STATUS OF IOTC DATABASES FOR TROPICAL TUNAS

IOTC Secretariat

Abstract

This document reviews the status of the information available on tropical tunas in the databases at the IOTC Secretariat as of September 2008. 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 for tropical tunas, in accordance with IOTC Resolution 01/05 *Mandatory statistical requirements for IOTC Members*.

The document describes the progress achieved in relation to the collection and verification of data, identifies problem areas and proposes actions that could be undertaken to improve them.

A list of recommendations for the improvement in the standing of the data on tropical tunas currently available at the secretariat is made for the consideration of the Working Party (next page).

The report covers the following areas:

- Overview
- Recommendations to improve the data available on tropical tunas to IOTC
- Overview of tropical tuna fisheries in the Indian Ocean:
    - Catch trends
    - Status of fisheries statistics for tropical tuna species
- Progress achieved on the recommendations made by the WPTT in 2007

Major data categories covered by the report

Nominal catches which are highly aggregated statistics for each species estimated per fleet, gear and year for a large area. If these data are not reported the Secretariat estimates a total catch from a range of sources (including: partial catch and effort data; data in the FAO FishStat database; catches estimated by the IOTC from data collected through port sampling; data published through web pages or other means; and data reported by other parties on the activity of vessels (IOTC Resolution 07/04; IOTC Resolution 05/03) or on imports of bigeye tuna from vessels under the flag concerned (IOTC Resolution 01/06).

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

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

2. RECOMMENDATIONS TO IMPROVE THE DATA AVAILABLE TO IOTC

The following list of recommendations is provided by the Secretariat for the consideration of the WPTT. The recommendations include actions which the Secretariat considers would lead to a marked improvement in the standing of the data currently available at the secretariat. In general, these recommendations are made over and above the existing obligations and technical specifications relating to the reporting of data.

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

- Yemen, Comoros and Madagascar implementing fisheries statistical collection and reporting systems.
- Sri Lanka strengthening their data collection systems to improving species and gear breakdown.
- Maldives, Iran and Pakistan providing catch and effort data for their artisanal fisheries, notably gillnets, pole and lines and handlines.
- Countries having emerging hand line fisheries, notably Maldives, Sri Lanka and Indonesia, making the necessary arrangements to collect and provide statistics for those fisheries.
- Countries having fisheries likely to catch significant amounts of bigeye tuna, notably Maldives, Indonesia and Sri Lanka making the necessary arrangements to ensure that the catches estimated for this species are sufficiently precise.
- Fisheries data collection agencies in each country, notably those in India and Sri Lanka, collaborating to produce one consistent set of catch statistics.C
- Countries increasing sampling coverage to obtain acceptable levels of precision in their catch and effort statistics.

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

- Indonesia and Malaysia collecting catch and effort information for their fresh tuna and/or deep-freezing longline fleets, including those not based in indonesia
- Taiwan,China collecting and providing catch and effort data for their fresh tuna longline fleets.
- India collecting and providing catch and effort data for its longline fleet.
- Iran reporting catch and effort data for its industrial purse seine fleet.
- Countries having industrial fleets ensuring that log book coverage is appropriate to produce acceptable levels of precision in their catch and effort statistics.
- Countries having industrial fleets implementing or increasing coverage of existing Vessel Monitoring Systems in order to be able to validate data collected through logbooks.
- Countries having industrial fleets increasing observer coverage to produce acceptable levels of precision in their estimates of bycatch and discard levels.
- Countries having industrial fleets providing estimates of discard levels of tropical tuna species.
- Countries having industrial fleets providing information on the activities of vessels presumed to be from non-reporting fleets.

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

- Pakistan, Comoros, Indonesia and Yemen to collect and provide size data for tropical tunas taken by artisanal fisheries, especially gillnet, handline and troll fisheries.
- India providing their size data available for tropical tunas.
- Maldives to provide size frequency data by gear
- Thailand and Iran to collect and provide size data for their industrial purse seine fleets
- Taiwan,China collecting and providing size data from their fresh tuna longliners.
- Indonesia and Malaysia collecting and providing size data for their longline vessels based in other countries
- China, Oman, Philippines, Seychelles and South Korea providing size data from their longline fleets.
- Japan increasing size sampling coverage from its longline fleet.
- Countries catching significant amounts of tropical tunas reviewing their existing sampling schemes to ascertain that the data collected are representative of their fisheries.

4. Reduce uncertainty in the following biological parameters important for the assessment of stock status of tropical tuna species by:

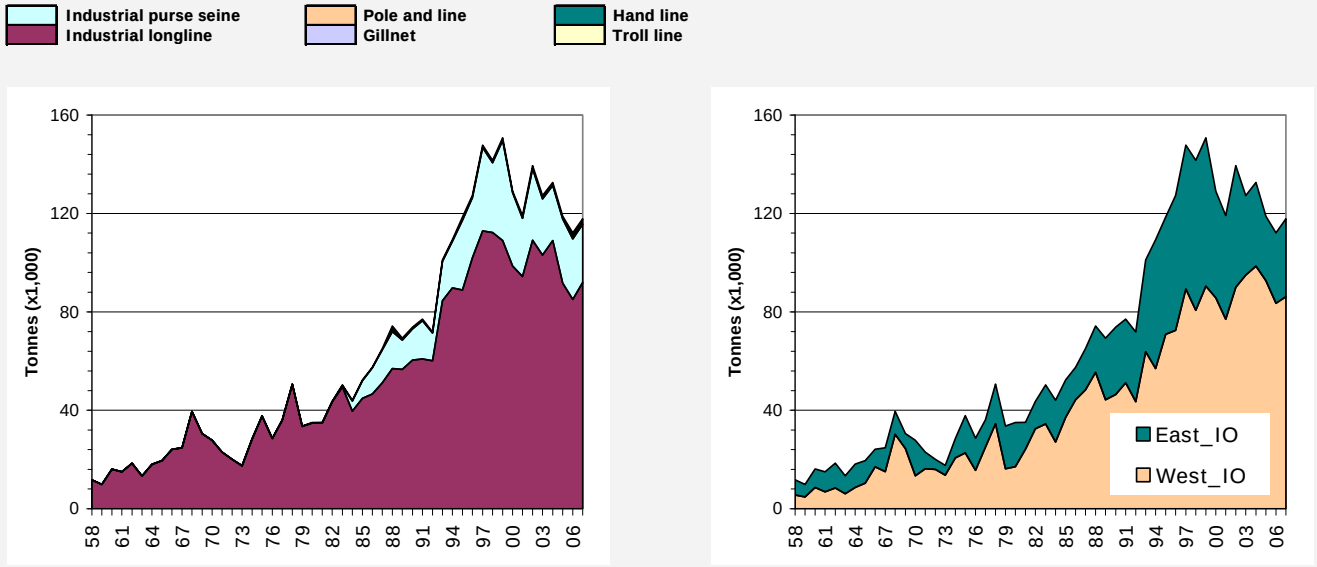
- Conversion relationships: Countries catching significant amounts of tropical tunas providing the basic data that would be used to establish length-weight keys, non-standard measurements-fork length keys, processed weight-live weight keys for these species.
- Countries collecting biological information on tropical tunas caught in their fisheries, preferably through observer programmes, and providing this information (including the raw data) to the Secretariat.

3. STATUS OF FISHERIES STATISTICS FOR TROPICAL TUNAS

Bigeye tuna (BET)

- **Fisheries and catch trends**

Bigeye tuna is mainly caught by industrial fisheries and appears only occasionally in the catches of artisanal fisheries. *However, in recent years the amounts of bigeye tuna caught by artisanal fisheries are likely to be considerably higher due to the major changes experienced in some of these fleets, notably changes in boat size, fishing techniques and fishing grounds.*



Figures 1-2: Catches of bigeye tuna by gear (left) and IOTC area (right) by year recorded in the IOTC Database (1958-2007)

Total annual catches have increased steadily since the start of the fishery, reaching the 100,000 t level in 1993 and peaking at 150,000 t in 1999. Total annual catches averaged 122,000 t over the period 2003 to 2007. Bigeye tunas have been caught by industrial longline fleets since the early 1950's, but before 1970 they only represented an incidental catch. After 1970, the introduction of fishing practices that improved the access to the bigeye resource and the emergence of a sashimi market made bigeye tuna a target species for the main industrial longline fleets. Total catch of bigeye by longliners in the Indian Ocean increased steadily from the 1950's to reaching 100,000 t in 1993 and around 140,000–150,000 t for a short period from 1997-1999 (Figure 1). The average annual catch by longliners for the period from 2003 to 2007 was 96,200t. Taiwan,China is the major longline fleet fishing for bigeye and it currently takes just under 50% of the total longline catch (Figure 3). Large bigeye tuna (averaging just above 40 kg) are primarily caught by longlines, and in particular deep longliners. Since the mid 1980's, bigeye tuna has been caught by purse seine vessels fishing on tunas aggregated on floating objects. Total catch of bigeye by purse seiners in the Indian Ocean reached 40,700 t in 1999, but the average annual catch for the period from 2003 to 2007 was 24,000 t. Purse seiners mainly take small juvenile bigeye (averaging around 5 kg) whereas longliners catch much larger and heavier fish; and while purse seiners take much lower tonnages of bigeye compared to longliners, they take larger numbers of individual fish.

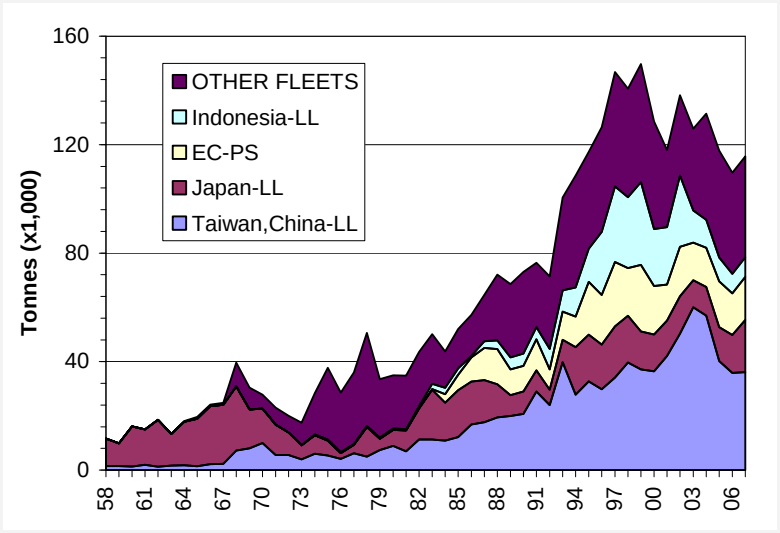


Figure 3: Catches of bigeye tuna by fleet recorded in the IOTC Database (1958-2007)

By contrast with yellowfin and skipjack tunas, for which the major catches take place in the western Indian Ocean, bigeye tuna is also exploited in the eastern Indian Ocean (Figure 2). The relative increase in catches in the eastern Indian Ocean in the late 1990's was mostly due to increased activity of small longliners fishing for fresh tuna. This fleet started operating in the mid 1980's. In the western Indian Ocean, the catches of bigeye are mostly the result of the activity of large longliners and purse seiners.

- ## Status of Fisheries Statistics at the IOTC

Retained catches are well known for the major fleets (Figure 4); but are less certain for non-reporting industrial purse seiners and longliners (NEI) and for other industrial fisheries (longliners of India and Philippines and purse seiners of Iran and Thailand). Catches are also uncertain for some artisanal fisheries including the pole and line fishery in the Maldives and the gillnet/longline fishery in Sri Lanka.

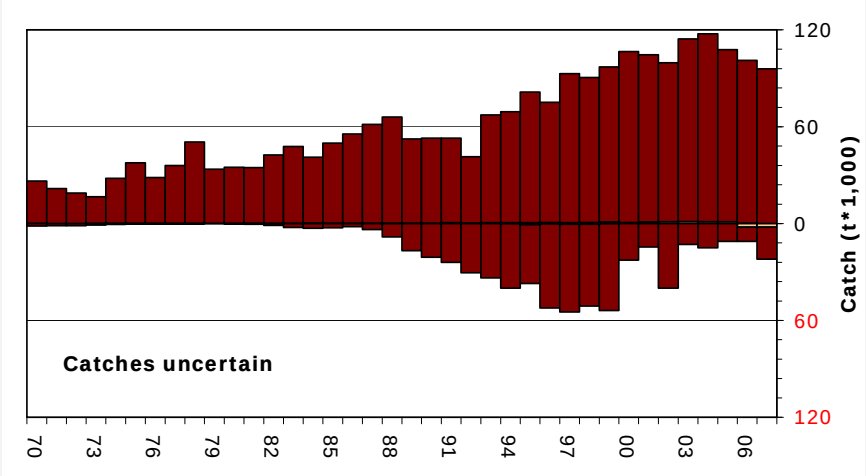


Figure 4. Uncertainty of annual catch estimates for bigeye tuna. The amount of the catch below the zero-line has been categorised as uncertain according to the criteria given in the text. Light bars represent data for artisanal fleets and dark bars represent data for industrial fleets. Data as of October 2008

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

Changes to the catch series: There have not been significant changes to the catches of bigeye tuna since the WPTT in 2007 (Figure 5). The changes in recent years are mostly due to revisions to the catches of the major longline fleets.

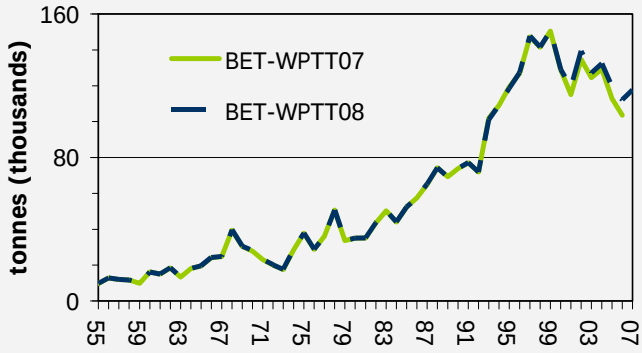


Figure 5: Bigeye tuna: Catches used by the WPTT in 2007 *versus* those estimated for the WPTT08 (1958-2007)

CPUE Series: Catch and effort data are generally available from the major industrial fisheries. However, these data are not available from some fisheries or they are considered to be of poor quality, especially throughout the 1990s for the following reasons:

- non-reporting by industrial purse seiners and longliners (NEI)
- uncertain data from significant fleets of industrial purse seiners from Iran and longliners from India, Indonesia, Taiwan,China (fresh tuna) and Philippines.

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

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

- the paucity of size data available from industrial longliners before the mid-60s, from the early-1970s up to the mid-1980s and in 2007
- the paucity of catch by area data available for some industrial fleets (NEI, India, Indonesia, Iran)

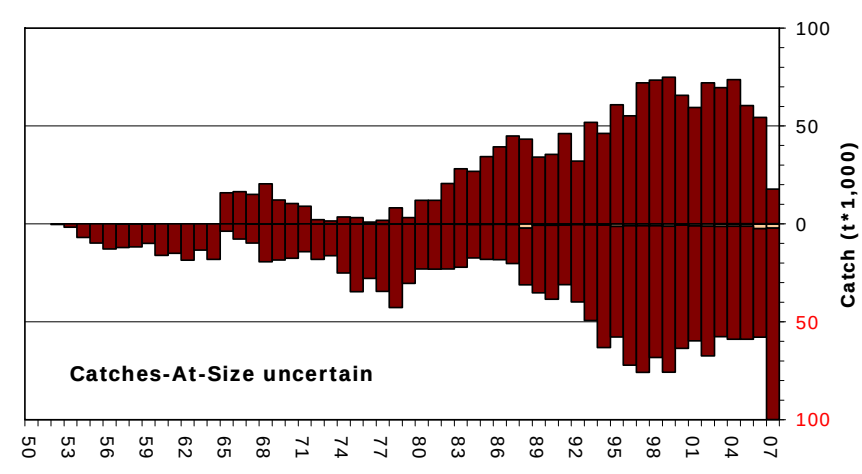


Figure 6. Uncertainty of catch at size data for bigeye tuna. The amount below the zero-line indicates the amount of catch for which the estimated catch at size has been categorised as uncertain according to the criteria given in the text. Light bars represent data for artisanal fleets and dark bars represent data for industrial fleets. Data as of October 2008

Skipjack tuna (SKJ)

- **Fisheries and catch trends**

Catches of skipjack increased slowly from the 1950s, reaching around 50,000 t at the end of the 1970s, mainly due to the activities of baitboats (or pole and line) and gillnets. The catches increased rapidly with the arrival of the purse seiners in the early 1980s, and skipjack became one of the most important tuna species in the Indian Ocean. Annual total catches exceeded 400,000 t in the late 1990's and the average annual catch for the period from 2003 to 2007 was 509,000 t (Figure 7). Catches in 2006 were the highest reported in the history of the fishery (613,000 t). *Preliminary data indicate that catches in 2007 might have dropped markedly with current estimates around 450,000 t.*

In recent years, the proportions of the catch taken by the industrial purse seine fishery and the various artisanal fisheries (baitboat, gillnets and others) have been fairly consistent, the majority of the catch originating from the western Indian Ocean (Figure 8). In general, *and excluding 2007*, there is low inter-annual variability in the catches taken in the Indian Ocean compared to those taken in other oceans.

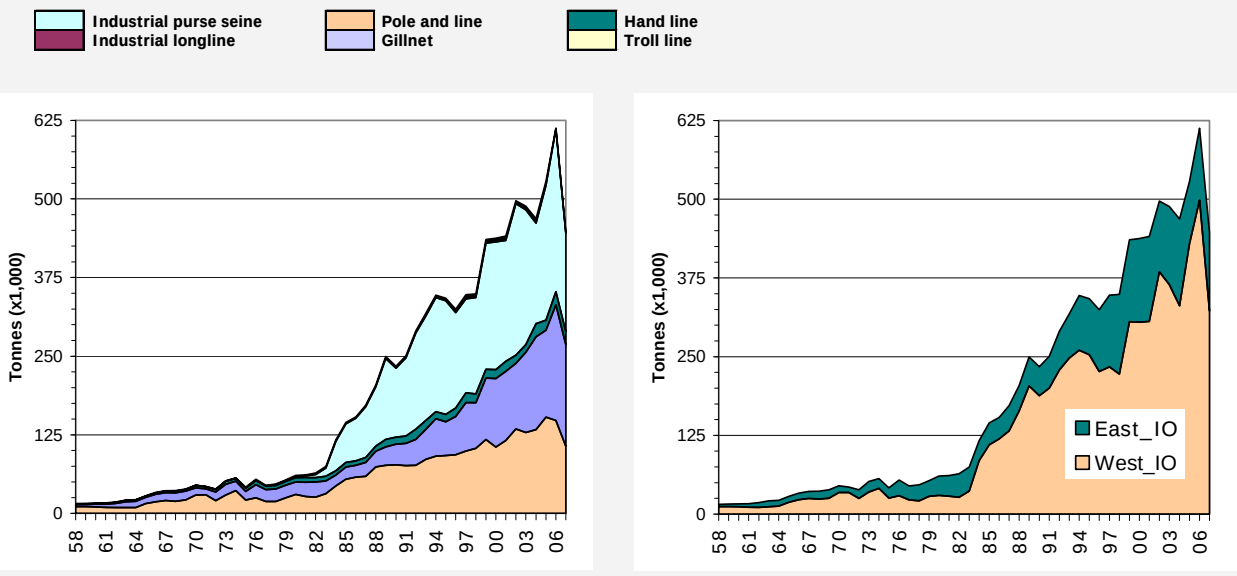


Figure 7-8: Catches of skipjack tuna by gear (left) and IOTC area (right) by year recorded in the IOTC Database (1958-2007)

The increase of skipjack catches by purse seiners is due to the development of a fishery in association with Fish Aggregating Devices (FADs). Currently, 80 % of the skipjack tuna caught by purse-seine is taken under FADs. *Catches by purse seiners were around 200,000 t from 1999 to 2003. Catches dropped markedly in 2004, probably as a consequence of exceptional purse seine catch rates on free schools of yellowfin tuna during that year. Catches in 2005-06 and 2007 showed opposite trends with marked increases in the catches in the first two years, up to the record catches recorded in 2006 (260,000 t.), and a more than 100,000 t. fall in 2007 (156,000 t.). The increase in catches and catch rates in recent years (with the exception of 2007) are believed to be associated to i*ncreases in fishing power and in the number of FADs (and the technology associated with them) used in the fishery. *The sharp decline in purse seine catches shown in 2007 coincided with a similar decline in the catches of Maldivian baitboats.*

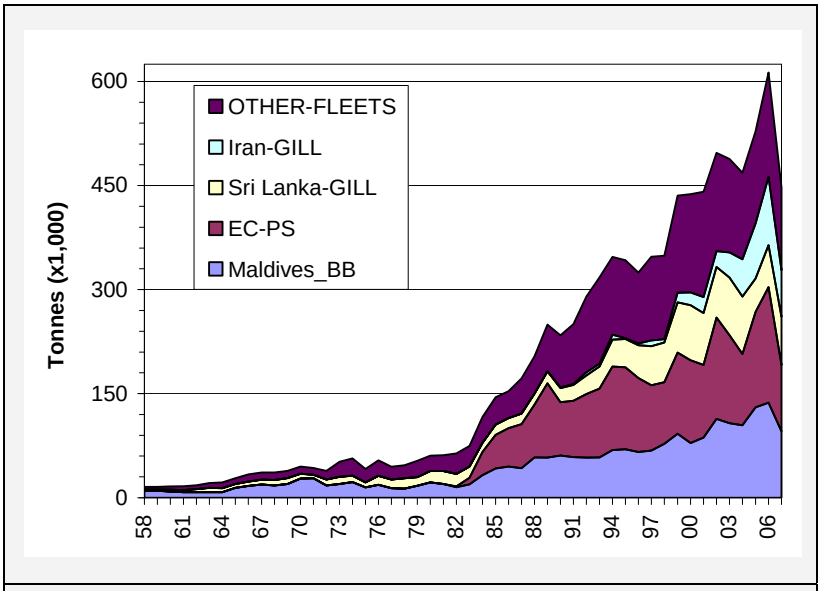


Figure 9: Catches of skipjack tuna by fleet recorded in the IOTC Database (1958-2007)

The Maldivian fishery has effectively increased its fishing effort with the mechanisation of its pole and line fishery since 1974, *the increase in boat size and power* and the use of anchored FADs since 1981. Skipjack represents some 75 % of its total catch, and catch rates have regularly increased since the beginning of the 1980s (*with the exception of 2007*).

Little information is available on the gillnet fisheries (mainly from Sri Lanka, Iran, Pakistan, India and Indonesia). However, it is estimated that the gillnet fisheries take around 30 to 40 % of the total catch of skipjack tuna (Figure 7).

- ## Status of Fisheries Statistics at the IOTC

Retained catches are generally well known for the industrial fisheries but are less certain for many artisanal fisheries (Figure 10), notably because:

- catches are not being reported by species
- there is uncertainty about the catches from some significant fleets including the Sri Lankan gillnet/longline fishery and the industrial purse seiners from Iran.

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

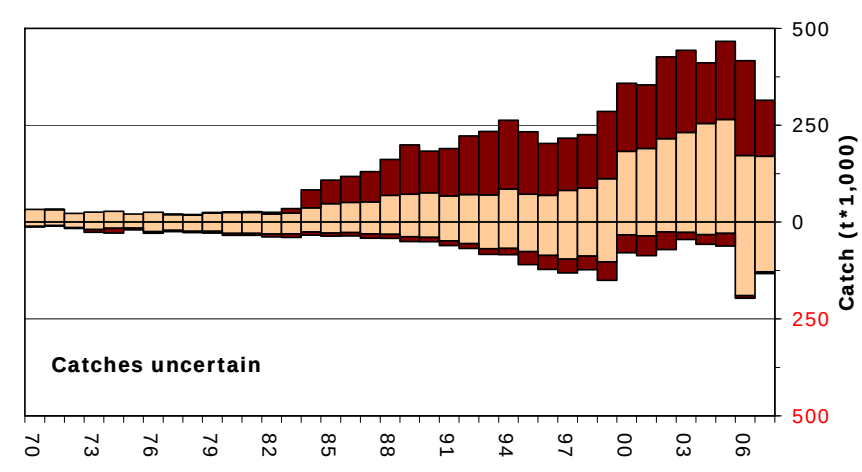


Figure 10. Uncertainty of annual catch estimates for skipjack tuna.

The amount of the catch below the zero-line has been categorised as uncertain according to the criteria given in the text. Light bars represent data for artisanal fleets and dark bars represent data for industrial fleets. Data as of October 2008

Changes to the catch series: There have been no major changes to the catches of skipjack tuna since the WPTT in 2007 (Figure 11).

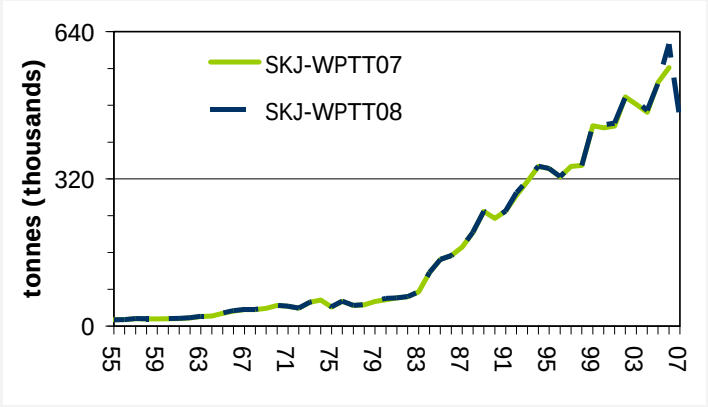


Figure 11: Skipjack tuna: Catches used by the WPTT in 2007 *versus* those estimated for the WPTT08 (1958-2007)

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

- almost no data are available for the artisanal fisheries of Indonesia
- the poor quality effort data for the significant gillnet/longline fishery of Sri Lanka (for years before 2005)
- no data are available for the significant pole and line fishery of Maldives in recent years.

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

Catch-at-Size(Age) table: CAS and CAA are available but the estimates are uncertain for some years and fisheries due to (Figure 12):

- the lack of size data before the mid-1980s
- the paucity of size data available for some artisanal fisheries, notably most hand lines and troll lines, many gillnet fisheries (Indonesia) and the pole and line fishery of Maldives in recent years
- the lack of biological information and length-age keys for the Indian Ocean.

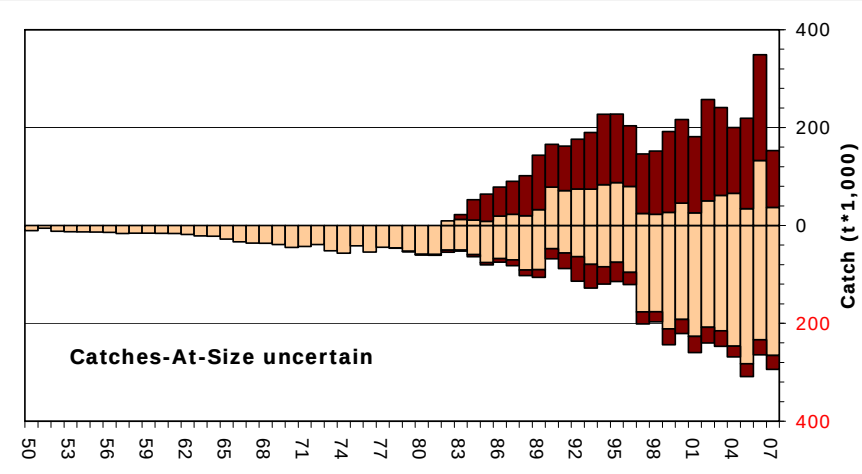


Figure 12. Uncertainty of catch at size data for skipjack tuna.

The amount below the zero-line indicates the amount of catch for which the estimated catch at size has been categorised as uncertain according to the criteria given in the text. Light bars represent data for artisanal fleets and dark bars represent data for industrial fleets. Data as of October 2008

Yellowfin tuna (YFT)

- **Fisheries and catch trends**

Catches by gear, area, country and year from 1958 to 2007 are shown in Figure 13, 14 and 15. Contrary to the situation in other oceans, the artisanal fishery component in the Indian Ocean is substantial, taking approximately 20-25 % of the total catch. Most yellowfin tuna are caught in Indian Ocean north of 12°S and in the Mozambique Channel (north of 25°S).

Although some Japanese purse seiners have fished in the Indian Ocean since 1977, the purse seine fishery developed rapidly with the arrival of European vessels between 1982 and 1984. Since then, there has been an increasing number of yellowfin tuna caught although a larger proportion of the catches is made of adult fish, when compared to the case of the bigeye tuna purse-seine catch. Purse seiners typically take fish ranging from 40 to 140 cm fork length and smaller fish are more common in the catches taken north of the equator. Catches of yellowfin increased rapidly to around 128,000 t in 1993. Subsequently, they fluctuated around that level, until 2003-2005 when they were substantially higher (around 200,000 t.). *Catches felled by 40,000 t. and 60,000 t from previous year's catches in 2006 and 2007, respectively (Figure 13).* In recent years, catches appear to be higher in the first quarter of the year. The amount of effort exerted by the EU purse seine vessels (fishing for yellowfin and other tunas) varies seasonally and from year to year.

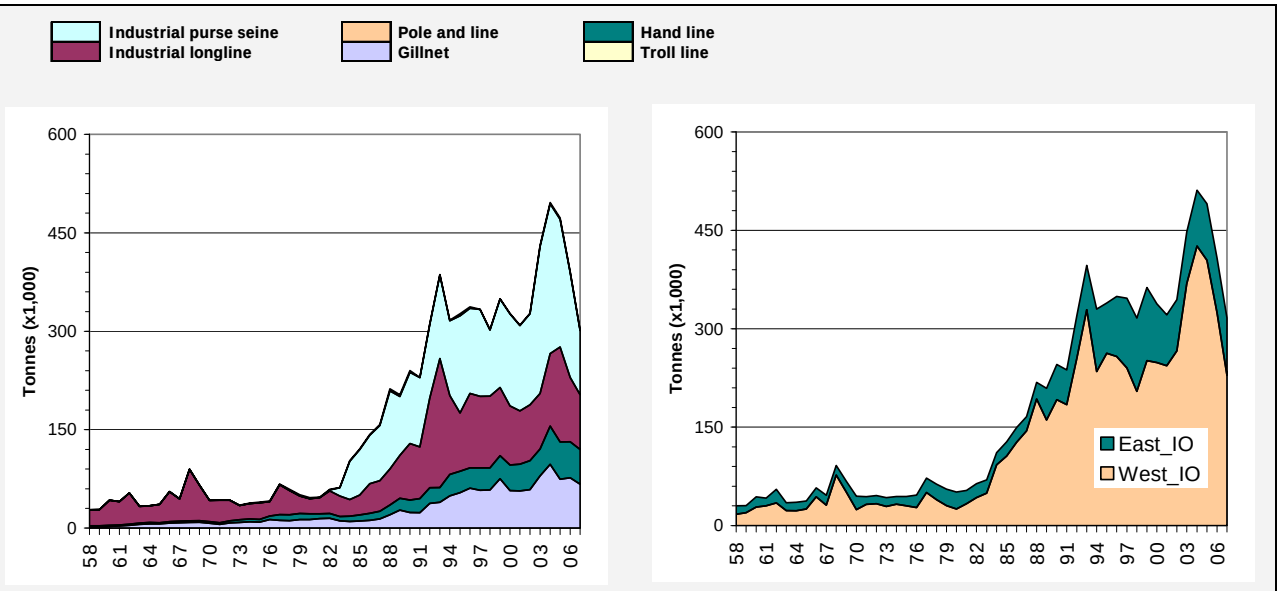


Figure 13-14: Catches of yellowfin tuna by gear (left) and IOTC area (right) by year recorded in the IOTC Database (1958-2007)

The purse seine fishery is characterized by the use of two different fishing modes: the fishery on floating objects (FADs), which catches large numbers of small yellowfin in association with skipjack and juvenile bigeye, and a fishery on free swimming schools, which catches larger yellowfin on multi-specific or mono-specific sets. Between 1995 and 2003, the FAD component of the purse seine fishery represented 48-66 % of the sets undertaken (60-80 % of the positive sets) and took 36-63 % of the yellowfin catch by weight (59-76 % of the total catch). Since 1997, the proportion of log sets has steadily decreased from 66 % to 48 %.

The longline fishery started in the beginning of the 1950's and expanded rapidly over the whole Indian Ocean. It catches mainly large fish, from 80 to 160 cm fork length, although smaller fish in the size range 60 cm – 100 cm have been taken by longliners from Taiwan,China since 1989 in the Arabian Sea. The longline fishery targets several tuna species in different parts of the Indian Ocean, with yellowfin tuna and bigeye tuna being the main target species in tropical waters. The longline fishery can be subdivided into an industrial component (deep-freezing longliners operating on the high seas from Japan, Korea and Taiwan,China) and an artisanal component (fresh tuna longliners from Indonesia and Taiwan,China). The total longline catch of yellowfin tuna reached a maximum in 1993 (196,000 t). Since then, catches have typically fluctuated between 80,000 t and 123,000 t, *excluding 2005 where the catches of longliners were the second highest recorded over the time series (145,000 t.). As it was the case with purse seine fisheries, longline catches after 2005 felled markedly to around 80,000 t. in 2007.*

Artisanal catches, taken by bait boat, gillnet, troll, hand line and other gears have increased steadily since the 1980s. In recent years the total artisanal yellowfin tuna catch has been around 130,000-150,000 t, with the catch by gillnets (the dominant artisanal gear) at around 70,000 t to 100,000 t. *During the year 2004 the catches by artisanal gears attained its maximum over the time series, peaking at 173,000 t.*

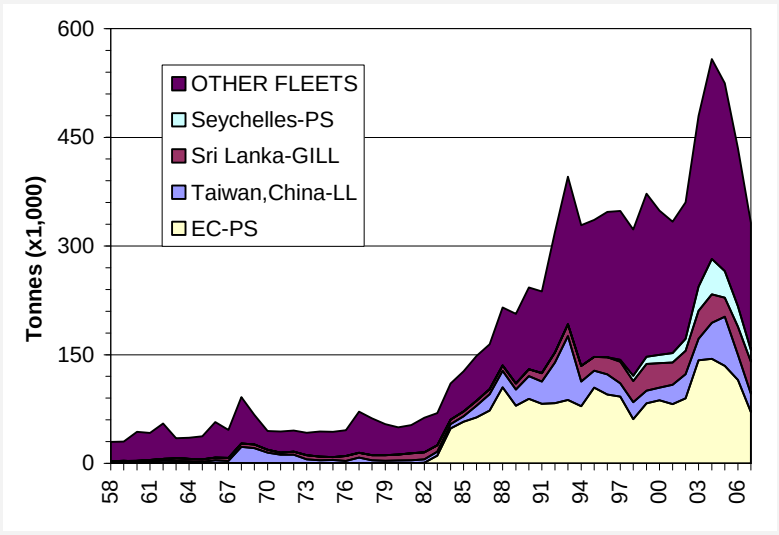


Figure 15: Catches of yellowfin tuna by fleet recorded in the IOTC Database (1958-2007)

Yellowfin tuna catches in the Indian Ocean during 2003, 2004, 2005 and 2006 were much higher than in previous years, while bigeye catches remained at their average levels. Purse seiners currently take the bulk of the yellowfin tuna catch, mostly from the western Indian Ocean (Figure 14), around Seychelles. In 2003, 2004, 2005 and 2006, purse seine total catches made in this area were 237,512 t, 226,768 t, 230,531 t, 220,283 t, respectively — about 50% more than the previous largest purse seine catch, which was recorded in 1995. Similarly, artisanal yellowfin catches have been near their highest levels and longliners have reported higher than normal catches in the tropical western Indian Ocean during this period. Purse seine catches made in the Seychelles area were much lower and similar to the levels last experienced in 1999.

After an initial decline, mean weights in the whole fishery remained quite stable from the 1970s to the early 1990s. Since 1993, mean weights in the catches in the industrial fisheries have declined. Prior to 2003, although total catch in biomass has been stable for several years, catches in numbers have continued to increase, as there has been more fishing effort directed towards smaller fish. As described above, this situation changed during 2003 through 2006; where most of the very large catches were obtained from fish of larger sizes.

- ## Status of Fisheries Statistics at the IOTC

Retained catches are generally well known (Figure 16); however, catches are less certain for:

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

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

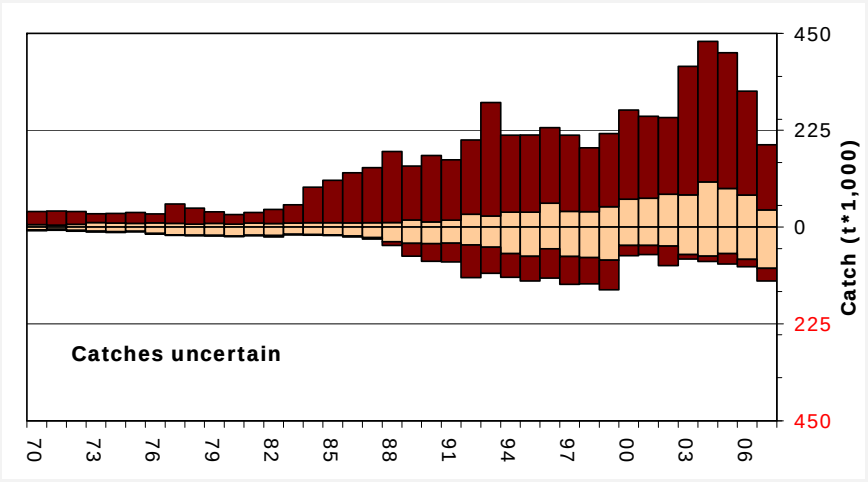


Figure 16. Uncertainty of annual catch estimates for yellowfin tuna. The amount of the catch below the zero-line has been categorised as uncertain according to the criteria given in the text. Light bars represent data for artisanal fleets and dark bars represent data for industrial fleets. Data as of October 2008

Changes to the catch series: There have not been significant changes to the catches of yellowfin tuna since the WPTT in 2007 (Figure 17).

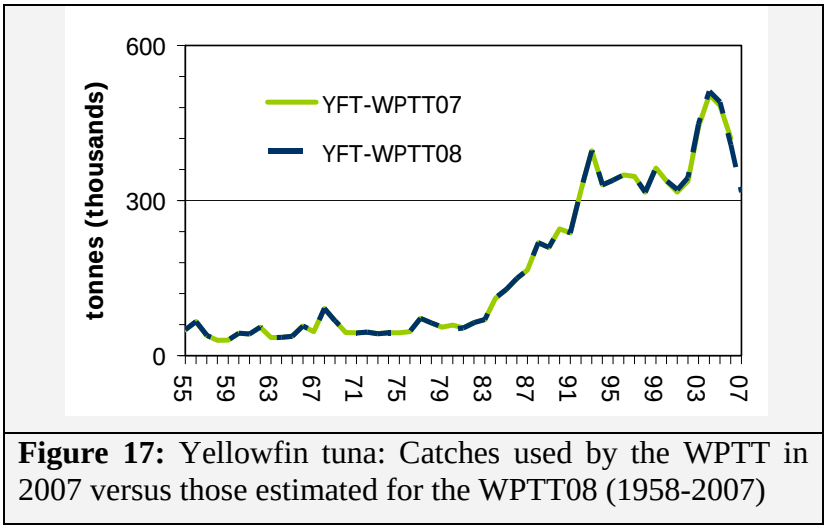


Figure 17: Yellowfin tuna: Catches used by the WPTT in 2007 versus those estimated for the WPTT08 (1958-2007)

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

- poor quality effort data for the gillnet/longline fishery of Sri Lanka
- no data are available for the artisanal fisheries of Indonesia, Yemen and Comoros
- no data are available for the pole and line fishery of Maldives in recent years.

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

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

- size data not being available for most artisanal fisheries, notably Yemen and Indonesia (lines and gillnets), Comoros (lines) and Maldives (pole and lines) in recent years

- the paucity of size data available from industrial longliners from the late-1960s up to the mid-1980s
- the paucity of catch by area data available for some industrial fleets (NEI, Iran, India).

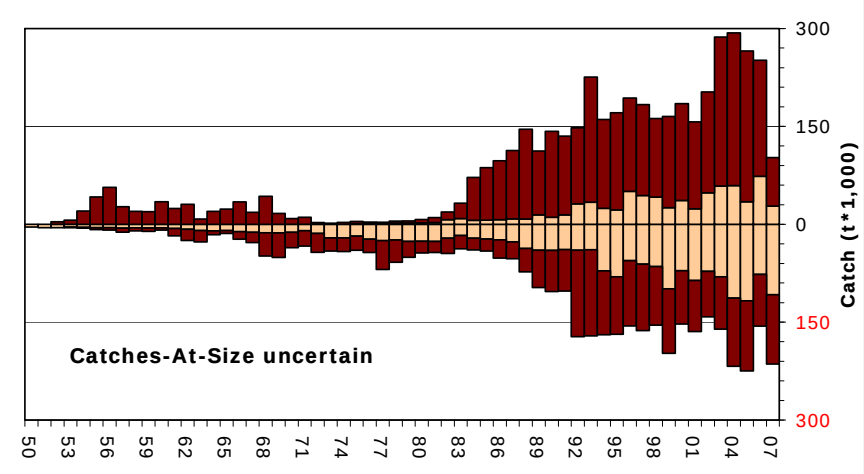


Figure 18. Uncertainty of catch at size data for yellowfin tuna. The amount below the zero-line indicates the amount of catch for which the estimated catch at size has been categorised as uncertain according to the criteria given in the text. Light bars represent data for artisanal fleets and dark bars represent data for industrial fleets. Data as of October 2008

4. PROGRESS ACHIEVED ON THE DATA RELATED RECOMMENDATIONS OUTSTANDING FROM PAST WPTT MEETINGS

8. RESEARCH RECOMMENDATIONS AND P RIORITIES

1) Further collaboration with Yemen (such as that proposed by the IOTC-OFCF project) to improve the quality of fisheries information.

The IOTC Data Coordinator and the OFCF Project Manager visited Yemen in April 2008 in order to complete the Memorandum of Understanding and Terms of Reference for the activities to be carried out by the Marine and Biological Research Authority with the support of the IOTC-OFCF Project. Unfortunately, some of the information required to complete the MOU was not made available during the trip. The OFCF visited Yemen again in order to collect the necessary information from the Ministry of Fish Wealth in Sana'a but, unfortunately, the final text of the MOU has not been fully agreed among the parties to date.

Taking into account the difficulties referred to above, the IOTC-OFCF Project will be proposing a phase-in approach, the first phase involving simply the collection of historical data from the MFW (numbers of fish unloaded and numbers of boats operated per month and landing place), cooperatives (fish size categories) and canning factories(size categories). A Second Phase, if the first proves successful, would involve the implementation of sampling in various locations of the Yemen coast.

The first phase will be initiated upon an exchange of letters between the MFW and the IOTC-OFCF Project, not requiring the signature of a MOU.

A trip to Yemen has been scheduled for December 2008 and the activities initiated as soon as the MFW agrees with the above plan.

By using information collected in previous trips to Yemen the Secretariat re-estimated in 2008 catches and effort per month and Province for 2003-07. The catches of yellowfin tuna show a strong seasonality with high catches during the winter months and usually low catches from May-June to September-October.

2. Regular analysis and reporting of the results of biological sampling programmes undertaken at tuna canneries.

To date, the Secretariat has not received new information concerning the above recommendation.

3. Recognising that the best opportunities for obtaining accurate fisheries data are likely to come from observer programmes, the WPTT strongly encourages the expansion and implementation of new observer programmes in the Indian Ocean. Furthermore, like the WPEB, the WPTT strongly recommended that a high level of regional coordination be provided by the Commission covering data collection, data exchange, training and the development of guidelines for the operational aspects of such programmes.

The Secretariat attended during 2008 to a meeting in Indonesia that included results from three observer programmes currently ongoing in this country. The Secretariat is involved in the coordination of observer activities in this country. The Secretariat will be also providing training to staff from the Directorate General for Capture Fisheries and the Research Centre for Capture Fisheries on the implementation of a logbook system to monitor the activities of longliners and other fleets from Indonesia.

APPENDIX I

ESTIMATION OF CATCHES OF NON-REPORTING FLEETS

The estimates of catches of non reporting fleets were updated in 2008:

The high number of non-reporting fleets operating in the Indian Ocean since the mid-1980's has led to large increases in the amount of catch that needs to be estimated. This reduces confidence in the catch estimates for yellowfin tuna and bigeye tuna, and to a lesser extent, skipjack tuna.

- **Purse seine** (Figure 19): Catches for the six former Soviet Union purse seiners, currently under the Thailand flag, were estimated for January-August 2005-and those for the remaining purse seiner (Equatorial Guinea) for 2005-2006. Total catches were estimated using the number of vessels available, the average catches of the former Soviet Union purse seiners in previous years, and average catches available for other fleets for 2005-06. Total catches were assigned to species and type of school fished according to data available for Thailand purse seiners during the same period (2005-2006). The amount of catch that the Secretariat has to estimate for this fleet has decreased considerably in recent years. It is thought that there are no longer purse seiners operating under flags of non-reporting countries.

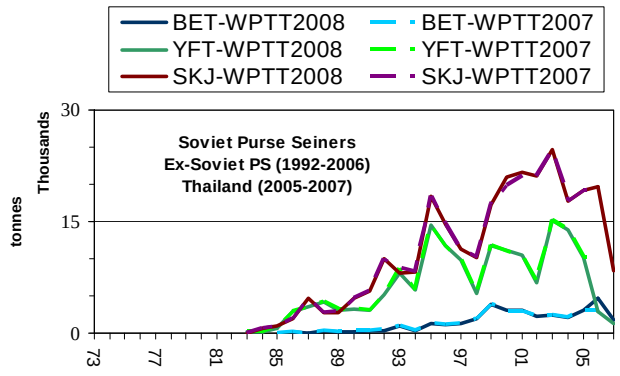


Figure 19: Catches of Soviet and ex-Soviet purse seiners estimated in 2008 versus previous catches estimated in 2007(1973-2006)

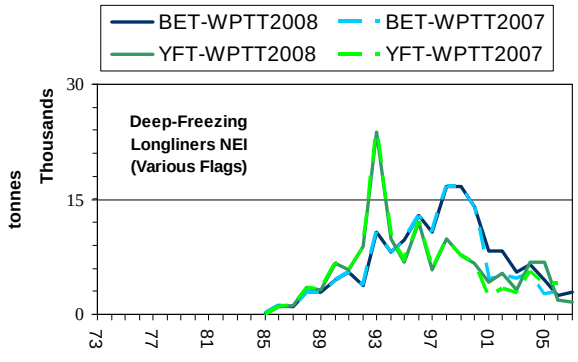


Figure 20: Catches of deep-freezing longline vessels in the Indian Ocean estimated in 2008 versus catches estimated in 2007 (1973-2006)

- **Deep-freezing longline** (Figure 20): The catches by large longliners from several non-reporting countries were estimated using IOTC vessel records and the catch data from Taiwanese, Japnese or Spanish longliners, based on the assumption that most of the vessels operate in a way similar to the longliners from Taiwan,China, Japan or Spain. The collection of new information on the non-reporting fleets during the last year, in particular the number and characteristics of longliners operating, led to improved estimates of catches. The number of vessel operating since 1999 has decreased and this has led to a marked decrease in catch levels. The reason for this decrease in the number of vessels (and catches) operating in the Indian Ocean is not fully explained. Nevertheless, this decrease is somewhat proportional to an increase in the number of vessels recorded under other flags whose catches are available, such as Philippines, Taiwan,China, the Seychelles and, recently, India.
- **Fresh tuna longline** (Figures 21-22): Fresh tuna longline vessels, mainly from China, Taiwan,China, India, Malaysia, Belize and Indonesia, have been operating in the Indian Ocean since the early 1970's. The catches of these fleets were, up to 2006, estimated by the IOTC Secretariat by using information from the following three sources:

- Catches reported from the flag countries: Although China reported total catches for its longline fleet they were not reported by gear (fresh-tuna longline or deep-freezing longline). The Secretariat estimated the catches of fresh-tuna longliners by using the total catches reported, the numbers of fresh-tuna longline vessels provided by China and catch rates for fresh-tuna and deep-freezing longlines available from other fleets.
- Information on catches and vessel activity collected through several catch monitoring schemes implemented in the main ports of landing for these vessels, involving the IOTC-OFCF[1] and/or institutions in the countries where the fleets are based and/or foreign institutions. This applies to Indonesia (2002 - to-date), Thailand (1998 – to-date), Sri Lanka (2002-03), Malaysia (2000-06), Oman (2004-05) and Seychelles (2000-02).
- Information available on the number of fresh-tuna longline vessels operating in other ports or on the activity of those vessels (e.g. the number of vessel unloadings). This applies to India (2005-07), Indonesia (1973-2001), Thailand (1994-97), Sri Lanka (1990-2001; 2004-05), Malaysia (1989-99), Singapore and Maldives (recent years). The catches in these ports and years were estimated from the known/presumed levels of activity of the vessels and the average catches obtained in ports covered through sampling.

In 2006 Taiwan,China provided total catches for its longline tuna fleet operating in the Indian Ocean for the period 2000 to 2005. The catches for 2006 and 2007 were provided in 2007 and 2008, respectively. The catches provided are higher than those estimated by the IOTC Secretariat for most years. The new catches provided for 2001-05 were used to replace those in the IOTC database. This was done on the assumption that vessels from Taiwan,China have been operating in ports from non-reporting countries and their catches have not been accounted for in previous estimates.

The catches for fleets other than Taiwan,China for 1973-2007 and for Taiwan,China in years prior to 2001 were estimated as explained in the two bullet points above.

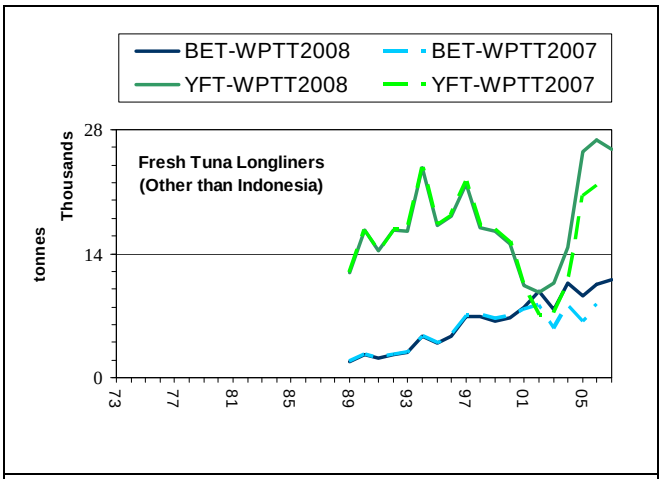


Figure 21: Catches of fresh-tuna longline vessels based in India, Malaysia, Maldives, Mauritius, Oman, Seychelles, Singapore, Sri Lanka, Thailand and Yemen (mainly registered in China, Taiwan,China and Indonesia) estimated in 2007 versus catches estimated in 2008 (1973-2007)

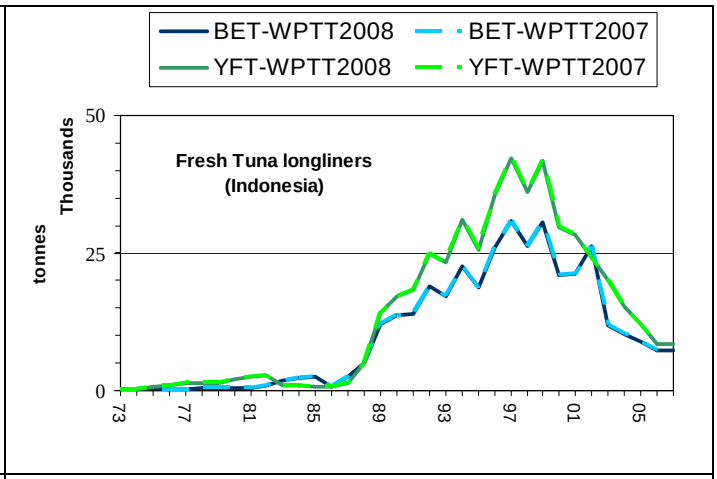


Figure 22: Catches of fresh-tuna longline vessels based in Indonesia (domestic and foreign) estimated in 2007 versus catches estimated in 2008 (1973-2007)

[1] Overseas Fisheries Cooperation Foundation of Japan