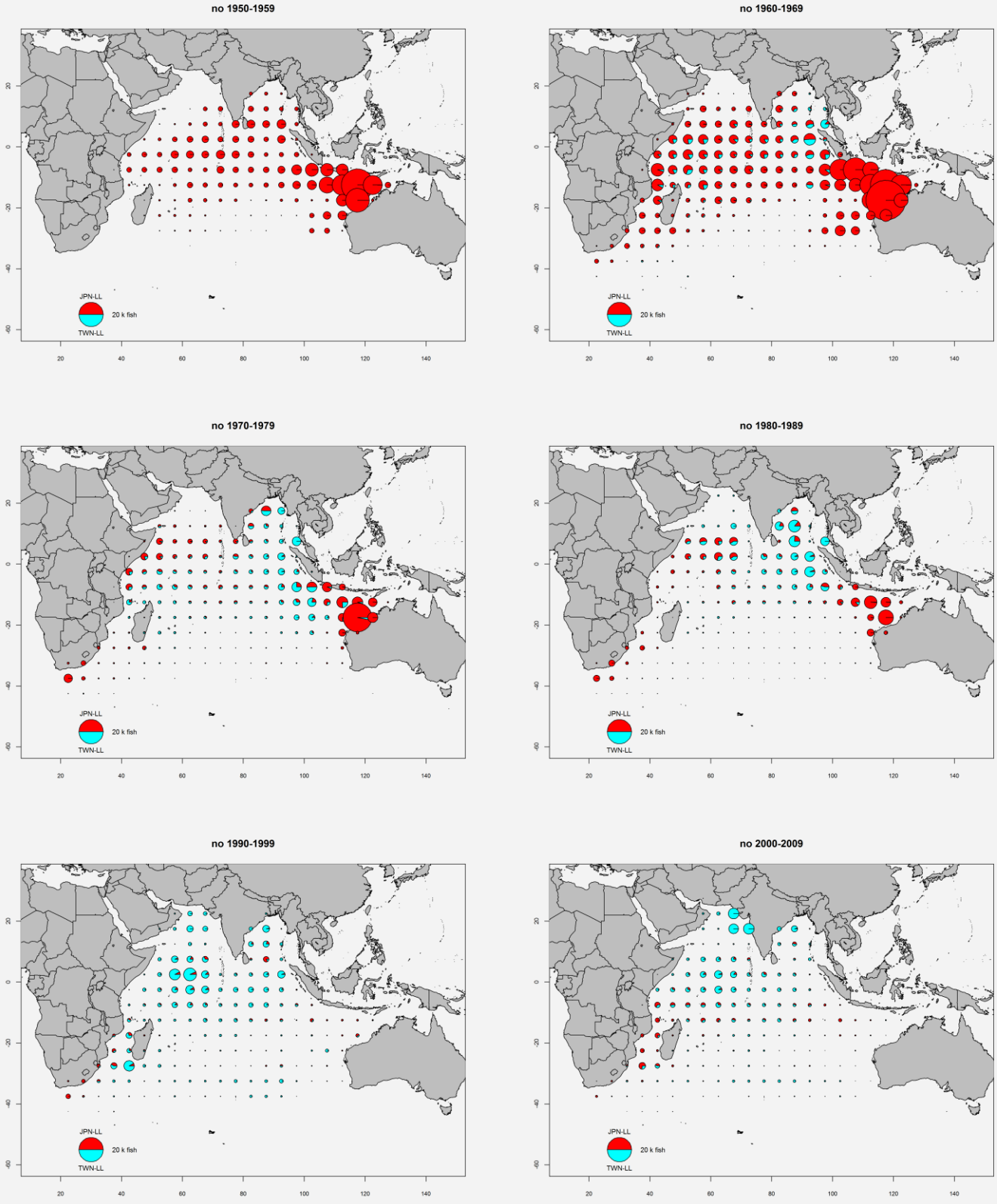
Figure 12: Catches of Black marlin by fleet recorded in the IOTC Database (1960-2009)

Catch trends for black marlin are variable; however, this may reflect the level of reporting. The catches of black marlin under drifting longlines have been more or less stable over time, at around 1,500-2,000 t. The largest catches were recorded in 1970 (2,400 t), with similar catches recorded in recent years (2008-09). Catches under drifting longlines have been recorded under **Taiwan,China**, **Japan**, South **Korea** and, recently, **Indonesia** and several **NEI** fleets (**Figure 12, Maps 19-30**). Between the early-50s and the late-80s part of the Japanese fleet was licensed to operate within the EEZ of Australia, reporting very high catches of black marlin in the area, in particular in waters off northwest Australia (**Maps 19-24**). 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 (**Maps 13-18**).

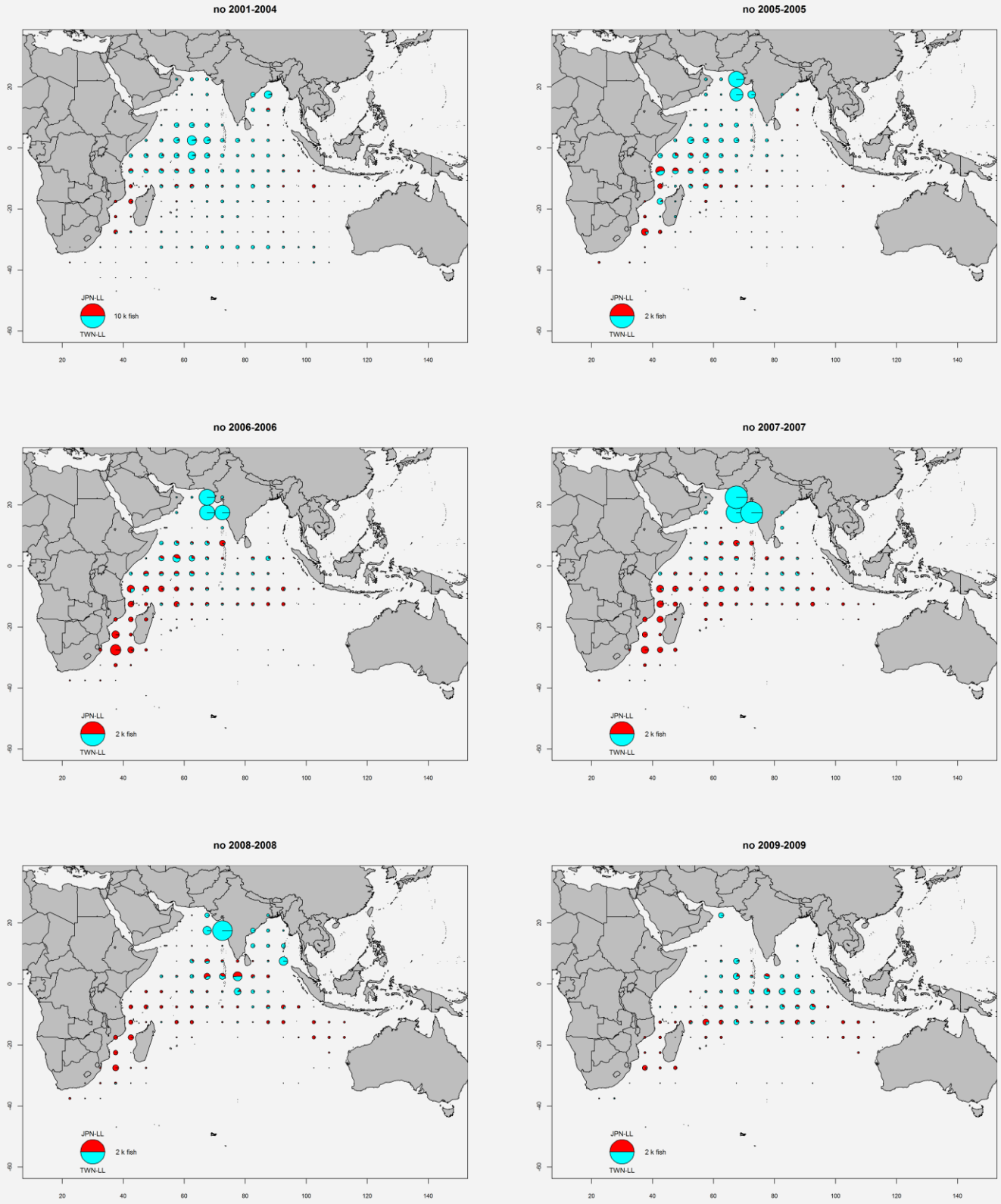
The catches of black marlin in **Sri Lanka** (**Figure 12**) have been high since the mid-1980's as a result of the development of a fishery using a combination of drifting gillnets and longlines. The highest catch (1,600 t) was recorded in 2001, while current catches are around 700 t.

However, the catches of marlins have been frequently misidentified in **Sri Lanka** making catches by species uncertain.

In recent years (2008-09) **Indonesia** has reported higher catches of black marlin for gillnet fisheries, amounting to around 900t (**Figure 12**, increase in category **Others**), which represents a more than two-fold increase over previous catch reports. In 2011, the Secretariat used the new data available to revise the catch series for Indonesia. The review led to new catch estimates, with new catches markedly higher than those estimated in the past.



Maps 19-24: 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.



Maps 25-30: 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 2000-2004 by fleet and for 2005-09, by year and fleet

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

Retained catches are uncertain (**Figure 13**) for some fisheries due to:

- Catch reports refer to total catches of all three marlin species; catches by species have to be 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** estimated by the Secretariat using alternative information, as they are not reported by the countries concerned
- catches likely to be incomplete for some industrial fisheries for which the black marlin is seldom the target species
- conflicting catch reports: The catches of longliners from the Republic of Korea reported as nominal catches and catches and effort are conflicting, with higher catches recorded in the CE table. For this reason, the Secretariat revised the catches of black marlin for 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.

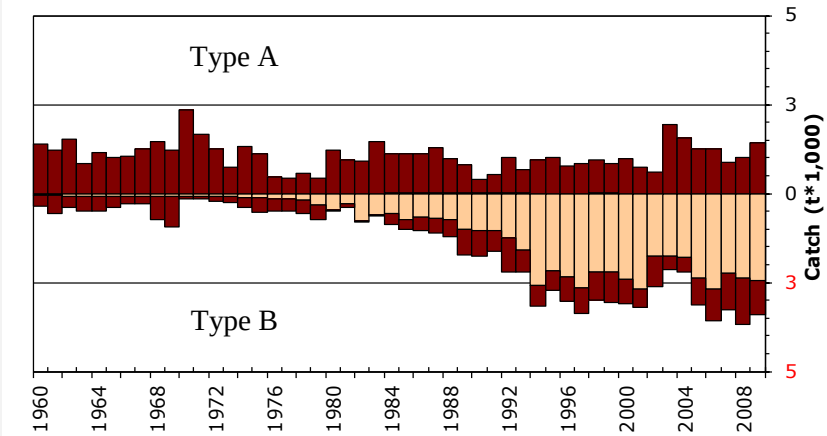


Figure 13. Uncertainty of time-area catches for black marlin (Data as of May 2011)

*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.*

Changes to the catch series: The catch series used by the WPB in 2010 and that to be used for the WPB in 2011 are slightly different, including:

- higher catches estimated between the Mid-70s and early-90s, following reviews of catch series for India and Indonesia. (Figure 14),
- lower catches estimated for 2006-08, following a review of the catch series for **India**.

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

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

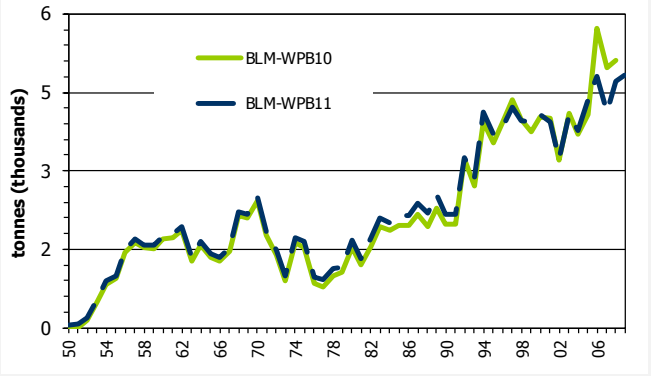


Figure 14: Black Marlin: Catches used by the WPB in 2010 *versus* those estimated for the WPB in 2011 (1950-2009)

Trends in average 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) table: The Secretariat has not built CAS or CAA tables for black marlin.

Striped Marlin (MLS)

- **Catch trends**

Striped marlin are caught almost exclusively under drifting longlines (98%) with remaining catches recorded under gillnets and troll lines (**Figure 15**). Striped marlin are the by-catch of industrial fisheries.

Catch trends for striped marlin are variable; however, this may reflect the level of reporting. The catches of striped marlin under drifting longlines have been changing over time, between 2,000 t and 8,000 t. The largest catches were recorded in 1993 (8,000 t). Current catches are around the lowest recorded, at about 2,000 t.

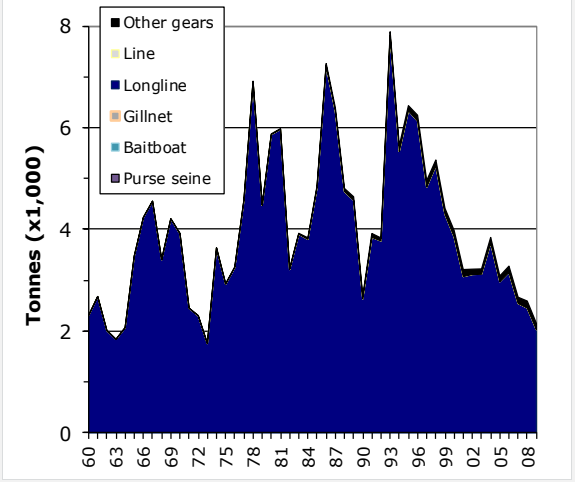


Figure 15: Catches of Striped Marlin per gear and year recorded in the IOTC Database (1960-2009)

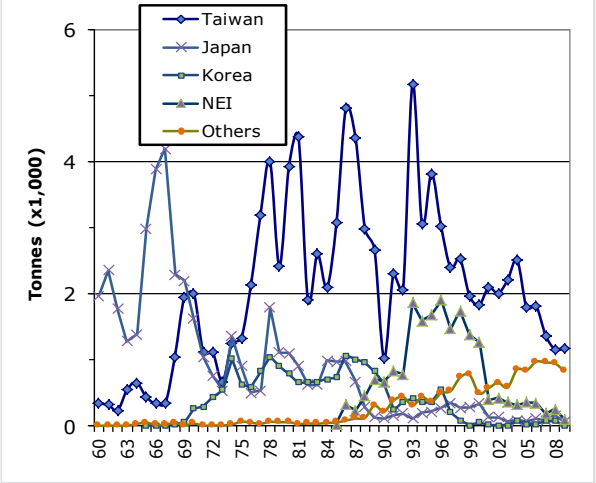
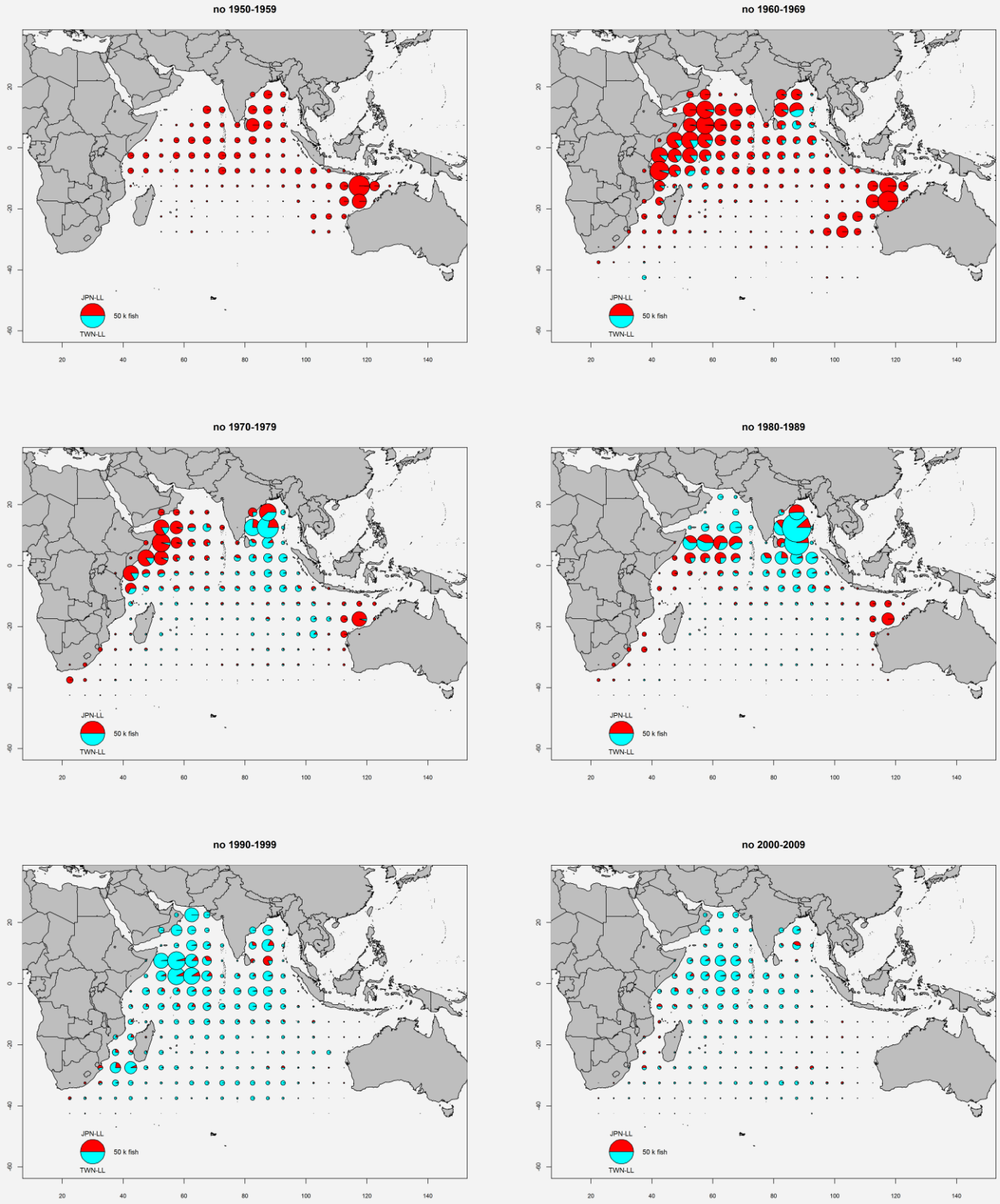
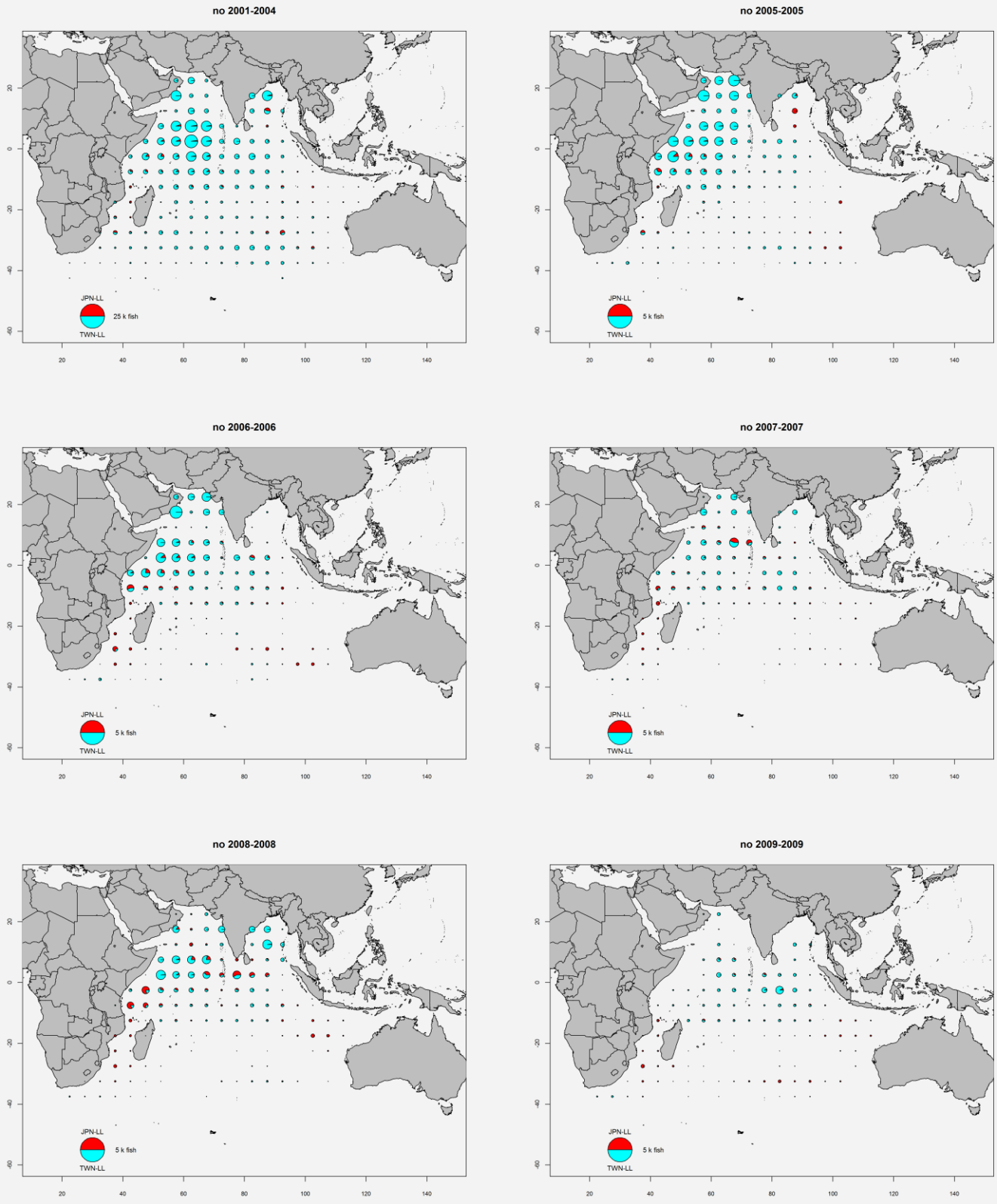


Figure 16: Catches of Striped marlin by fleet recorded in the IOTC Database (1960-2009)

Catches under drifting longlines have been recorded under **Taiwan,China, Japan**, **Korea** fleets and, recently, **Indonesia** and several **NEI** fleets (**Figure 16**). Taiwan,China and Japan have reported large drops in the catches of striped marlin for its longline fleets in recent years. The reason for such decrease 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 (**Maps 19-24**). High catches of the species were also reported in the Bay of Bengal during this period, by both Taiwanese and Japanese longliners. In recent years, deep-freezing longliners from Japan and Taiwan,China have reported lower catches of striped marlin, mostly in the northwest Indian Ocean (**Maps 13-18**). 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.



Maps 31-36: 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.



Maps 37-42: 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 2000-2004 by fleet and for 2005-09, by year and fleet

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

Retained catches are reasonably well known (**Figure 17**) 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 Secretariat for some industrial fisheries (longliners of **Indonesia** and **Philippines**).
- catches of non-reporting industrial longliners (**India**, **NEI**) estimated by the 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 in the Republic of Korea reported as nominal catches and catches and effort are conflicting, with higher catches recorded in the CE table. For this reason, the Secretariat revised the catches of striped marlin over the time-series using both datasets. Although the new catches estimated by the Secretariat are thought to be more accurate, catches of striped marlin remain uncertain for this fleet.

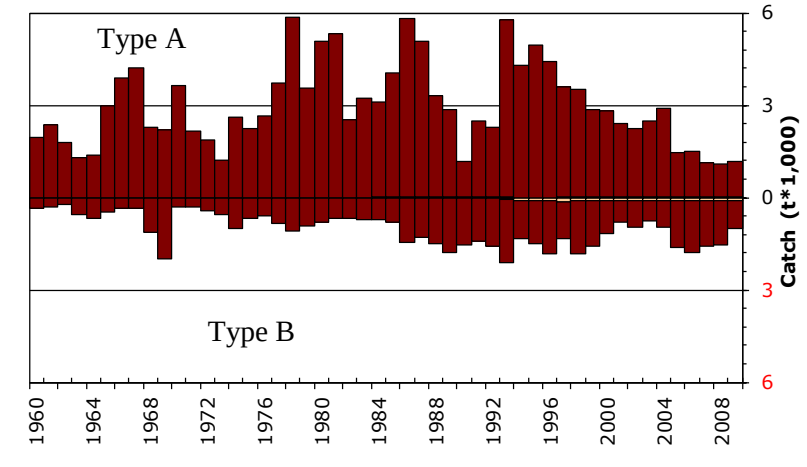


Figure 17. Uncertainty of time-area catches for striped marlin (Data as of May 2011)

*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.*

Changes to the catch series: There have not been significant changes to the catches of striped marlin since the WPB in 2010 (**Figure 18**).

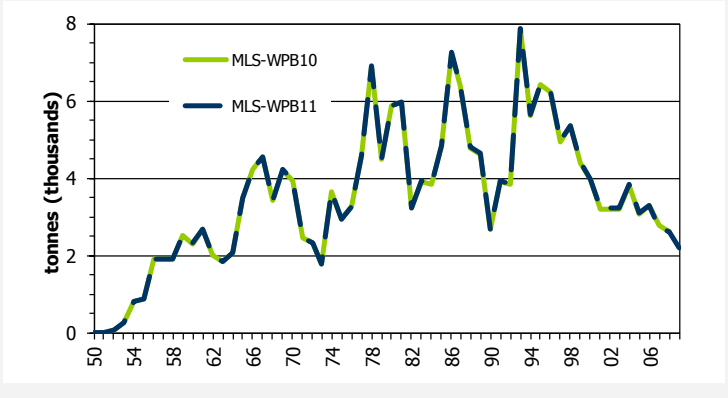


Figure 18: Striped Marlin: Catches used by the WPB in 2010 *versus* those estimated for the WPB11 (1950-2009)

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 Iran, as this species has no commercial value in this country.

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

Trends in average 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) table: The Secretariat has not built CAS or CAA tables for striped marlin.

Indo-Pacific Sailfish (SFA)

Indo-Pacific Sailfish is caught mainly under gillnets (78%) with remaining catches recorded under troll and hand lines (15%), longlines (7%) or other gears (**Figure 19**). Current catches are around 21,000 t.

The catches of sailfish greatly increased since the mid-1980's in response to the development of a gillnet/longline fishery in Sri Lanka (**Figure 20**) and, especially, the extension in the area of operation of **Iranian** gillnet vessels to areas beyond the EEZ of Iran. Pakistan and India have also important fisheries for this species. **Iran** has reported large drops in the catches of sailfish in recent years.

The catches of **Iranian** gillnets (**Figure 20**) increased dramatically, more than six-fold, after the late nineties, from values averaging the 2,000t in the late 80's to a maximum of 12,600t in 2005. The catches decreased in 2006 and again in 2007-08 (5,000 t); catches in 2009 were estimated at about 8,000 t.

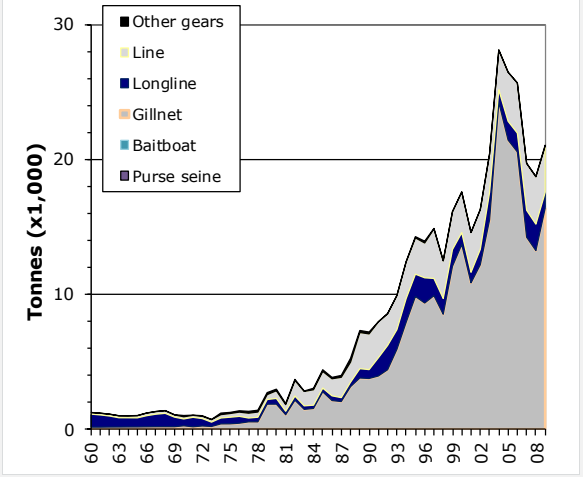


Figure 19: Catches of Indo-Pacific sailfish per gear and year recorded in the IOTC Database (1960-2009)

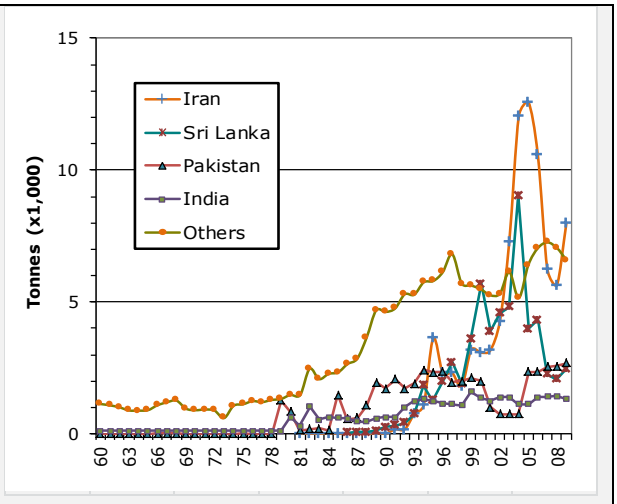
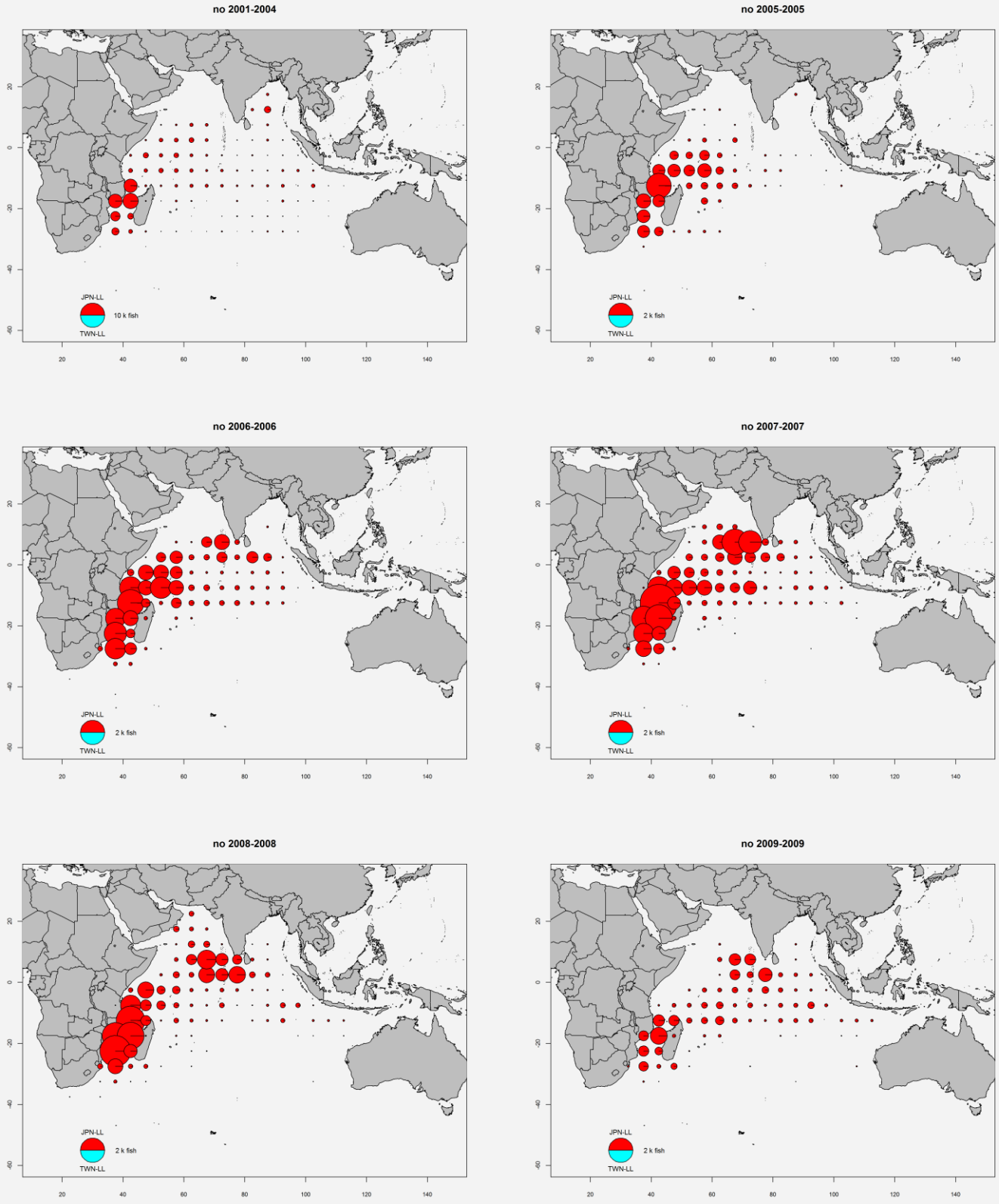


Figure 20: Catches of Indo-Pacific sailfish by fleet recorded in the IOTC Database (1960-2009)

The catches of sailfish under drifting longlines and other gears do not show any specific trends in recent years, with total catches amounting to about 5,000 t. However, it is likely that longline fleets underreport 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 (**Maps 13-18**).



Maps 43-48: Time-area catches (in number of fish) of Indo-Pacific sailfish as reported for the longline fisheries of Japan (JPN) and Taiwan,China (TWN) for the period 1996-2004, by fleet and for 2005-09, by year and fleet

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

Retained catches are poorly known (**Figure 21**) for most fisheries due to:

- catch reports refer to total catches of all billfish species; catches by species have to be 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 likely to be incomplete for some industrial fisheries for which this species represents a by-catch.
- catches likely to be incomplete for some artisanal fisheries (gillnets of **Pakistan**, pole and lines of **Maldives**) due to under-reporting
- a lack of catch data for most sport fisheries.

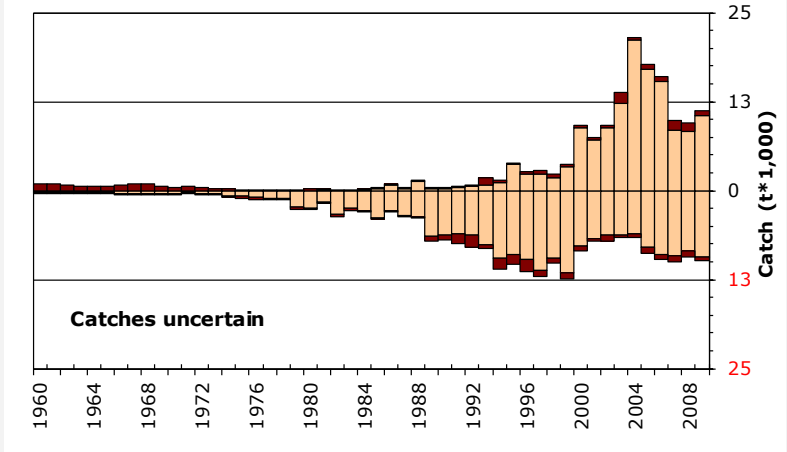


Figure 21. Uncertainty of annual catch estimates for IP sailfish.

The amount of the catch below the zero-line has been categorised as uncertain according to the criteria given in the text. Light bars represent data for artisanal fleets and dark bars represent data for industrial fleets. Data as of June 2011

Changes to the catch series: There have not been significant changes to the catches of Indo-Pacific sailfish since the WPB in 2010 (**Figure 22**). The changes recorded in recent years originated in a review (by the Secretariat) of the catches reported by Indonesia, resulting in catches slightly lower than those reported by Indonesia.

Figure 22: Indo-Pacific sailfish: Catches used by the WPB in 2010 *versus* those estimated for the WPB in 2011 (1950-2009)

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

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

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

Catch-at-Size(Age) table: The Secretariat has not built CAS or CAA tables for IP sailfish.