STATUS OF IOTC DATABASES FOR TROPICAL TUNAS

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Abstract

This document reviews the status of the information available on tropical tunas in the databases at the IOTC Secretariat as of September 2009. 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
- Actions proposed 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 2008

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.

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2. ACTIONS PROPOSED TO IMPROVE THE DATA AVAILABLE TO IOTC

The following list is provided by the Secretariat for the consideration of the WPTT. The list includes 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 actions are proposed 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 to increase sampling coverage to 2005-06 levels in order to improve estimates of catches for its fisheries, especially species and gear breakdown.
- Indonesia, Iran, Maldives, Pakistan, and Sri Lanka providing catch-and-effort data as per IOTC standards for their artisanal fisheries, notably gillnet, pole-and-line and hand line.
- Maldives modifying its data collection system to allow for the catches of bigeye tuna to be estimated, especially for its pole-and-line and hand line fisheries.
- Fisheries data collection agencies in India and Sri Lanka collaborating to produce the best possible set of catch statistics for their fisheries, revising their historical data series basing on the results of this analysis.
- Countries to increase sampling coverage to obtain acceptable levels of precision (CV to be initially set at less than 20%) in their catch-and-effort statistics and to report this information to the Secretariat, routinely.

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

- Countries having industrial fisheries for tropical tunas to use the standard IOTC logbooks to collect catch-and-effort data by species, in particular:
    - Longliners from India, Indonesia, Malaysia, Philippines, and Oman, including those vessels based outside their flag states.
    - Fresh-tuna longliners from Taiwan,China
    - Industrial purse seiners from Iran
- The above logbooks should include tools to assist fishers and data collectors to correctly identify tropical tunas, especially juvenile tunas.
- Countries ensuring that logbook coverage is appropriate to produce acceptable levels of precision (CV to be initially set at less than 20%) in their catch-and-effort statistics and to report this information to the Secretariat, routinely.
- Countries with observer programmes to analyse the data collected to estimate discards of tropical tuna species and the precision of these estimates, and to report this information to the Secretariat, routinely.

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

- Comoros, India, Indonesia, Pakistan, and Yemen collecting and providing size data for tropical tunas taken by artisanal fisheries, especially gillnet, handline and troll fisheries.
- Maldives providing size frequency data by atoll and gear
- Thailand and Iran collecting and providing size data for their industrial purse seine fleets
- Taiwan,China collecting and providing size data from their fresh tuna longliners.
- India, Indonesia, Malaysia, Philippines and Oman collecting and providing size data for their longline vessels, including those based outside their flag states

- Japan increasing size sampling coverage (to cover a minimum of 10% of the catch (in number) by quarter by 10° latitude – 20° longitude area) from its longline fleet.
- Japan and Taiwan,China to analyze the size samples collected from their longline fisheries for tropical tunas in order to verify if the length frequencies derived from such samples are representative of their fisheries.
- Countries reporting size data to the Secretariat to include information about data source (e.g. data from port sampling, observer programme, etc.), type of measurement, actual sample sizes, sampling coverage and precision of the estimates by fishery and species, routinely.
- Countries with observer programmes collecting size data for tropical tuna discards, by species, using the data collected to estimate the precision of these estimates, and to report this information to the Secretariat, routinely.

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

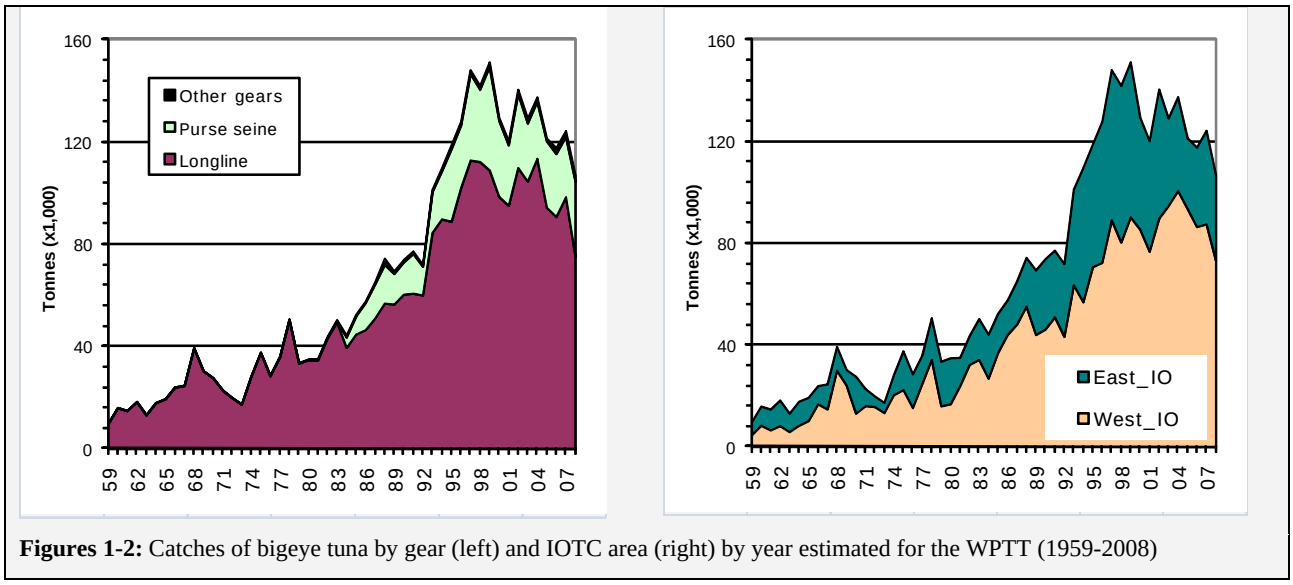
- Conversion relationships: Countries catching significant amounts of tropical tunas collecting, preferably through observer programmes, and providing the basic data that would be used to establish length-weight keys, non-standard measurements-fork length keys, processed weight-live weight keys for these species.

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 estimated for the WPTT (1959-2008)

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 2004 to 2008. 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 2004 to 2008 was 95,000t. Taiwan,China is the major longline fleet fishing for bigeye and it currently takes just under 30% of the total longline catch (Figure 3). However, the catches of Taiwanese longliners have decreased markedly in recent years, with current catches of bigeye tuna amounting to less than half the catches recorded in the mid 2000's. 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 2004 to 2008 was 25,000 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.

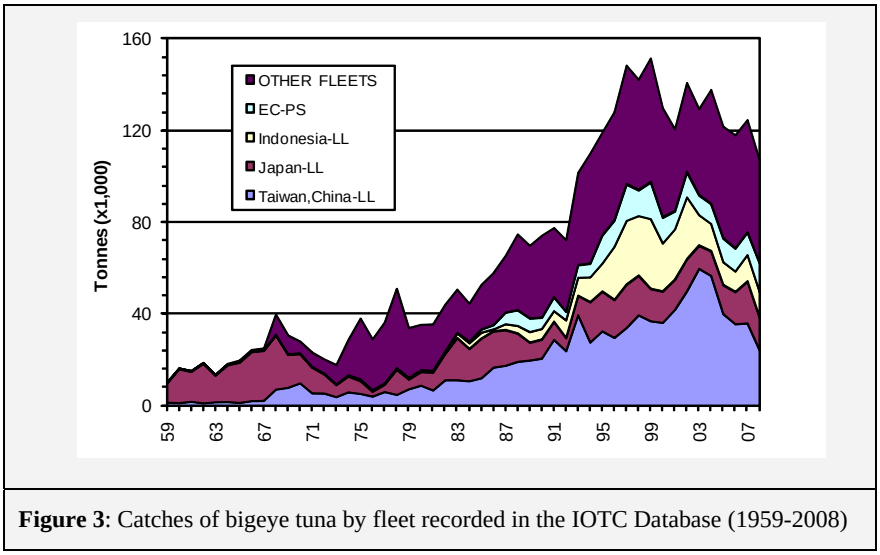


Figure 3: Catches of bigeye tuna by fleet recorded in the IOTC Database (1959-2008)

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.

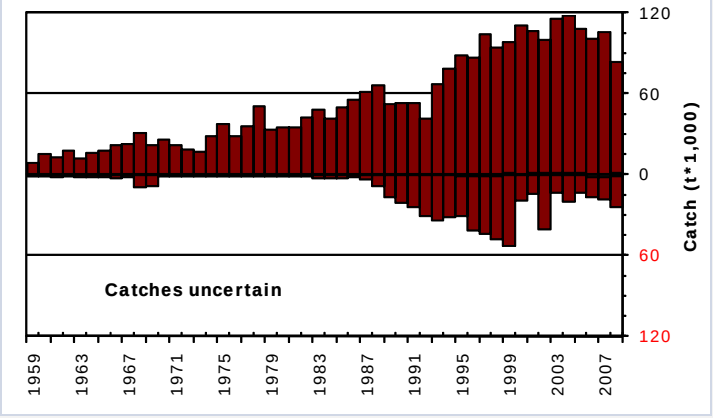


Figure 4. Uncertainty of annual catch estimates for bigeye tuna. The amount of the catch below the zero-line has been categorised as uncertain according to the criteria given in the text. Light bars represent data for artisanal fleets and dark bars represent data for industrial fleets. Data as of September 2009

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 2008 (Figure 5). The changes in recent years are mostly due to revisions to the catches of the major longline fleets.

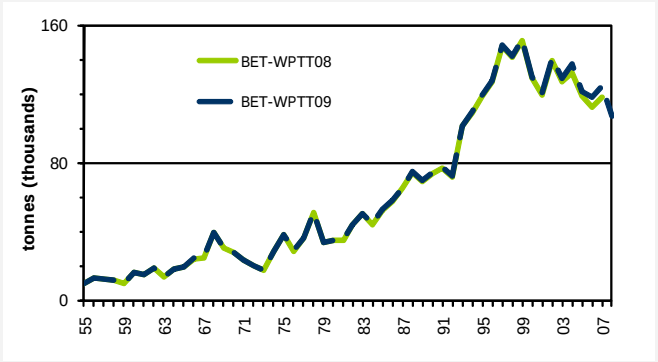


Figure 5: Bigeye tuna: Catches used by the WPTT in 2008 *versus* those estimated for the WPTT09 (1959-2008)

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, Malaysia, Oman, Philippines, and Taiwan,China (fresh tuna).

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

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 2008
- the paucity of catch by area data available for some industrial fleets (NEI, India, Indonesia, Iran)

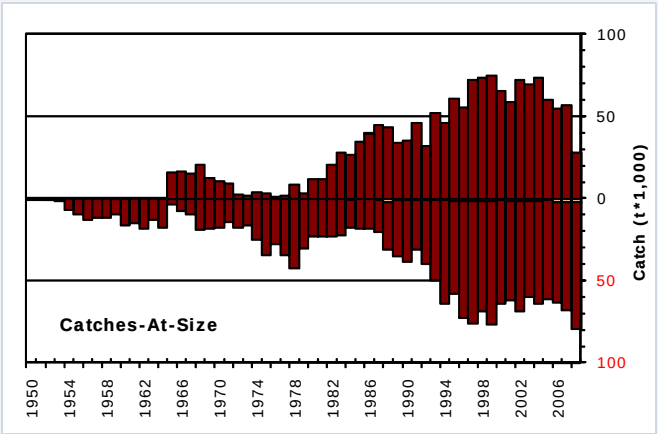


Figure 6. Uncertainty of catch at size data for bigeye tuna. The amount below the zero-line indicates the amount of catch for which the estimated catch at size has been categorised as uncertain according to the criteria given in the text. Light bars represent data for artisanal fleets and dark bars represent data for industrial fleets. Data as of September 2009

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 2004 to 2008 was 495,000 t (Figure 7). Catches in 2006 were the highest reported in the history of the fishery (613,000 t). Skipjack tuna catches dropped markedly in 2007 (450.000 t); *preliminary estimates for 2008 indicate that catches might have further dropped with current estimates around 415,000 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).

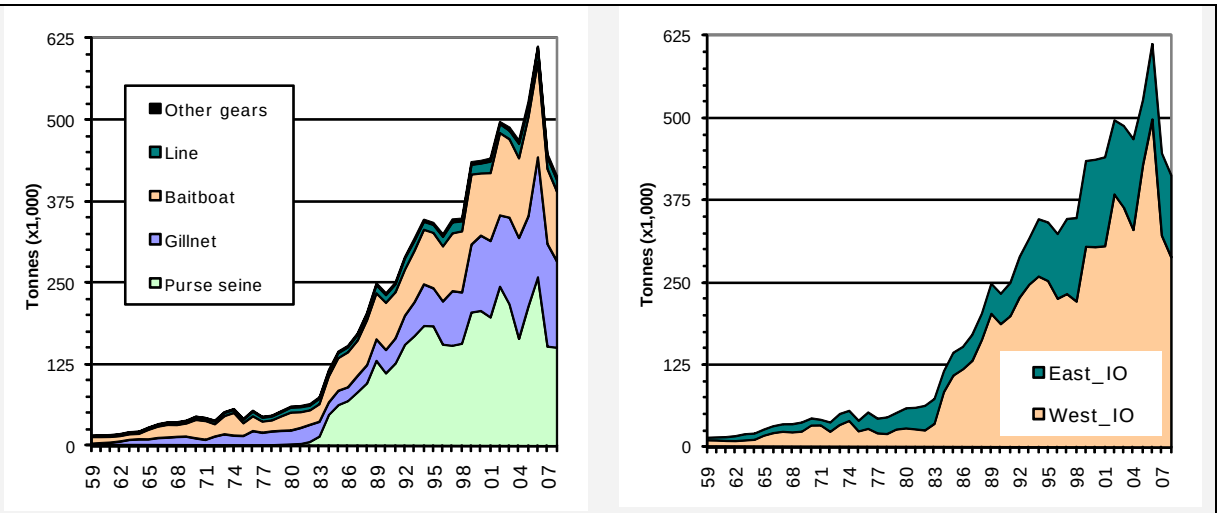


Figure 7-8: Catches of skipjack tuna by gear (left) and IOTC area (right) by year estimated for the WPTT (1959-2008)

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 (153,000 t.), with similar catches recorded in 2008. The increase in catches and catch rates in recent years (with the exception of 2007-08) are believed to be associated to* increases 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 2007-08 coincided with a similar decline in the catches of Maldivian baitboats.*

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 and 2008*).

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).

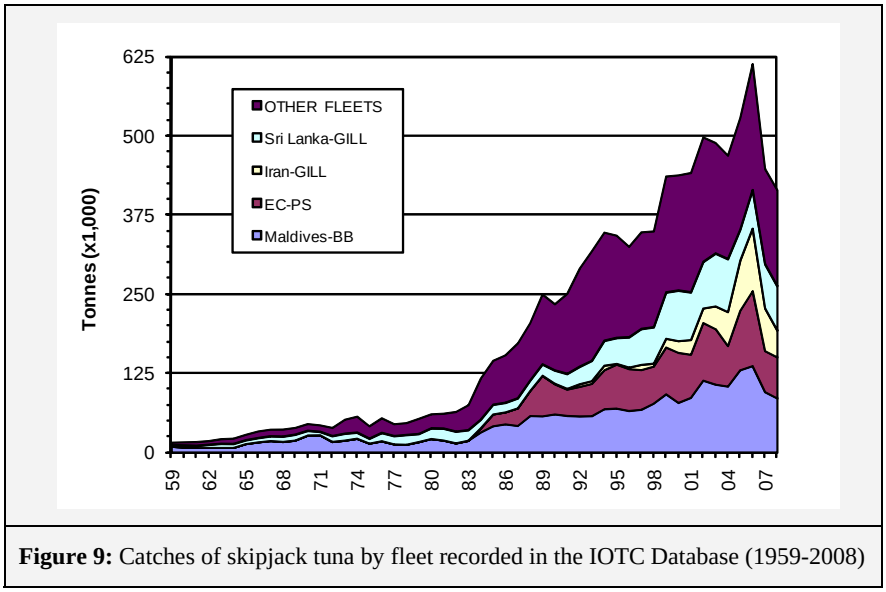


Figure 9: Catches of skipjack tuna by fleet recorded in the IOTC Database (1959-2008)

- **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.

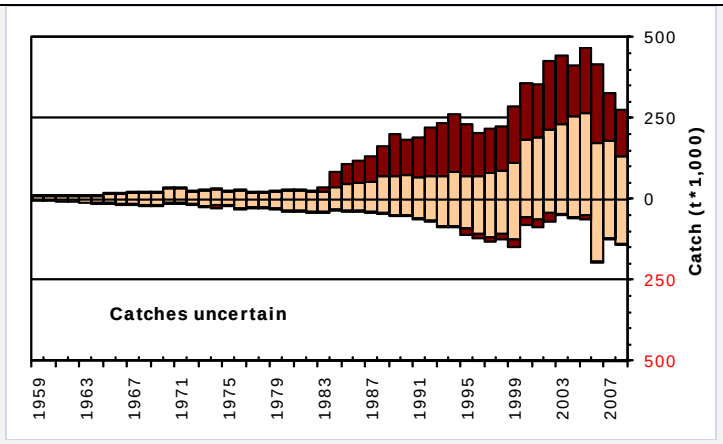


Figure 10. Uncertainty of annual catch estimates for skipjack tuna.

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 September 2009

Changes to the catch series: There have been no major changes to the catches of skipjack tuna since the WPTT in 2008 (Figure 11).

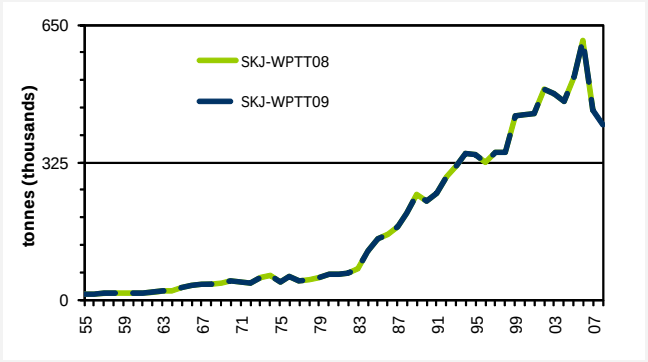


Figure 11: Skipjack tuna: Catches used by the WPTT in 2008 *versus* those estimated for the WPTT09 (1959-2008)

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
- 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 table: CAS 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

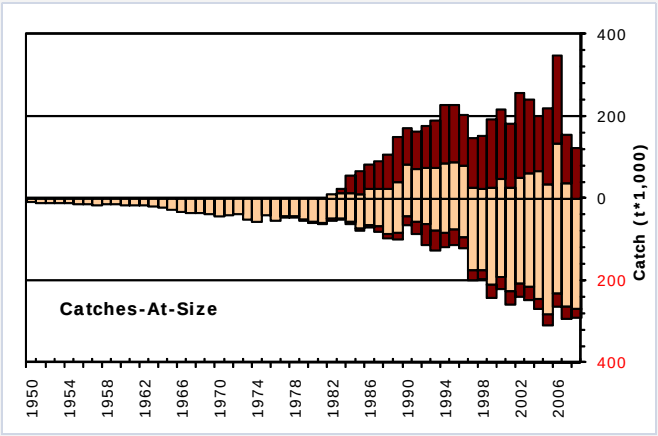


Figure 12. Uncertainty of catch at size data for skipjack tuna.

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 September 2009

Yellowfin tuna (YFT)

- **Fisheries and catch trends**

Catches by gear, area, country and year from 1959 to 2008 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 (over 200,000 t.). *Catches felled by 40,000 t. and 60,000 t from previous year's catches in 2006 and 2007, respectively, while preliminary catches for 2008 are in between those for the latter years (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.

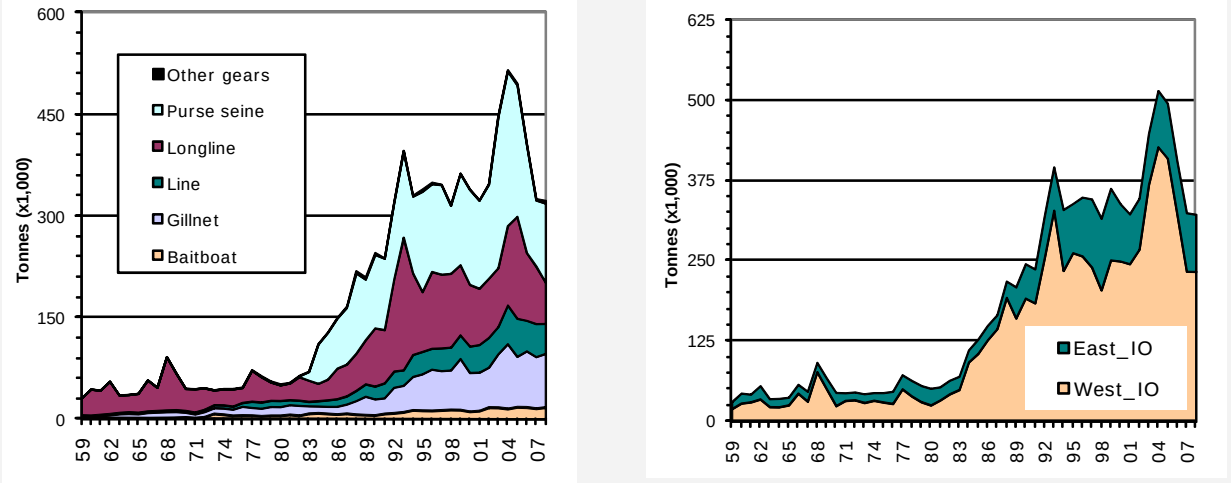


Figure 13-14: Catches of yellowfin tuna by gear (left) and IOTC area (right) by year recorded in the IOTC Database (1959-2008)

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 a deep-freezing longline component (large scale deep-freezing longliners operating on the high seas from Japan, Korea and Taiwan,China) and a fresh-tuna longline component (small to medium scale fresh tuna longliners from Indonesia and Taiwan,China). The total longline catch of yellowfin tuna reached a maximum in 1993 (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 (151,000 t.). As it was*

the case with purse seine fisheries, longline catches after 2005 felled markedly to around 85,000 t. in 2007. Preliminary estimates for 2008 tend to indicate further drops in the catches of longliners, with catches estimated at 60,000 t.

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 170,000 t.*

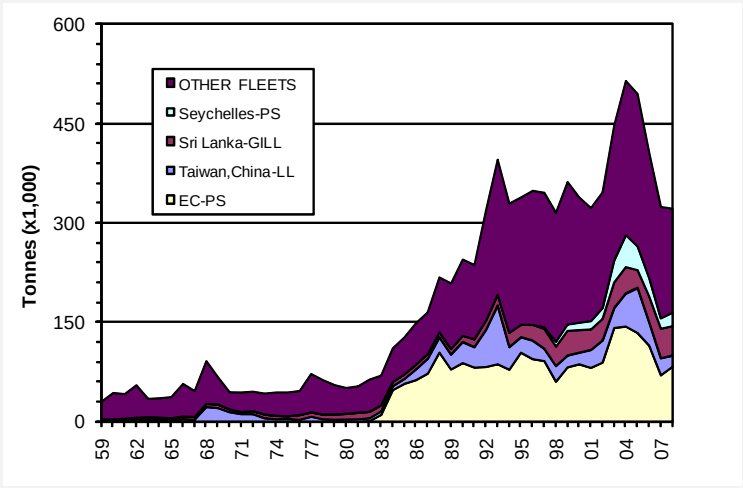


Figure 15: Catches of yellowfin tuna by fleet recorded in the IOTC Database (1959-2008)

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 and 2004, purse seine total catches made in this area were around 225,000 t — 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 high 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.

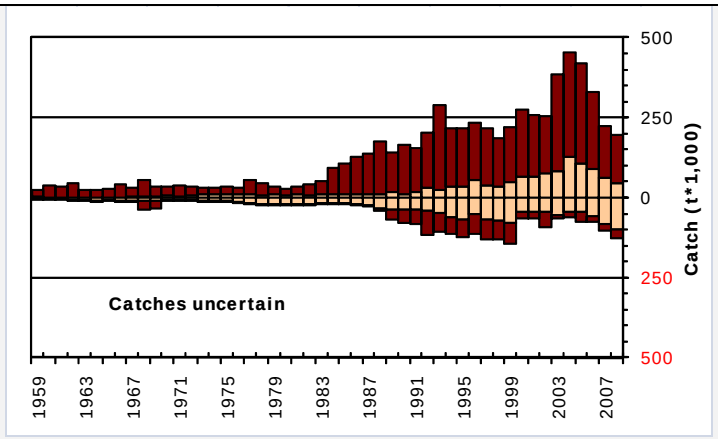


Figure 16. Uncertainty of annual catch estimates for yellowfin tuna. The amount of the catch below the zero-line has been categorised as uncertain according to the criteria given in the text. Light bars represent data for artisanal fleets and dark bars represent data for industrial fleets. Data as of September 2009

Changes to the catch series: There have not been significant changes to the catches of yellowfin tuna since the WPTT in 2008 (Figure 17).

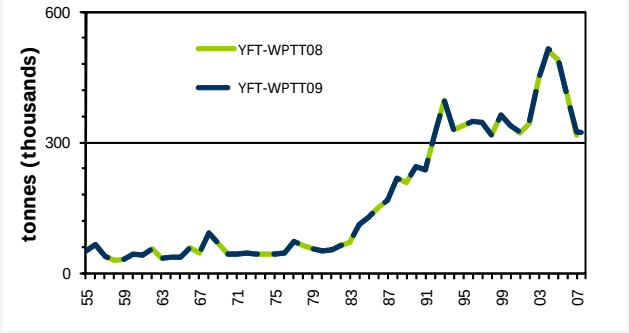


Figure 17: Yellowfin tuna: Catches used by the WPTT in 2008 versus those estimated for the WPTT09 (1959-2008)

CPUE Series: Catch and effort data are available from the major industrial and artisanal fisheries. However, these data 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 available from the gillnet fisheries of Iran and Pakistan
- 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, Indonesia, Malaysia).

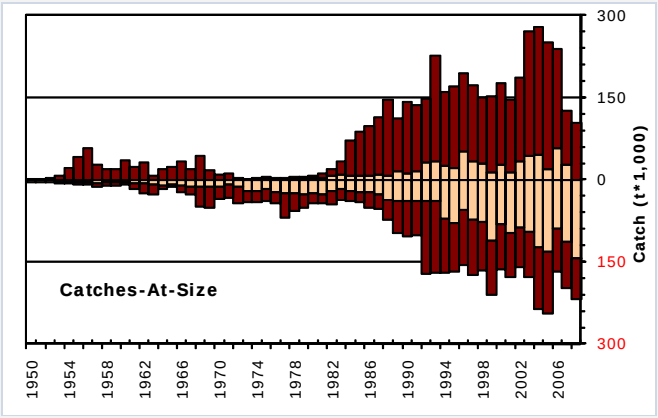


Figure 18. Uncertainty of catch at size data for yellowfin tuna. The amount below the zero-line indicates the amount of catch for which the estimated catch at size has been categorised as uncertain according to the criteria given in the text. Light bars represent data for artisanal fleets and dark bars represent data for industrial fleets. Data as of September 2009

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

1. To improve the certainty of catch and effort data available for artisanal fisheries:

- Yemen, Comoros and Madagascar implement fisheries statistical collection and reporting systems.

  The IOTC-OFCF Project attended in 2009 a meeting convened by the Southwest Indian Ocean Fisheries Commission (SWIOFC) to assess progress concerning data collection and processing systems in Yemen, Comoros, Madagascar and other countries in the region, in relation with the activities initiated by the SWIOFC. The main objectives of this meeting were to revise existing data and progress achieved in each country concerning the analysis of existing information and main deficiencies concerning recent and historical data (gap analysis).

  The situation in these three countries remains of concern.

  *New contacts established during the meeting allowed the IOTC-OFCF Project to, once again, visit **Yemen** with the objective of resuming talks concerning cooperation with the Ministry of Fish Wealth in the collection of historical data from the government and private sectors in Yemen. Unfortunately, the Secretariat had to cancel its plans for a new visit to Yemen further in 2009, following a ban on UN staff missions to Yemen, implemented by the UN Security Agency. The Secretariat plans to send a new mission to Yemen to resume talks as soon as the UN ban is lifted.*

  *The IOTC-OFCF Project initiated also talks with staff from the Ministry of Fisheries in **Comoros**, which resulted in plans from the IOTC-OFCF Project to send a mission to Comoros in December 2009. The main objective of this mission will be to assess the current situation in Comoros concerning data collection and processing systems for tuna fisheries and proposal for the preparation of a Country Report on the fisheries of Comoros.*

  *The IOTC-OFCF Project had to cancel a mission to **Madagascar** during 2009 due to the coup-d'état. The Secretariat will reconsider visiting Madagascar once that the political situation in this country returns back to normal.*

  During this and further meetings of the SWIOF-C and SWIOF-P, representatives from the IOTC Secretariat and the SWIOF agreed to strengthen cooperation in the planning and implementation of future activities by the SWIOF or the IOTC, especially in areas of common interest.

- Sri Lanka strengthen its data collection systems with an emphasis on providing data by species and gear.

  *The IOTC Secretariat is not aware of changes in **Sri Lanka** concerning the above recommendation. The data received from Sri Lanka for 2007 and 2008 is considered of poor quality, the main reasons being poor sampling coverage and insufficient data verification.*

  In September 2009 the Secretariat received reports from the OFCF, after a mission from OFCF staff to Sri Lanka, indicating that the Statistical Unit (SU) of the Ministry of Fisheries and Aquatic Resources from Sri Lanka had plans to extend data collection to its northern provinces, following the end of the war in these areas. In addition, the report indicated that the National Aquatic Resources and Development Agency of Sri Lanka (NARA) had resumed implementation of logbooks on 800 of its off-shore fleets, including gillnet/longline combination vessels and handline vessels. The Secretariat will contact Sri Lanka to follow-up on these subjects.

- Maldives, Iran and Pakistan provide catch and effort data for their artisanal fisheries, notably gillnets, pole and lines and handlines.

  Iran and Pakistan have not reported any catch-and-effort data for their gillnet fisheries to the Secretariat.

  ***Iran** has currently around 750 gillnet vessels that operate fully or partially outside the EEZ of Iran.*

  *During 2009 the Secretariat received a personal communication from a consultant in **Pakistan**, who provided details about the type of operation of Pakistani gillnetters and quality of catch reports to the IOTC or FAO. He indicated that gillnets in Pakistan are operated over the entire Arabian Sea. He also indicated that current catch estimates are not reliable. The Secretariat will contact Pakistan to follow-up on the above issues.*

  ***Maldives** has not provided catch-and-effort data to the IOTC in recent years. The Secretariat downloaded information from the internet for the Maldives, including estimates of total catches and catch-and-effort data. Unfortunately, catch-and-effort data are not available by gear. During a meeting of the SWIOFC a representative of the Ministry of Fisheries of the Maldives requested the assistance of the IOTC in the planning of a new data collection and processing system that the Maldives plans to implement in the early future. The IOTC Secretariat*

will be visiting Maldives before the meeting of the WPTT.

- Countries having emerging hand line fisheries, notably Maldives, Sri Lanka and Indonesia, make 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 make the necessary arrangements to ensure that the catches estimated for this species are sufficiently precise.

  *The changes in the data collection and processing systems of **Maldives** and **Sri Lanka** indicated in the previous sections may lead to improvements in the quality of data reports from these countries, including gear and species breakdown.*

  ***Indonesia** modified its data collection system in 2005, including more detailed species lists and gear identification. Although Indonesia has been reporting more detailed catches by species and gear since then, the quality of the datasets reported remains uncertain.*
- Fisheries data collection agencies in each country, notably those in India and Sri Lanka, collaborate to produce one consistent set of catch statistics.

  *The Secretariat is not aware of any arrangements made by **India** or **Sri Lanka** concerning the above issues.*
- Countries increasing sampling coverage to obtain acceptable levels of precision in their catch-and-effort statistics.

  The Secretariat does not receive information about the levels of precision of IOTC statistics when they are reported by countries. The Secretariat has created new IOTC forms for the reporting of IOTC statistics, including reporting of coverage levels and levels of precision of the estimates. The new forms and a draft IOTC Manual for the reporting of fisheries statistics to the IOTC will be presented to the next meeting of the IOTC Working Party on Data Collection and Statistics (WPDCS) for consideration. The WPDCS will also consider which levels of precision are appropriate for catches and length frequency data relating to IOTC and dependent species.

2. To improve the certainty of catch and effort data available for industrial fisheries:

- Indonesia and Malaysia collect catch and effort information for their fresh tuna and/or deep-freezing longline fleets, including those not based in Indonesia

  *Following a request from the government of **Indonesia**, the IOTC-OFCF Project organized in May 2009 an International Work Shop[3] to assist the implementation of a new logbook system for the tuna and tuna-like fisheries of Indonesia. The main objective of the new logbook programme is to improve the quality of the catch-and-effort data collected from the tuna fisheries of Indonesia. Implementation of the new logbook programme will start in January 2010, to cover all Indonesian longliners, including those not based in Indonesia.*

  ***Malaysia** reported in 2009 partial catch-and-effort data for its longline fisheries for 2008. However, the data were not reported as per the IOTC standards, containing only total catches and effort by month (not by 5° square grid). In addition, the catch-and-effort data reported is thought incomplete, as it does not contain catch-and-effort data for Malay longliners not based in Malaysia.*
- Taiwan,China collect and provide catch and effort data for their fresh tuna longline fleets.

  ***Taiwan,China** has not provided catch-and-effort data for its fresh-tuna longline fleet in the Indian Ocean, in spite of an increase in the number of fresh-tuna longliners that operate in the area in recent years .*
- India collect and provide catch-and-effort data for its longline fleet.

  ***India** has reiterated that it will not provide catch-and-effort data for its longline fleet, indicating that these data is not for release.*
- Iran report catch and effort data for its industrial purse seine fleet.

  ***Iran** has reported total effort (in number of fishing days) by vessel in 2008. However, the Secretariat has not received catch-and-effort data as per IOTC standards.*
- Countries having industrial fleets ensure that log book coverage is appropriate to produce acceptable levels of precision in their catch-and-effort statistics.

  The next meeting of the WPDCS will consider which levels of precision are appropriate for catch-and-effort data

[3] Workshop on the implementation of a logbook programme for the fisheries of Indonesia: Review of issues and considerations (Jakarta, 18-20 May 2009)

relating to IOTC and dependent species.

- Countries having industrial fleets implement or increase coverage of existing Vessel Monitoring Systems in order to be able to validate data collected through logbooks.

  The Compliance Section of the Secretariat sent a questionnaire in 2009 to assess implementation of VMS by IOTC CPC's, including questions about levels of coverage and use of information collected through VMS. The Secretariat will inform the next meeting of the WPTT about the results of this study.

- Countries having industrial fleets increase observer coverage to produce acceptable levels of precision in their estimates of bycatch and discard levels.

  The next meeting of the WPDCS will consider which levels of precision are appropriate for observer data relating to IOTC and dependent species.

- Countries having industrial fleets provide estimates of discard levels of tropical tuna species.

  ***Australia** (longline), the **EC** (purse seine), and **South Africa** (longline) have reported information on recent levels of discards of tropical tunas and other species for its fisheries. The Secretariat has not received information from other countries concerning discard levels of tropical tunas.*

- Countries having industrial fleets provide information on the activities of vessels presumed to be from non-reporting fleets.

  The Compliance Section of the IOTC Secretariat received several reports from IOTC CPC's or other countries in the region about the activities of vessels whose catches had not been reported to the IOTC. The Secretariat estimated catches for these and other vessels whose activities were not monitored by the flag countries. All these catches are presented under the NEI categories; more details about the estimation procedure and current levels of catch are presented in Appendix.

3. To increase the amount of size data available to the Secretariat:

- Pakistan, Comoros, Indonesia and Yemen collect and provide size data for tropical tunas taken by artisanal fisheries, especially gillnet, handline and troll fisheries.

  *The Secretariat is not aware of **Comoros**, **Indonesia**, **Yemen**, or **Pakistan** having implemented sampling schemes for the collection of size data from their artisanal fisheries.*

- India provide its size data available for tropical tunas.

  ***India** has reiterated that it will not provide length frequency data for its fisheries, indicating that these data is not for release.*

- Maldives provide size frequency data by gear

  ***Maldives** has provided length frequency data for its fisheries. However, size data has not been made available by gear. When comparing size data from recent years with the data available from previous years the Secretariat noted significant increases in the proportions of large yellowfin tuna specimens in the samples from the Maldives. The likely increase in yellowfin tuna of large size in the catches is thought to come from the increased use of handlines in the Maldives, which tend to catch specimens of larger size that those taken by pole-and-line fisheries. Therefore, the size data provided by the Maldives cannot be used.*

- Thailand and Iran collect and provide size data for their industrial purse seine fleets

  ***Thailand** and **Iran** have implemented port sampling schemes for the collection of length frequency data from their industrial purse seine fisheries. However, considering the type of vessels involved and onboard fish storage practices, the Secretariat believes that the size data collected through port sampling has limited use. To date, Thailand and Iran have not provided length frequency data for its purse seine fisheries.*

- Taiwan,China collect and provide size data from their fresh tuna longliners.

  ***Taiwan,China** informed that it has implemented sampling in some locations in the Indian Ocean to be able to collect length frequency data from its longline fleets. However, the Secretariat has not received length frequency data from Taiwan,China concerning its fresh-tuna longline fleets.*

- Indonesia and Malaysia collect and provide size data for their longline vessels based in other countries

  *The Secretariat is not aware of **Indonesia** or **Malaysia** having implemented sampling schemes for the collection of size data from its longline vessels based in other countries.*

- China, Oman, Philippines, Seychelles and South Korea provide size data from their longline fleets.

  Seychelles *provided during 2009 length frequency data for its industrial longline fishery, for the years 2007 and 2008. Size data are collected by the crew of Seychelles longliners, with sizes collected from the first 30 fish caught on each longline set.*

  South Korea *and* ***China*** *provided during 2009 length frequency distributions for tropical tunas caught by longliners operating under their flag. Length frequency data are collected through scientific observers. However, the data collected has limited use as observer coverage levels are thought to be too low.*

  The Secretariat is not aware of ***Oman*** *or* ***Philippines*** *having implemented sampling schemes for the collection of size data from its longline vessels based in other countries.*

- Japan increase size sampling coverage of its longline fleet.

  Japan *informed the Secretariat in 2009 about its plans to increase observer coverage in longliners operating in the Indian Ocean. Japan indicated that it expected an increase in the amount of size data collected from its fisheries in the nearly future.*

- Countries catching significant amounts of tropical tunas review their existing sampling schemes to ascertain that the data collected are representative of their fisheries.

  The next meeting of the WPDCS will consider which levels of precision are appropriate for length frequency data relating to IOTC and dependent species.

4. To reduce uncertainty in biological parameters important for the assessment of tropical tuna species:

- 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.

  The IOTC Secretariat revised in 2009 length-weight and length from the tip of the snout to the base of the first dorsal fin-fork length equations for the yellowfin tuna, based on new information presented to the WPTT in 2007[4] *by the* ***EC****, as derived from samples of fish unloaded through the canning factory in Victoria (Seychelles) by industrial purse seiners operating in the Indian Ocean.*

  The following measurements cannot be converted into the standard measurements selected for tropical tunas:

  - *Length from the base of the first dorsal fin to the fork of the tail – fork length, for yellowfin tuna and skipjack tuna.*
  - *Curved fork length measurements (e.g. with a tape measure) – straight fork length measurements (e.g. with a calliper), for the three species*

- Countries collecting biological information on tropical tunas caught in their fisheries, preferably through observer programmes, and providing this information (including the raw data where possible) to the Secretariat.

  In recent years, the ***Republic of Korea*** *and the* ***EC*** *provided samples containing length-weight, processed weight-round weight and fork length-sex for tropical tuna species. The Secretariat has not received biological data from other countries in recent years.*

[4] Updated biological parameters for Indian Ocean yellowfin tuna and monitoring of forage fauna of the pelagic ecosystem, based on a routine sampling at the cannery in Seychelles. Francis Marsac et al. (IOTC-2006-WPTT-09

APPENDIX I

ESTIMATION OF CATCHES OF NON-REPORTING FLEETS

The estimates of catches of non reporting fleets were updated in 2009:

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. At present, there are no purse seiners operating in the Indian Ocean under flags of non-reporting countries.

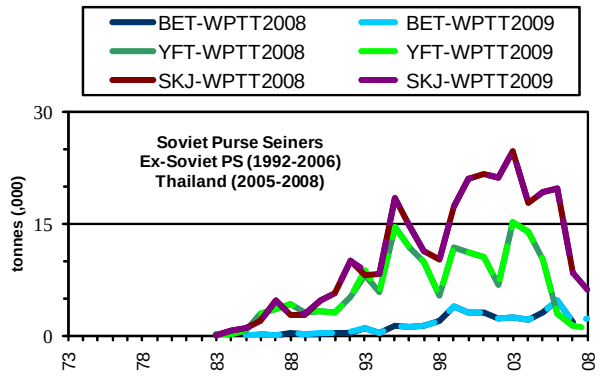


Figure 19: Catches of Soviet and ex-Soviet purse seiners estimated in 2009 versus previous catches estimated in 2008 (1973-2008)

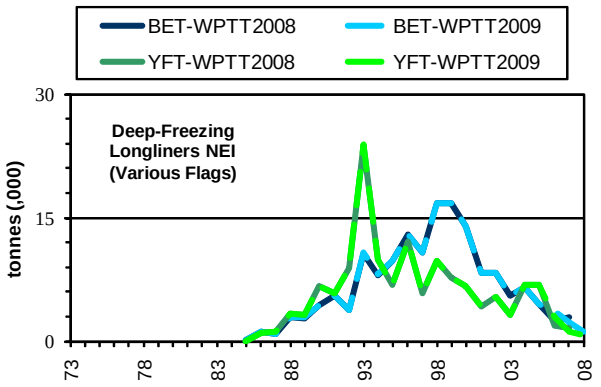


Figure 20: Catches of deep-freezing longline vessels in the Indian Ocean estimated in 2009 versus catches estimated in 2008 (1973-2008)

- **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, Japanese or Spanish longliners, based on the assumption that most of the vessels operate in a way similar to the longliners from Taiwan,China, Japan or Spain. The collection of new information on the activities of non-reporting fleets during the last year, in particular the numbers and characteristics of non-reporting longliners, led to improved estimates of catches. Since 1999 the number of non-reporting longliners in the Indian Ocean has decreased considerably leading to a marked decrease in catch levels. Such decrease has coincided with an increase in the numbers of vessels operated by some IOTC CPC's, such as Taiwan,China, the Seychelles and, recently, Malaysia, India, Oman, and other coastal countries in the IOTC region. Although these countries usually report catches to the Secretariat, the data reported is considered incomplete (as indicated in Section 4)
- **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 have been 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 [5] and/or institutions in the countries where the fleets are based and/or foreign institutions. This applies to Indonesia (2002 - 2006), Thailand (1998 – 2006), Sri Lanka (2002-03), Malaysia (2000-2006), Oman (2004-05) and Seychelles (2000-02). Since 2007 Indonesia and Malaysia have reported catches for their longline fleets. However, the catches reported are thought to be incomplete as Indonesia and Malaysia do not monitor the activities of vessels under their flags based in other countries. The Secretariat estimated the catches of this component as for the countries indicated below.
- Information available on the number of fresh-tuna longline vessels operating in other ports or on the activity of those vessels (e.g. the number of vessel 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 that were covered through sampling.

In 2006 Taiwan,China provided total catches for its longline tuna fleet operating in the Indian Ocean for the period 2000 to 2005. The catches for 2006-08 have also been provided. The catches published by Taiwan,China were slightly higher than those that the IOTC Secretariat had estimated from the data collected through port sampling. The new catches provided for 2001-05 were used to replace those in the IOTC database. This was done on the assumption that vessels from Taiwan,China had operated in ports of non-reporting countries, their catches not accounted for in estimates made by the Secretariat.

The catches for fleets other than Taiwan,China for 1973-2008 and for Taiwan,China in years prior to 2001 were estimated as explained in the three bullet points above.

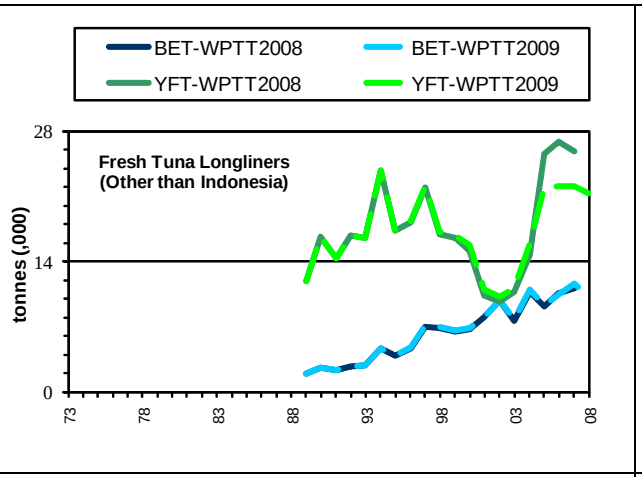


Figure 21: Catches of fresh-tuna longline vessels based in India, Malaysia, Maldives, Mauritius, Oman, Seychelles, Singapore, Sri Lanka, Thailand and Yemen (mainly registered in China, Taiwan,China and Indonesia) estimated in 2008 versus catches estimated in 2009 (1973-2008)

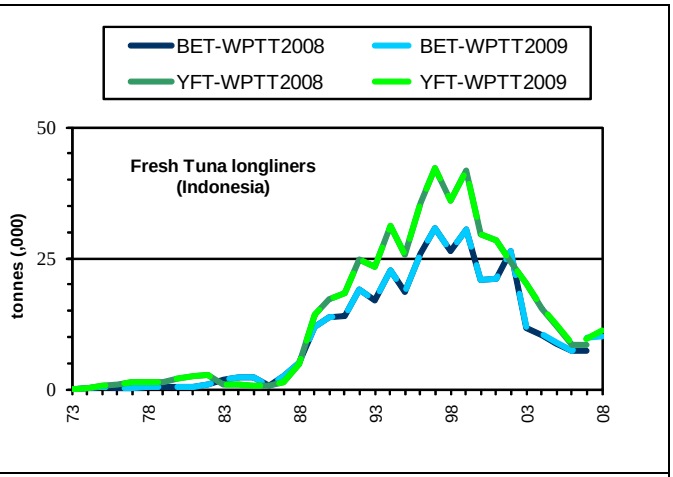


Figure 22: Catches of fresh-tuna longline vessels based in Indonesia (domestic and foreign) estimated in 2008 versus catches estimated in 2009 (1973-2008)

[5] Overseas Fisheries Cooperation Foundation of Japan